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VOLUME IX

MADRAS

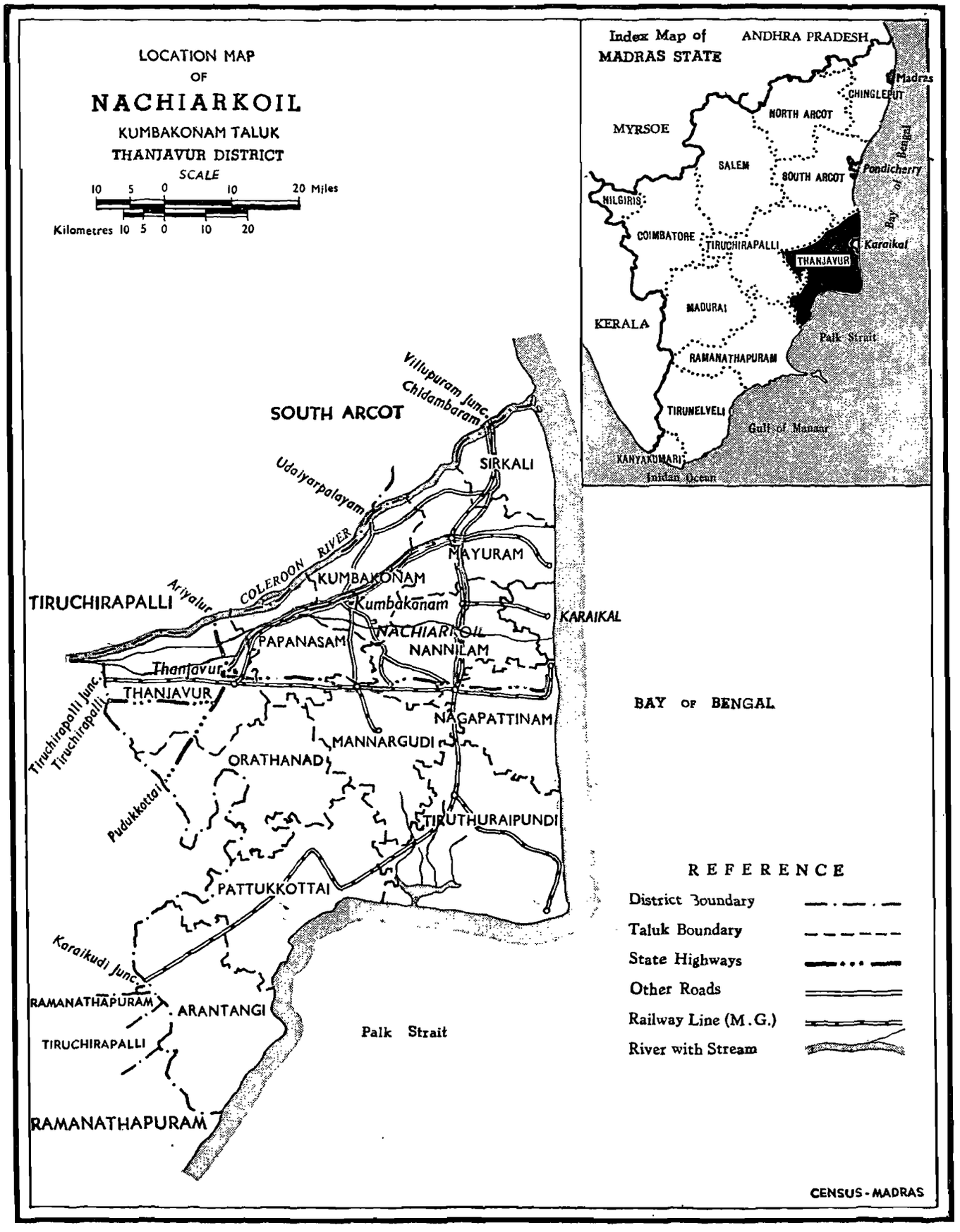
PART VII - A (ix)

BRASS AND BELL-METAL WARE OF NACHIARKOIL

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1966


LOCATION MAP
OF
NACHIARKOIL
KUMBAKONAM TALUK
THANJAVUR DISTRICT
SCALE
10 5 0 10 20 Miles
Kilometres 10 5 0 10 20
Index Map of
MADRAS STATE
ANDHRA PRADESH
Madras
CHINGLEPUT
NORTH ARCOT
MYRSOE
SALEM
SOUTH ARCOT
Pondicherry
Bay of Bengal
NILGIRIS
COIMBATORE
TIRUCHIRAPALLI
Karaikal
THANJAVUR
MADURAI
KERALA
Palk Strait
RAMANATHAPURAM
TIRUNELVELI
Gulf of Manaar
KANYAKUMARI
Indian Ocean
SOUTH ARCOT
Villupuram Junc.
Chidambaram
SIRKALI
Udaiyarpalayam
COLEROON RIVER
MAYURAM
KUMBAKONAM
Kumbakonam
Ariyalur
TIRUCHIRAPALLI
KARAIKAL
NACHIARKOIL
PAPANASAM
NANNILAM
Thanjavur
THANJAVUR
Tiruchirapalli Junc.
Tiruchirapalli
NAGAPATTINAM
MANNARGUDI
ORATHANAD
Pudukkottai
TIRUTHURAIPUNDI
PATTUKKOTTAI
Karaikudi Junc.
RAMANATHAPURAM
ARANTANGI
TIRUCHIRAPALLI
RAMANATHAPURAM
Palk Strait
BAY OF BENGAL
REFERENCE
District Boundary
Taluk Boundary
State Highways
Other Roads
Railway Line (M.G.)
River with Stream
CENSUS - MADRAS

CENSUS OF INDIA 1961

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FOREWORD

One of the first steps to be taken in the First Five Year Plan was the establishment of six Boards for the promotion of handicrafts, village and small industries : (1) The Khadi and Village Industries Board (2) The All-India Handicrafts Board (3) The All India Handloom Board (4) The Central Silk Board (5) The Coir Board and (6) The Small Industries Board.

The rapid expansion of the activities of these Boards which concentrated not only on production and techniques, but also on organisation, extension, credit, marketing, and export, consolidated and enlarged the position that the household industries sector had so long enjoyed in the nation's economic life. It was this fact that forced itself upon the preparations for the 1961 Census and demanded that household industry should be separately investigated for a proper accounting of the nation's manpower resources and its specific contribution to the national income. The 1961 Census therefore asked a special series of questions on household industry, input of family and hired labour, and the periods over which household industry is conducted. It was felt, however, that an enumeration of the total number of establishments and their industrial classification would be incomplete without a proper description of what they produce and how they produce. It was important to make an assessment of the limits of rigidity within which traditional skill operates. This could be obtained by studying the caste, occupational, social and economic stratifications, the limitation of credit and marketing facilities, the dominance of custom over contract, the persistence of traditional tools and design forms, the physical limitations of transport, communication and mobility, the inability to adopt new lines or adapt to changing circumstances. It was important also to make an assessment of the limits of flexibility that traditional skill is capable of because the transformation of traditional skills to modern skills is easier said than done and a thorough study may well reveal that it is perhaps cheaper from the social point of view to develop industrial skills from scratch than to try to graft traditional skill on alien soil. A rather tragic case of failure to make what would on the face of it seem a minor adjustment cast its heavy shadow on the nation when it was discovered that goldsmiths used to working on 22-carat gold all their lives felt sadly helpless when aksed to work on 14-carat, so narrow and unadaptable were the limits of their skill and proficiency and so rudimentary the tools and equipment with which they and their forefathers had worked. This fiscal accident revealed that tools are even more important than skills.

An early opportunity was therefore taken in February 1960 to suggest to State Census Superintendents, that the Census provided a unique opportunity for conducting and documenting a survey of this kind. As such a survey was quite outside the usual terms of reference of Census work it was thought prudent cautiously to feel one's way with the thin end of the wedge of what would, it was hoped, prove to be an exciting pursuit. It was therefore considered the wiser course to wait until the State Census Offices felt so interested that they would no longer take the inquiry as an imposition but rather want to do it on their own and ask for the necessary staff and equipment. This Office, too, in its turn, could make use of the interval to organise and elaborate the design of inquiry in order to feed the appetite that work in progress would serve to whet. Because it was a labour of love, sought to be unobtrusively thrust on one's colleagues and because the inquiry itself was so vast that normally it would demand in any country as big a set-up if separtely established, as the Census organisation itself and that over a much longer period, and because it was almost a pioneer venture, nothing like it having been undertaken since the 1880's, it was decided to move towards a build-up by stages, to let the inquiry unfold itself only as fast as my colleagues chose to ask for more.

Thus, in the first circular of 18 February 1960, it was suggested that the inquiry might be conducted through the agency of the Development Department, the State Director of Industries, the Director of Tribal Welfare, the Registrar of Cooperative Societies, and other organisations concerned with the promotion of household industry. A draft questionnaire containing 30 questions in three parts was recommended for canvassing. It was suggested that information on this questionnaire, village by village and area by area, might either be obtained through the regular departmental channels of the State Government, or through the newly set up Census organisation, or through the hierarchy of the newly-created Panchayats. Stress was laid on the need of photographic documentation and illustration of designs, shapes and forms not only by photographs but with the help of line drawings or sketches together with a full description of the materials used.

Almost the whole of 1960 and the first half of 1961 were spent in organising and taking the Census count, although several States even during this period had not allowed the grass to grow under their feet but made exploratory studies and decided in their minds how the inquiry should be organised. A series of regional conferences held in Trivandrum, Darjeeling and Srinagar in May and June 1961 revealed much enthusiasm among State Superintendents to proceed with the survey, but the need of separate staff and equipment was felt at the same time as the realization dawned that this was much too serious an inquiry to be treated casually and left to be achieved through the usual administrative channels and State Census Superintendents proceeded to augment their staff with qualified research and investigating officers, technical persons, photographers, artists, draughtsmen and other trained personnel.

This was followed by rapid progress in coordination between the Central and State Census offices in the matter of exchange and processing of information, documentation and investigation, of assisting each other with trained investigators and in editing and finalizing drafts, layouts, presentations.

Mention has been made of a questionnaire in three parts and thirty questions. The idea was to make a beginning with empirical, analytical studies based on a structured questionnaire which would replace general descriptive accounts that had obtained so far. The primary aim was to obtain a picture as much of the artisan himself as of his craft, to obtain a perspective of the artisan and his craft in his social and economic setting, the extent to which tradition bound him and the winds of change ruffled him, the extent of his mobility, and immobility, the conditions of market, credit, new contacts and designs in which he operated, the frame of new as well as traditional producer-customer relationships in which he still worked, and how far he was ready to pierce his own caste-tribe socio-economic cocoon and make a break through to new opportunities promised by the Five Year Plans. The aim was to hold up the mirror to hereditary skills struggling with the dialectics of tradition and change.

Thus the first part of the questionnaire, purporting to be a village schedule, sought to take account of the size and population of the village, its remoteness from or proximity to centres of trade and commerce, in short, the degree of isolation in which the artisan worked, and the relative strengths of various communities in the village which would afford clues to social interdependence and the prevalence of the JAJMANI system. The second part was devoted to artisan communities in the village; the several castes of artisans, the number of families in each, the total number of workers, males and females, the extent of cooperative activity among them, the extent of dependence upon employers and of wage or contract labour. There were questions on the raw materials used, the means of their procurement, the possible extent of dependence on others for raw materials, the extent of the material that artisans can handle within the limits of their skill. There were other questions on the exchange and flow of designs, the use of colours, the ancientness of the craft and legends associated, the colonization of the craftsmen, on patrons and customers and on social and economic contact with the world inside and outside the village. There were specific questions on the workshop

itself and particularly the tools and the source of supply of these tools, because it was felt that tools decide everything and are the surest index of inertness or flexibility. Separate blocks of questions were designed to bring out the ramifications of artisans castes throughout the country and the ways they sustained themselves, the type of clientele they catered for, the extent to which they operated on money or barter or service, how specialised their craft was, how wide the market, how dependent they were on their socially preordained clientele and how restricted the latter was by the seemingly unalterable laws of social custom; the extent to which they could operate in the open market, the range of their wares and the sizes to which these were ordinarily restricted either by the limits of their own skill or the length of their customers' pursestrings. Inquiries were to be made about the operation of middlemen and of cooperative societies, the people who gave new designs and demanded new products. Finally the several stages of production of the articles themselves were to be fully described including the final and finishing stage and a list of very skilled craftsmen of each community was to be furnished. The third part was devoted specially to tribal communities and designed to find out how self-sufficient or dependent they were on the production and supply of manufactured goods, the extent to which they produced themselves or depended on others, their contacts with other communities and the specific forms of production and commerce through which these contacts were maintained.

Particular emphasis was laid on the need of obtaining as full an account as possible of unique regional design differentiations as they reflect not only the very culture patterns of the country but the persistent inventive faculties of the craftsmen. The importance was emphasised of giving full attention to articles of domestic use as it is in their shapes, designs and forms that the culture patterns and traditional skills persist most tenaciously.

Simultaneously with the investigation of specific crafts, State Superintendents proceeded to compile a comprehensive list of all types of handicrafts obtaining in their State. As for the specific Crafts to be investigated several tables were devised from the structured questionnaire in order to guide investigators toward pointed observation and analysis, to enable them to write, not just general descriptions, but with their eye on the object and on facts.

Investigations conducted between September 1962 and May 1961, including a study group of all States and the Social Studies Division in December 1961 at Delhi, stimulated many of the States into going in for a much enlarged schedule. The revised village schedule itself, the counterpart of the first part of the February 1960 schedule, contained 19 large sections containing elaborate and probing questions. The Family Schedule for practising artisan families similarly contained 19 main questions each subdivided into many questions. The Family Schedule for non-practising artisan families contained 21 questions. There were schedules for the study of cooperative societies, of production-cum-training centres, and of consumer's preference. This enlarged schedule of investigation, in the formulation of which the States themselves actively assisted, was greatly welcomed. The surveys that will appear in this series will therefore consist of two main types: (a) those based on the original short schedule and (b) those based on the much enlarged schedule. In some cases Census Superintendents felt enthused enough to scrap the work based on the original short schedule and do it over again on the enlarged schedule. In the meantime much experience was gained on the analysis of facts and figures to cloth each observation with plenty of authentic information so that the reader could make his own judgement instead of being expected to see all the time through another pair of eyes.

This programme of survey of handicrafts and household industries has been fortified by several ancillary surveys, each one of which would deserve major attention. Along with the survey a compilation has been made of all handicraft centres in each State and an inventory prepared of skilled craftsmen. Photographic and other documentation has been built up to constitute what may now be regarded as the most considerable repository in the country. Elaborate and accurate maps of craft centres in taluks, tehsils and districts are either ready or

under preparation. A full census of all fairs and festivals, weekly hats and markets, throughout India, has been taken and is being published for the first time. Andhra Pradesh has embarked upon a project of chronicling the social and religious antiquity and uniqueness of every fair and festival. A separate volume will be devoted to each district which promises to be of the utmost value to sociologists and orientalists. A full and complete inventory, replete with sketches and measurements of every object has been prepared of exhibits in museums of tribal crafts in India. There has been a fairly satisfactory survey of houses and buildings, indigenous architectural designs and use of local building material of the whole country. All this has been entirely a labour of love, patiently organised and executed under great strain and in disregard of health and comfort, for which I take this opportunity of expressing my appreciation and grateful thanks to my colleagues.

New Delhi
July 30, 1964.

ASOK MITRA
Registrar General, India

PREFACE

Sri A. Mitra, Registrar General, India has, in his foreword, indicated how a study on handicrafts was planned as part of the 1961 Census on an All India basis. Against this background, I will indicate briefly what has been done in Madras State.

In "Harijan" dated 10th November, 1946, Mahatma Gandhi wrote as follows:

> "The villagers should develop such a degree of skill that articles prepared by them should command a ready market outside. When the villages are fully developed, there will be no dearth of men with a high degree of skill and artistic talent. There will be village posts, village artists, village architects, linguists and research workers. In short, there will be nothing in life worth having which we will not have in village."

It has been the pride of India that her arts and artisans have been well-known throughout the world. It has also been the endeavour of the Government of India to preserve our crafts and raise the economic standard of the artisans through various measures initiated during the First and Second Five Year Plans. In a mixed economy, it is necessary to maintain a balance between industrial development and the development of our village crafts and industries. This volume is an attempt to study the conditions of handicrafts including village industries and craftsmen of Madras State, on a statistical basis. It will also be our endeavour to examine how far the village of Gandhiji's concept is being maintained in India and to what extent the crafts could be sustained on a competitive basis which in the long run will add variety and artistic value to the various products which this State can produce.

This study was undertaken at the instance of Sri Asok Mitra, Registrar General, India. The relevant extracts of the letter written by him in 1960 are reproduced below:

"You will recall that we have introduced special questions on household industry in the household schedule and on establishment and workshops in the houselist in order to obtain a frame for all types of industries in the country. There was of course, a special request from the Ministry of Commerce and Industry in this regard, but from the census point of view, it is important to assess the magnitude of the household industries and small establishments, so that it can be related to livelihood of the population and enumeration of the total number of establishments and their industrial classification would be incomplete without a proper description of what they produce and how they produce. Census Organisation can well afford a comprehensive survey of a descriptive nature and I believe the Census really provides a unique opportunity for conducting such a survey".

This volume entitled 'Handicrafts and Artisans of Madras State' is the result of his letter. As the survey in this State was begun before the Social Studies Division was set up in New Delhi, it has not been possible for me to follow the questionnaire evolved on an All India basis. I have followed my own method of study. It was my intention to collect information on all the Handicrafts practised in the State and build up tables for the State, district by district and taluk by taluk. Some work was done in this direction. But the project had to be given up because of the difficulty involved in conveying a proper concept of handicrafts to different agencies filling in our schedules. So our attempt has been limited in preparing monographs on selected industries noted for their artistic appeal.

Detailed monographs have so far been published on the following handicrafts:

1. Silk weaving of Kanchipuram
2. Palm leaf Products of Manapad and Nagore
3. Artmetal wares of Tanjavur
4. Icons in metal and stone.
5. Druggets and Carpets of Wallajapet
6. Wood carving of Madurai
7. Glazed Pottery of Karigiri
8. Fine Mats of Pattamadai

The present one is on Bellmetal and Brass metal work of Nachiarkoil.

It is also hoped that during the intercensal period, more monographs will be prepared on other handicrafts. This survey was rendered possible by the sympathetic attitude adopted by the Government of Madras who directed the Director of Industries and Commerce, the Registrar of Co-operative Societies, the Director of Information and Publicity and the Director of Harijan Welfare to extend their full co-operation to me in the study.

The study was conducted by Sri Anser Ahmed, Research Assistant which was supervised and the draft report prepared by Sri P. Murari, I. A. S., Deputy Superintendent of Census Operations. Mrs. Ruth Reeves has perused the draft and given useful suggestions especially regarding the sketches and photographs. In view of this contribution she has been shown as a Co-author.

In making this survey a success, the Superintendent and staff of the Government Bell metal Training-cum-Production Centre at Nachiarkoil have extended their full co-operation. I must also place on record the good work done by the Janatha Printing and Publishing Co., Pte. Ltd., in printing this volume.

P. K. NAMBIAR



Thriambaka Deepam.



4½′ Kuthuvilakku with Annai Prabai

BRASS AND BELL - METAL WARE OF NACHIARKOIL

CHAPTER—I

INTRODUCTION

Indian craftsmen are skilled in the production of articles of daily use in brass, copper and other base metals. In the North, brass-ware of Banaras has always been noted for its excellence, its gold-like brilliance and rich colour. The water goblets, trays, lotas, pandans, salvers, flower vases and plates made at Banaras are famous for the grace of their forms, the artistry of their designs and the brilliant chasing of mythological and other figures. Beside Banaras, many other places are well-known for their pans and other domestic and decorative metal-ware. For example the brass lotas and other domestic vessels made in Madhya Pradesh, particularly the ancient Gondwana (for storing water) are characterised by their pure traditional forms. Brass is also used extensively for the making of articles of daily use and ornamental objects like vases, cups, bells etc. In Bombay State, Ahmedabad, Poona and Nasik are renowned for the excellence of their brass and copper ware.

Quite a lot of work in base metals is also done in the South, some of it of a very high quality. Utensils are made both in brass and copper and the brass work of Nellore is specially good. Tanjore and Madurai may be said to produce the finest work in brass, copper and bronze—in fact some say in the whole of India. To quote Sir George Birdwood :

> "In its bold forms and imperial inwrought ornamentation, it recalls the descriptions by Homer and the work of the artists of Sidon in bowls of antique forms. Some are simply etched and others deeply cut in mythological designs; and others are dispersed all over with crustae of the leaf pattern seen in Assyrian sculptures. Copper and brass or silver and copper produce the effect often of quiet and regal grandeur".*

He is apparently referring to the Swami style of work utilised for the manufacture of Tanjore Art Plates and bowls made in copper and silver with a brass base.

> "Some of the most beautiful and interesting brass wares of India are those directly required for ceremonial purposes or which have been derived from the requisites used in temples. "Gindy" or "Achmani" used by priests in sprinkling holy water and making drink offerings are beautiful symbolic objects largely drawn upon the decorative art. The "Aarathi" plate is often extremely beautiful while the "Peetam" or "Idol pedastal" of lotus leaf pattern has originated much that is admirable in India. The lamp, especially the hanging lamps, the bells found in every South Indian Temple have considerably stimulated the art conceptions and some of the most beautiful examples of Indian art are found in these, especially in the chain used to hang up the bell".*

The piety and devotion with which objects of ritual use were made is well exemplified in the *Maha Nirvana Tantra.*

> "The jar is called KALASHA because Viswakarma made it from different parts of each of the Devatas. It should be 36 fingers in breadth in its widest part and 16 in height. The neck should be 4 fingers in breadth, the mouth 5 and the base 5. This is the rule for the design of the KALASHA. It should be made without hole or crack. In its making all miserliness should be avoided since it is fashioned for the pleasure of Devas."**

The "Devas" referred to above are Deities while Devatas are minor Gods or Divine Beings.

The lamps made for temples are artistically used in South India and are of many different kinds, the most characteristic being those in the form of a branching tree, each branch ending in a small tray or bowl for the oil and the wick. Simple upright stems support shallow bowls to take many wicks, the central pillar often terminating in a bird or "Prabhai", generally a picture of *Hamsa* or *Swan.* Lamps may also be made to be suspended by chains from the ceiling, the chains often being richly decorated and always excellent in workmanship and design. The common form of the temple lamp is in the form of a standing woman holding in her hands a shallow bowl to contain the oil and the wick. To quote the famous Indian authority, Sri O. C. Gangoli :

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* Rustom J. Mehta—Handicrafts and Industrial Arts of India, p. 34

* J. B. Bushan—Indian Metal ware

** Rustom J. Mehta—Handicrafts and Industrial Arts of India, p, 37

"Of all the forms met within South India, few are perhaps so interesting and characteristic of South India as those conceived in the forms of human statues carrying in their hands a cup which serves as the receptacle for the oil for burning the wick. This type of lamp appears very frequently and with some variations is previously strewn over almost all the temples in South India. The statue holding the wick is generally a female figure and is technically known as "DEEPALAKSHMI". The male form is not common though one or two may be seen in South Indian temples. Surprisingly enough, lamps with human motifs are not found in the North or any where else in this country except perhaps in Bengal to a limited extent and even these are Southern derivatives. Almost as popular as the figure lamps are the HAMSA lamps. The receptacle for oil and the wick is at the top of an upright position decorated with knobs and other patterns and the whole surmounted with the figure of Swan. As an auspicious and beautiful bird it has a place of honour and precedence before all". (Gangoli)

"In South Indian art, the Swan, so symbolic an object of grace is usually depicted conventionally with an upturned tail which reproduces a fancy of the artist rather than a fact in nature." (Gangoli)*

And such products are produced at the famous centre of Nachiarkoil in Tanjore District.

Tanjore is the seat of ancient civilization in the State and has always been noted for the practice of arts of luxury and refinement. In its chequered history which is largely inter-twined with those of the Cholas and the Vijayanagar Kings, as patrons of art, architecture and crafts, it has always given birth to and carefully nurtured many traditional handicrafts. To mention a few of the reputed crafts in Tanjore and its environs, we have the musical instruments known as Nathaswaram of Narasingampet, which have a wide reputation, the making of pith temple models and garlands, wood-carving of a very fair quality by a class of workmen called car-carpenters who carve images on temple cars at Tanjore, Mannargudi and Tiruvadi, the manufactures of fine pieces of jewellery like gold snuff boxes, pearl pendants etc., painting of wooden tables or on glass with a paste of powder and gum, ornamenting with glass and precious stones, an unique craft practised by a class of people called the RASUS of Tanjore, wax-printing at Kumbakonam found adjacent to the Kumbeshwaraswami Temple, the textile industry, the weaving of pure silk by Pattunulkarars, Sowrashtra Brahmins in Tanjore and Kumbakonam and the manufacture of bronze icons and art metal plates by Stapathis and Pathars in Swamimalai and Tanjore respectively and the making of vessels of brass, copper, tin and bell-metal for domestic use and for export at Nachiarkoil and Kumbakonam.

The brass and bell-metal ware industry is one of the oldest surviving handicrafts of this district.

"The most noted centres for this work are Kumbakonam and Nachiarkoil situated in Kumbakonam taluk of Tanjore district. The latter village is especially celebrated for its bell-metal koojas and its native lamp stands which are made hardly anywhere else in the district. There are two hundred households employed in metal work there; at Kumbakonam where 600 households are employed, large numbers of sheet metal vessels of many shapes are made. These are exported in great quantities. The brass vessels are hammered out on stakes from large plates of heated metals in sections (generally three) which are afterwards braced together. The final smoothness is obtained by gentle hammering after heating the vessels. The bell-metal vessels are cast on wax moulds on core sand base. The wax moulds are covered with a coating of wax and this again by a thick layer with an orifice at bottom of clay. The whole is then exposed to heat which melts and expels the wax through the orifice and leaves a space between the mould and the outer layer of clay into which the molten metal is poured. At Mannargudi, good brass vessels are also made in fair quantities and to a lesser extent they are manufactured in nearly all towns. Bell-metal work is rather rarer but is also fairly widespread."*

Brass and bell-metal work is in vogue in many of the districts of Madras State, outstanding among them being the districts of Tanjore, North Arcot, Kanyakumari and Tirunelveli. In all these districts, the following articles are invariably produced:

1. Vessels of various sizes and shapes
2. All kinds of household utensils like tumblers, jugs, pans etc.
3. Chains and lamps
4. Traditional temple lamps
5. Ritual articles

In addition to the Departmental Training Centre run by the State Directorate of Industries and Commerce at Nachiarkoil, Tanjore District which is the chief centre for this craft in the State, known for its quality and maximum output, there is also a Production-cum-Sales Co-operative Society at Nagercoil, the headquarters of Kanyakumari district. There are

* Rustom J. Mehta — Handicrafts and Industrial Arts of India, p. 37

* Tanjore District Gazetteer written by Mr. F. R. Hemingway, I. C. S. and edited by Mr. W. Francis, p. 125

also other Industrial Co-operative Societies for brass and bell-metal workers, one at Tirumangalam taluk in Madurai district and the other at Vagaikulam in Tirunelveli district. The approximate annual value of production in the districts where this craft is practised can be found in Annexure-I to the Report.

The manufacture of brass and bell-metal wares has been an important occupation of the Pathers since the year 1857 at Nachiarkoil. The craft was originally practised by a particular sect called Pathers. Some four or five families of Pathers practising the production of brass and bell-metal fled in 1857 from Nagercoil which was then in the Travancore-Cochin State. Unsettled conditions of livelihood and fear and danger to their lives led to their migration. With their bag and baggage they left their homeland, some reaching Kumbakonam, others landing at Vagaikulam in Tirunelveli district and the more intrepid moving on to Andhra Pradesh. Those who reached Kumbakonam were surprised to see the articles being fashioned out of brass sheets. These Pathers were ignorant of sheet work while they themselves were adept in the art of wax moulding. Finding that they could not compete with artisans in Kumbakonam who for years have practised the craft of fashioning articles of brass out of big sheets and realising that they could not satisfactorily practise the art of brass and bell-metal ware by the wax moulding process which requires wide open spaces, moulds and a particular type of sand to fill in the mould, they moved out of Kumbakonam and on their way halted at Nachiarkoil to visit the temple and worship the deity. It was at this place, by accident, and fortunately for Nachiarkoil and Tanjore district, they found out that the sand in the river-bed adjacent to Nachiarkoil was most suited for moulding and casting. It is believed by the local craftsmen that such type of sand is not found anywhere else in Madras State. No doubt 'Vandal' sand is found in abundant measure in the river beds near Vagaikulam in Tirunelveli district and Nagercoil in Kanyakumari district, but it is inferior compared to the sands of Nachiarkoil. This was accepted as a good omen and the four or five families of nomadic Pathers settled at Nachiarkoil permanently putting an end to their unsettled wanderings and took up in right earnest the threads of their life which had so unfortunately snapped for them at Nagercoil. Even to this day, we hear of Pathers of Nagercoil moving into Nachiarkoil to carry on their traditional craft, thanks to the miraculous properties of this vandal sand available on the river bed of the Cauvery. We have attempted to study the geneology of these original Pather families who had migrated to this place and this geneological tree is reproduced as Appendix II to this report.

Nachiarkoil with a population of 4,440 is situated six miles from the taluk headquarters, Kumbakonam in a south-easterly direction and is located conveniently on the main road between Kumbakonam and Tiruvarur. The nearest railway station is Kumbakonam, six miles away, but since the village lies on the main road which passes through the heart of the village, communication does not pose any problem. Buses ply regularly between Nachiarkoil and Kumbakonam. The road winds and curves its way through lush and velvety green fields of paddy stalks waving in the breeze. The graceful coconut and the sturdy plantain stand in luxuriant profusion all along the route. In fact some of the finest scenery found in this district greets the eye of the traveller all along the way.

An interesting legend is current among the villagers regarding the origin of this village. Our source of information happens to be some of the aged villagers of Nachiarkoil. "Thirunaraiyur" was the ancient name for Nachiarkoil. During the reign of the Chola King Kochenganan, a famous temple was built in honour of the Goddess Vanchulavalli who blessed him and presented him with a sword to conduct his campaign against his enemies. This sword brought him victory after victory and his campaign was a complete success. The original temple was a Shiva temple and adjacent to this temple there was another temple where the presiding deity was Vishnu known locally as Srinivasaperumal. When Lord Srinivasaperumal fell in love with Vanchulavalli, Shiva who was the presiding deity of the temple gladly vacated His place and yielded it to Perumal who fulfilled His cherished desire of marrying the Goddess. Shiva in turn occupied the place originally held by Perumal, a few miles away from Nachiarkoil. After Her marriage, the Goddess Vanchulavalli became the main deity of the temple and as She had the name of Nachiar, the temple came to be called as Nachiarkoil. The village accordingly got the name of this temple and henceforth was known as Nachiarkoil.

A more popular legend regarding the etymology of the village is as follows:

According to the Sthalapurana of the temple, this village was originally called Thirunaraiyur. In this village which was formerly surrounded by dense forests, a hermit named Medhavi observed strict austerities and did penance in order to get Goddess Mahalakshmi as his daughter. His boon was granted when Maha-

lakshmi, the consort of Lord Vishnu was born in this world under a Vanchula tree adjacent to the ashram of the hermit. Because she was found under a Vanchula tree, the girl came to be known as Vanchulavalli. She grew up to be a beautiful maiden and Medhavi looked after her well. Lord Vishnu, finding a bachelor's life intolerable, came to the earth from His heavenly abode. He assumed the mortal form of a Brahmin, named Himself as Vasudevan and accompanied by four other Brahmins started wandering on the earth. One day the disciples of the sage Medhavi met these Brahmins on the banks of the river Manimutharu. The former took the latter to the ashram of the hermit where they were entertained by Medhavi in grand style. Vasudevan happened to meet Vanchulavalli and fell in love with her. After a hearty meal, the hermit asked Vanchulavalli to fetch water for Vasudevan to wash his hands. While she was pouring water from a vessel, Vasudevan caught hold of her hands whereupon she called out to her father. Medhavi, seeing Vasudevan holding the hands of his daughter got angry and was about to curse Vasudevan. At this critical juncture, Vasudevan assumed his original form with a conch in the right hand and a chakra in the left. On seeing this, Medhavi blessed Vasudevan and gave his daughter in marriage to the latter. However, before the marriage could be consummated, Medhavi laid down three conditions which Vasudevan had to fulfil. First of it was that Vasudevan should not have another birth in future ; secondly all creatures—men and beasts living in the village—should attain Moksha (salvation) after death ; thirdly predominance should be given in all matters to his daughter Vanchulavalli Nachiar. Lord Vishnu in the human form of Vasudevan had no option but to agree to these conditions and after marriage, the village was named Nachiarkoil instead of Tirunaraiyur. From that day, in the temple, precedence is given only to Vanchulavalli Nachiar and not to Srinivasaperumal. This is clearly borne out by the fact that Srinivasaperumal is worshipped after her and even during various festivals the deity Nachiar is taken in the temple car preceding Lord Perumal.

The village has a Post Office, a Higher Elementary School, a Government Dispensary, and an Embroidery Training Centre. It comes under the aegis of the Tiruvadamarudur Block and has many of the major amenities found in big towns, except a rest house for the benefit of the traveller.

Early History of the Craft

The bell-metal industry has been flourishing in this village for the last 105 years. Even before that, brassware made out of brass sheets had been the monopoly of the local artisans. But after the Pather community had introduced the wax moulding processes, manufacture of household articles such as Kuthuvilakku (traditional pedestal multifaced oil lamp), temple bells and deepams (lamps), both in brass and bell-metal, through the process of box - moulding, wax - moulding and loam - moulding has been going on in this village. No ingots are or were ever used for casting. Instead, many of the artisans purchase old brass vessels unfit for use and sold by thrifty housewives, use the scraps and melt them for the purpose of fashioning new articles.

This industry is carried on in this village by 12 sects. At present, there are 132 families consisting of 160 persons engaged in this occupation. Bell-metal and brass-metal products need open spaces where moulds can be heated without any danger to huts and Nachiarkoil with its broad streets provides the ideal location for the establishment of this craft. Another advantage is the type of sand available in the village in the surrounding areas suitable for preparation of the different moulds. There is the *Karuman* sand which is ideally suited for wax moulding. This sand is light red in colour and is found to the east of the village. Moulds for manufacturing big vessels are prepared out of this sand. The multi-purpose sand called Vandal sand fetched from the Cauvery river-bed, one mile from Nachiarkoil, of light brown colour is the chief attraction. To prepare moulds out of this Vandal sand, clay powder is added and the mixture used for box moulds. Another type of sand called *Savuttu* sand is of light grey colour and is used in wax moulding. This sand is found in the tanks to the south and east of the village.

In olden days, in order to melt the metal, the Pathers utilised crucibles manufactured in the village itself. Clay dug out of the tank of Veppakulam situated to the east of the village was ideally suited for this purpose. Clay and sand sieved well to remove stones etc., was mixed in equal proportions and this clarey sand was then added to roasted husks in the proportion of 1:2 and made into a paste with the addition of water. The mixture was kept in the shade for ten days and then taken out and kneaded thoroughly. The crucibles were next fashioned by hand out of this mixture. A potter's wheel is utilised for this purpose, to the centre of which is fixed a wooden mould of the required crucible. Cowdung ash is sprinkled on the mould and the mixture of husk and clay sand which has been kneaded is taken and thrown on this mould. The crucible thus formed is then taken out of the mould and dried in the shade. They are taken out and heated

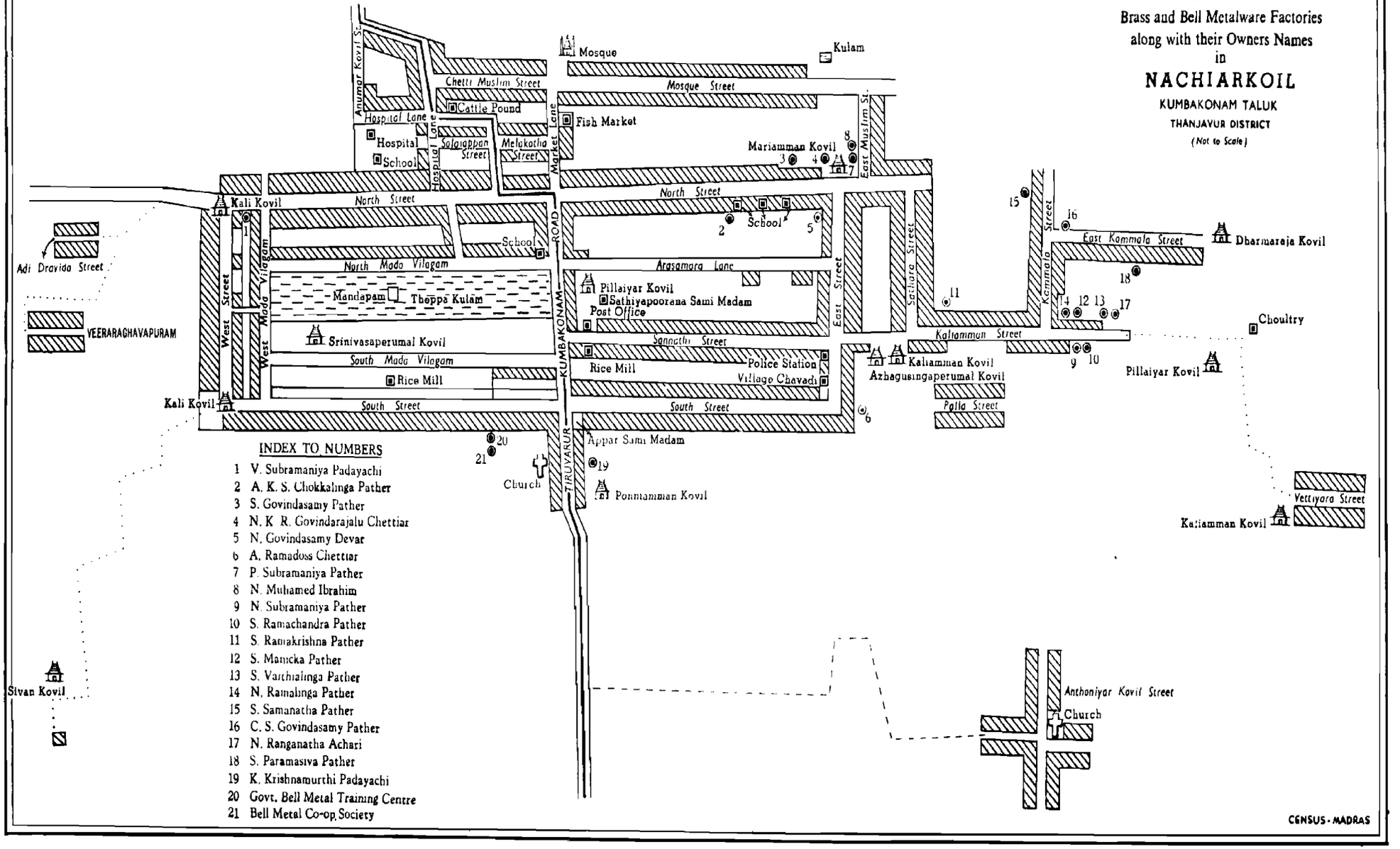
LOCATION OF

Brass and Bell Metalware Factories along with their Owners Names in NACHIARKOIL

KUMBAKONAM TALUK

THANJAVUR DISTRICT

(Not to Scale)



INDEX TO NUMBERS

1 V. Subramaniya Padayachi
2 A. K. S. Chokkalinga Pather
3 S. Govindasamy Pather
4 N. K. R. Govindarajalu Chettiar
5 N. Govindasamy Devar
6 A. Ramadoss Chettiar
7 P. Subramaniya Pather
8 N. Muhamed Ibrahim
9 N. Subramaniya Pather
10 S. Ramachandra Pather
11 S. Ramakrishna Pather
12 S. Mamicka Pather
13 S. Vaithialinga Pather
14 N. Ramalinga Pather
15 S. Samanatha Pather
16 C. S. Govindasamy Pather
17 N. Ranganatha Achari
18 S. Paramasiva Pather
19 K. Krishnamurthi Padayachi
20 Govt. Bell Metal Training Centre
21 Bell Metal Co-op. Society

CENSUS - MADRAS

before they are used for casting, lest they crack when subjected to the extreme heat of the molten metal. These crucibles, crudely prepared by the Pathers of Nachiarkoil were of inferior quality and could not be utilised for more than one casting. But nowadays the production of such inferior crucibles has been given up even by the poorest artisans as modern refractory crucibles made at Rajamundry are available in the open market in plenty at cheap rates and are capable of being utilised for ten castings. These crucibles are sold by private merchants, the price being fixed according to their numbers.

No. I costs Re. 0.50
No. II costs Re. 1.00
No. III costs Rs. 1.50
No. IV costs Rs. 2.00

For a long time, the fashioning of brass and bell—metal wares was the sole monopoly of the Pather community. However, monopoly of a craft based solely on birth is now a thing of the past. In many handicrafts like pottery, handloom weaving etc., artisans who hitherto enjoyed a monopoly, thanks to their hereditary skills are facing fierce competition from others belonging to different communities. Similarly in the fashioning of brass and bell-metal wares, members of other communities have, by application and practice, made serious inroads into what was the sole monopoly of the Pather caste. Pillais, Odayars and Naickers have taken to this craft and are successfully competing with Pathers in fashioning and marketing brass and bell-metal ware. Nevertheless, it is found that a majority of the master craftsmen still belong to the Pather caste as the following Table would prove :

	Community	*Artisans*
1.	Pather	62
2.	Padayachi	41
3.	Pillai	20
4.	Chettiar	11
5.	Vellalar	6
6.	Thevar	6
7.	Bakthar	4
8.	Muslim	4
9.	Odayar	3
10.	Nadar	1
11.	Asari	1
12.	Naidu	1
	Total ...	160

CHAPTER II

TECHNIQUES OF PRODUCTION

The manufacture of bell-metal wares has always been the traditional occupation of the Pather community. Koojas (water jugs with tumblers), temple bells, bells used during poojas and big vessels for containing cooked food have always been made out of bell-metal, an alloy of copper and tin. However, in recent years, it has not been possible to obtain raw materials for the manufacture of bell-metal ware. Tin has become costly and scarce and so many of the members of the Pather community bade goodbye to bell-metal work and turned their attention to producing objects of brass, the raw material for which is easy to get and the wares of which have always a steady market. In Nachiarkoil, it is more common to find persons engaged in brass metal work out of which household utensils, kuthuvilakku (pedestal oil lamp), temple lamps (deepams), tumblers, bells (mani) etc. are manufactured in bulk. Bell-metal wares are still produced, but only in small quantities and on order, by a few expert craftsmen. The following are the essential raw materials used in the manufacture of brass and bell-metal wares. The metals used are non-ferruginous as they do not have any admixture of iron.

Copper

The ore contains cuprous sulphide and copper pyrites. The principal characteristic of copper is its conducting capacity and its malleability. It is also ductile. It is rust-resistant and can be forged when hot or cold; but it cannot be welded. It is unsuitable for casting.

Tin

The ore exists as stannic oxide. It is mixed with coal and is heated in a reverberatory furnace using lime as flux. The molten metal is then run into a pig mould. It is a white and lustrous metal, soft, malleable and ductile capable of being beaten into very fine thin sheets of 1/1000". It is not affected by atmosphere and is acid-resistant which is what makes it important in the manufacture of household utensils used in daily life. It is a costly metal, a poor conductor of heat and electricity. In Nachiarkoil, in addition to bell-metal, it is used for making alloys such as solders. For easy flow of the liquid metal during box moulding some aluminium is also added to the tin.

Zinc

The ore exists in the form of carbonate or sulphide of zinc; it is roasted, vapourised and collected in a special vessel by means of distillation. It is a greyish white metal used primarily to prepare alloys.

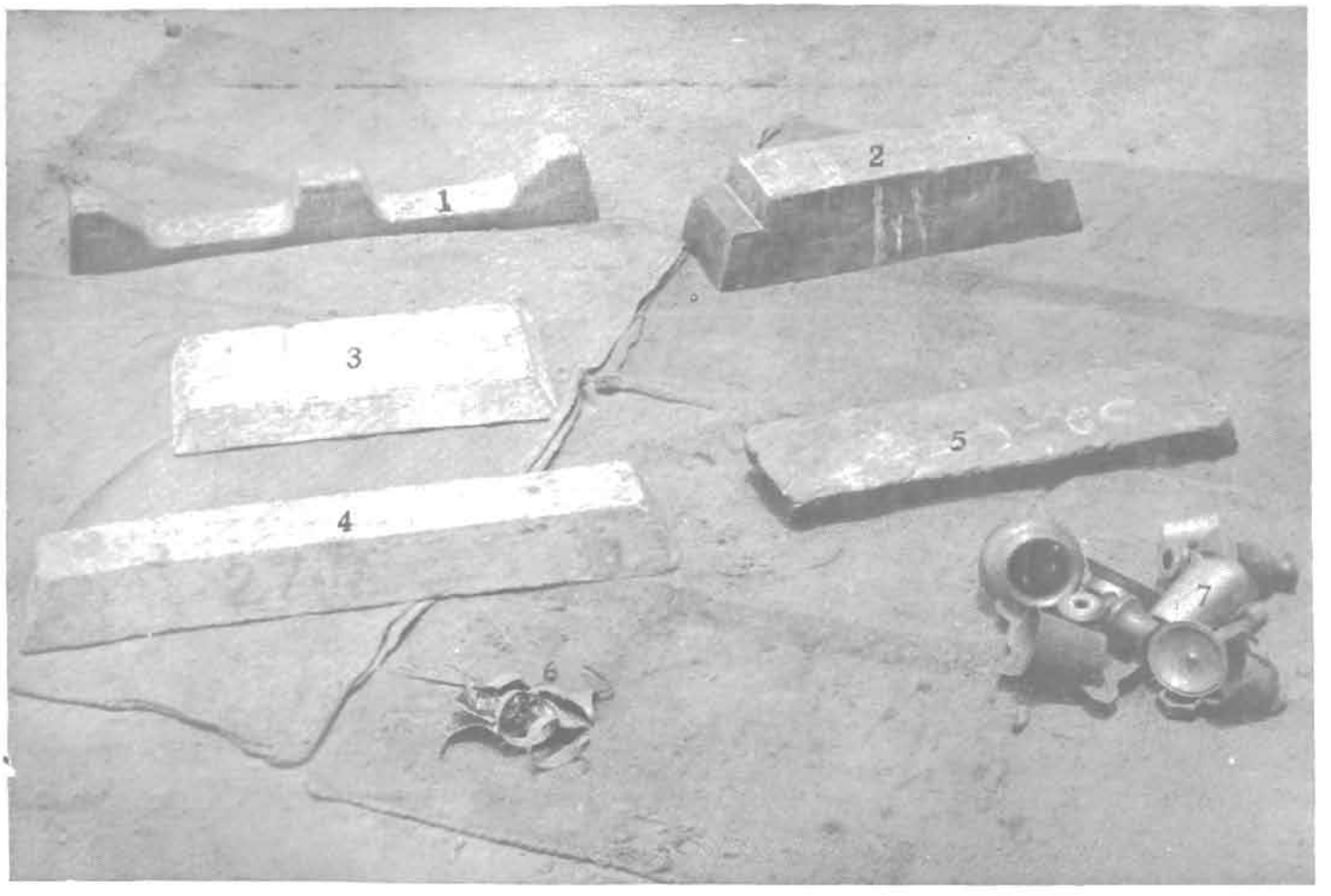
Aluminium

The ore of aluminium is aluminium oxide. When mixed with other substances like clay, it is known as bauxite. The metal is extracted from its ore by electrolysis and then cast into ingots.

Lead

The ore exists in the form of galena or lead sulphide or lead carbonate. The ore is roasted, mixed with iron ni a blast furnace. The resultant lead oxide is mixed with coke and lime and melted in a furnace. The molten metal is then drawn out. It is a bluish grey metal, malleable and ductile. Pure lead is not used for casting.

In the early days, during the inception of the craft, sellers of date fruit used to move from house to house selling their dates and exchanging them with old brass and bell-metal ware. These wares were collected and sold to the manufacturers of brass and bell-metal wares for money or grain. This was of course a difficult process but supply was maintained. However, during the turn of the century and before the second World War, it was a golden age for the industry and the artisans. These base metals were easy to obtain, even privately at low cost and so Nachiarkoil was the centre of a flourishing trade. The second World War intervened to shatter the hopes and aspirations of the artisans and it became difficult to get the raw materials during the war years and the industry went into doldrums. Even after the declaration of peace and the attainment of independence to the present day, the industry has not been able to expand to its maximum capacity due to the non-availability of the metal required to form the alloys. Many merchants of Nachiarkoil and Kumbakonam have requested the Government to allot copper and tin in large quantities to meet the expanding needs of the industry and the public but to little purpose. Private dealers, due to shortage of tin and copper, charge exorbitant rates and



Displayed above are the various raw metals in ingot shape used in this industry along with the old broken vessels called scrap metal.

1. Zinc
2. Brass ingots
3. Lead ingots
4. Copper ingots
5. Tin ingots
6. & 7. Old and broken vessels referred to as scrap metal.

so the artisans had to approach the Madras Industries and Commerce Department for help. The latter called for the requirements of the merchants who sent the filled-in application for allotment of the Government quota, but this was rejected due to the meagre quantity available in Madras State. The industrial unit and the Cooperative Society continue to obtain their requirements of raw material in the shape of metals through the permit system, either from the State Trading Corporation or the "Service Corporation", Industrial Estate, Guindy. Copper, tin and zinc are supplied in the form of ingots. From this, the difficulties of independent artisans to obtain raw material can well be imagined. The following statement indicates the metal, colour and price of those metals purchased in the open market Owing to constant fluctuations in the open market, these figures may not reflect the current position.

	Name of metal	Colour	Price (per kilo) Rs. nP.
1.	Brass	Yellow	3.68
2.	Aluminium	White	4.93
3.	Zinc	Greyish white	1.30
4.	Lead	Bluish grey	2.04
5.	Tin	White	12.88
6.	Copper	Red	4.45

Regarding other metals, merchants unable to get ingots purchase scrap and melt them as per their requirements. It would be interesting to study the gradual rise in price of brass and bell-metal from 1935 onwards.

Year	Name of metal	Price (per maund) Rs.
1935	Bell-metal	10/-
	Brass	4/-
1946	Bell-metal	30/-
	Brass	15/-
1962	Bell-metal	60/-
	Brass	45/-

Except for the members of the Government Unit and Industrial Co-operative, all other craftsmen of Nachiarkoil purchase old brass ware from other merchants and hawkers who move from town to town and collect old and broken vessels in exchange for new ones and in turn sell to merchants in Nachiarkoil for cash. These merchants thus entirely depend on the street hawkers and so the supply position of these raw materials is uncertain.

The next important raw material is sand. The different types of sand found around Nachiarkoil are considered to be the best in the whole of South India. It grips the article firmly while moulding and casting. The supply of sand has never posed a problem to the craftsmen of Nachiarkoil. One cart-load of sand costs Re. 1/-. For a medium sized factory, 8 cart loads of different types of sand are sufficient for one year. Thus in one year a factory requires 2 cart-loads of vandal sand, 2 cart-loads of river sand, 2 cart loads of savuttu sand and 2 cart loads of clay. These sands are mixed and the resultant moulding sand can be used again and again. After a few castings, due to wastage and constant application, the moulding sand is likely to lose its special properties. To rejuvenate it, clayey sand is added to this moulding sand in the ratio of 1: 4. The following types of sands are mixed to be utilised for the different types of moulds.

1.	Box moulding	Vandal sand with an admixture of clay sand.
2.	Wax moulding	Vandal sand, Savuttu sand and river sand in the proportion of 4:4:1.
3.	Loam moulding	Only Vandals and.

Coke

Coke is the next important raw material. It is utilir sed to fire the furnace in which the various metals are melted. Coke is purchased from Tiruchirapalli. Tar is removed to keep it free from smoke. An appropriate quantity of coke is taken according to the weight of the metals to be melted. If the metal to be melted weighs one kilogram, two kilograms of coke are utilised. The formula is as follows : for any given weight of metal, the quantity of coke used should be twice the weight of the metal. One pound of coke costs Re. 0.10.

Wax

Wax has been a very important raw material used by the Pathers who migrated into Nachiarkoil for the wax moulding process. For many years, the wax moulding process was utilised for manufacture of bell-metal ware. Being a painstaking and difficult process, many of the Pathers experienced difficulties in adhering to the wax moulding process and took to box moulding which was introduced 30 years back.

Preparation of wax

White dammar, a resin derived from one of the coniferous trees found in India, castor oil and beeswax are mixed in the proportion of 22:9:9. White dammar is slightly powdered and stirred in a dish for a few minutes. Castor oil is then taken and poured into the

dammar and stirred well with the help of a stick. The mixture is heated over a slow fire, the temperature being kept constant. When the mixture forms a clear paste, the beeswax is poured into it. A vessel filled up to three quarters with water is taken and a fine muslin cloth spread over its open mouth. The mixture of dammar, beeswax and castor oil is filtered through the muslin cloth in order to remove dust and sand. The filtered hot wax mixture floats on the water which brings down its temperature. The collected wax is then skimmed from the surface of the water, placed on a clean soft plank and kneaded with the fingers. The kneading turns it into a smooth and soft lump. The hands of the persons kneading it must be frequently dipped into soapy water to avoid the effects of heat and stickiness. In this process the wax turns into a yellowish white mass which is known as prepared wax. The cost of one viss beeswax (about 3½ lbs.) is Rs. 1.80 ; castor oil, one seer (about 2 lbs.) costs Re. 0.62 ; dammar one kilo costs Rs. 1.56.

Cowdung Cakes

Cowdung cakes are used in almost all the workshops as fuel while melting the wax out of the moulds and to heat the latter preparatory to pouring the molten metal into them. These cowdung cakes are prepared locally and are available in every household. The cost of 100 cowdung cakes ranges from Rs. 2.50 to Rs. 3.00.

Parting Sand

Parting sand is made by powdering the bricks and sieving the powder on to a cloth to make it smooth. It is filled in a cloth bag and shaken over the pattern moulds to prevent the vandal sand from adhering to it when the top and bottom bores are eventually separated. Sometimes ash is also used instead of parting sand.

Preparation of Shellac

Beeswax and white dammar are mixed in equal proportions until it reaches a dough like consistency. A small quantity of red brick powder and shellac, i.e. a mixture of lac and liquor ammonia is poured on it and mixed well with both hands, formed into circular balls and attached to the face of the burnishing lathe.

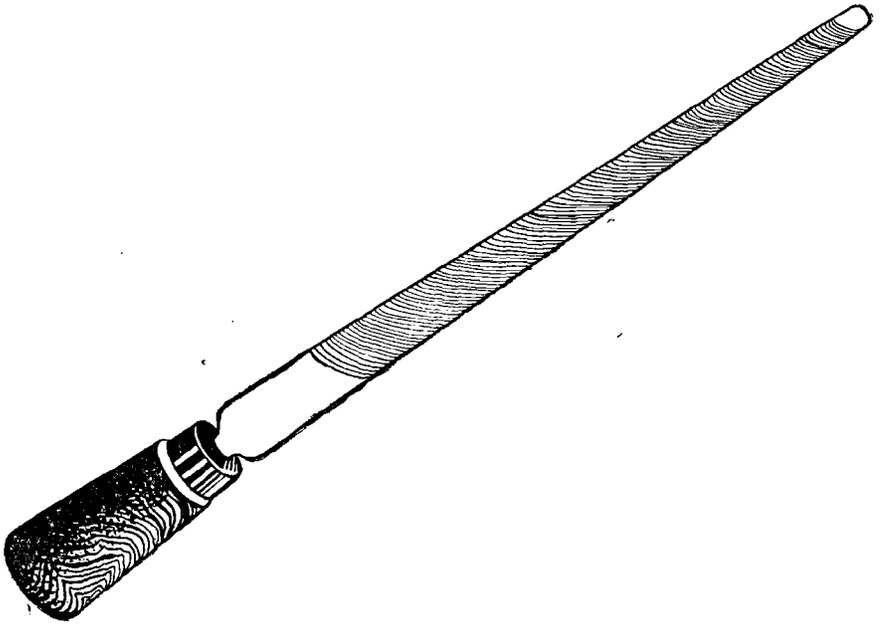
The following are the tools used in all workshops engaged in the production of brass and bell-metal works.

1. Files
2. Hacksaws
3. Drills
4. Tapes
5. Dies
6. Pliers
7. Calipers
8. Vices
9. Hammers
10. Tongs
11. Chisels
12. Burnishing lathes

A brief description of the tools is appended below. Appendix IV contains the names of tools, their functions and approximate value.

Files

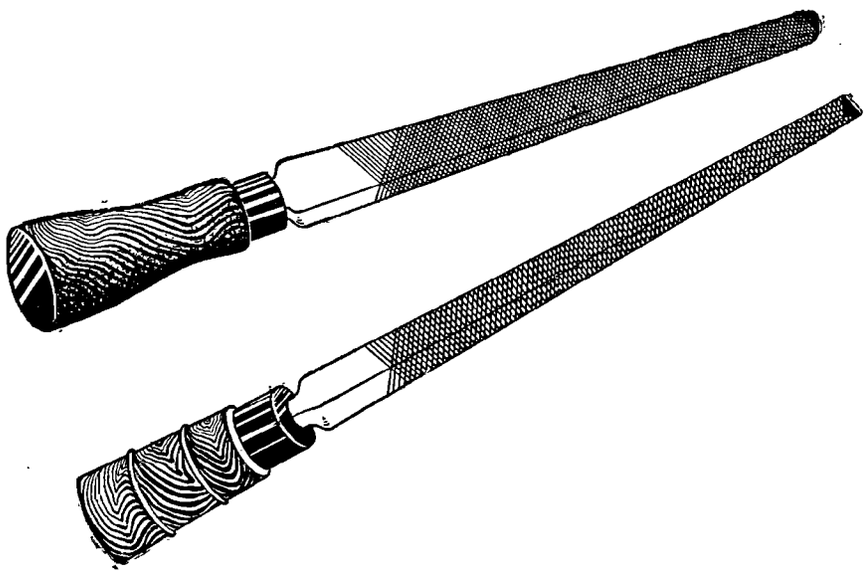
The seare cutting and filing tools available in varieties of length, grade and sections. They are made of high



Round File

carbon steel and are hard except for the handle. The file has a series of teeth set at an angle which cut on the forward stroke. They are used for removing extra pieces of metal adhering to the surface and for making the surface smooth and even.

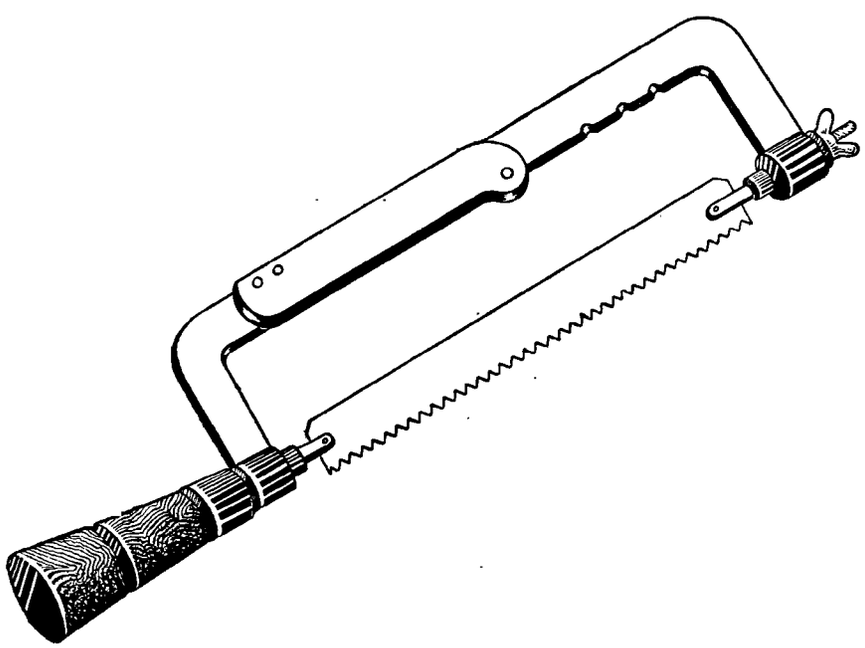
Triangular file



Half round file

Hacksaw

This is used to cut through the metal as also to remove surplus metal. It consists of two parts i.e., frame and the blade. There are two types of frame, the solid and adjustable and the fixed one. It is made of mild tempered steel and the two ends are bent at right angles. At each end, a pin is fixed to hold the blade. The blades are made of Tungsten steel. It has serrated edges on one side which cuts through the metal.



Hacksaw frame and Blade

Drill

This is a cutting tool with the help of which holes are drilled on metal. The commonly used type in Nachiarkoil is a twist drill. It consists of three main portions, the shank, the body and the point. The point is of sharpened steel and is capable of drilling holes in metal at high speed. The shank helps in fixing the drill to the drill press.

Taps

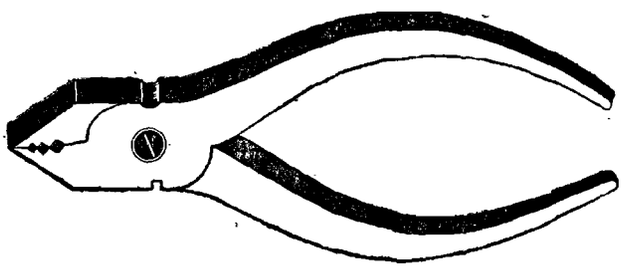
With the help of taps internal threads are cut on previously drilled holes, the sides of which are smooth. Without the help of internal threads, parts cannot be screwed into position. Taps are made of cast iron steel. The instrument is in the shape of a bolt with 3 or 4 lutes cut on it to provide cutting edges. Instead of a bolt head, it has a square end on which is fixed a handle called a tap wrench. This wrench is long enough to provide sufficient leverage to the cutting end. The wrench is adjustable.

Dies

Just as there are taps for internal threading, there are instruments called dies for external threading on rounded surfaces of brass or bell-metal. These are of two types solid and adjustable. The instrument resembles a nut with 3 or 4 grooves etched on it which forms the cutting edge. The dies are manipulated with handles.

Pliers

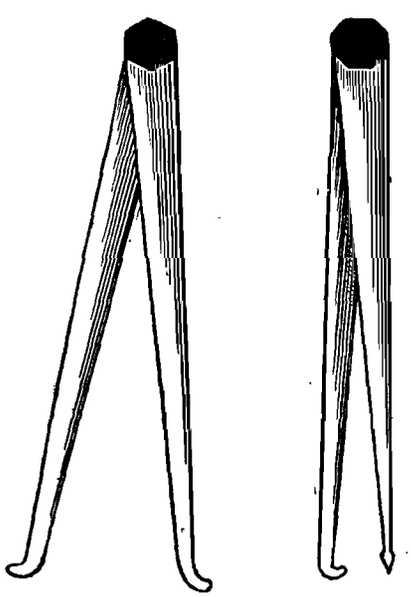
These are used either for cutting or holding. The pincer arms of these pliers are long and tapered. They are used for holding small nuts or screws in position where the fingers of the artisans cannot probe.



Side cutting plier

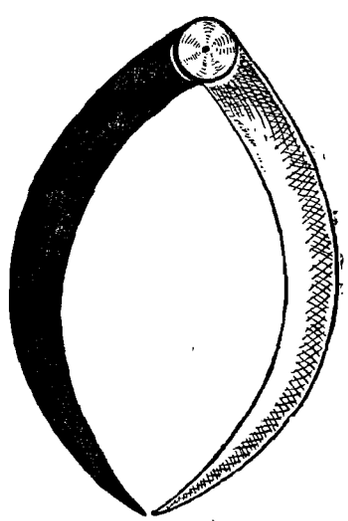
Calipers

For measuring the outside and inside diameter of objects, calipers are used. In its simplest form, it consists of two legs, the ends of which slide over the object to be measured. It is utilised to measure the outside and inside diameter of moulded articles.



Inside Caliper

Leg and point



Outside Caliper

Vice

Bench vice with 4" long jaw is generally found in all the workshops. It consists of two jaws, one fixed and the other movable. It is made out of cast iron with serrated steel jaws screwed on. One jaw is rigidly bolted to the bench. The movable jaw has square threaded or buttress threaded spindles which pass through a corresponding nut bolted down to the fixed jaw. The spindle is made of steel while the nut is made of either cast iron or bronze. A handle passes through the spindle. By rotating the handle, the movable jaw can be brought to any position. It is used for gripping metal objects, for chipping, filing, threading and cutting.

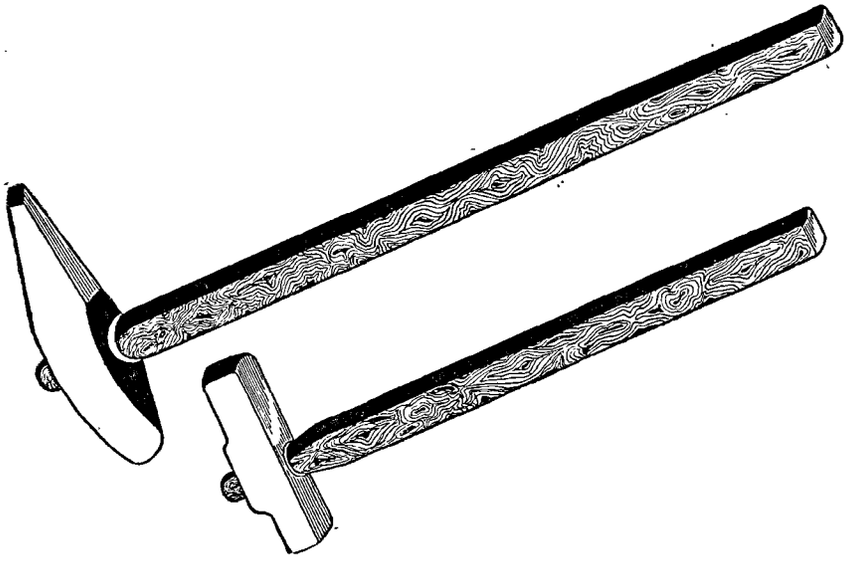
Hammers

Various types of hammers are used. The most common are the ball pane, straight pane, and cross pane hammers. These are made of cast steel. The face and pane are ground and tempered. These hammers have a wooden handle. They are used for hammering the chisels, punches etc.

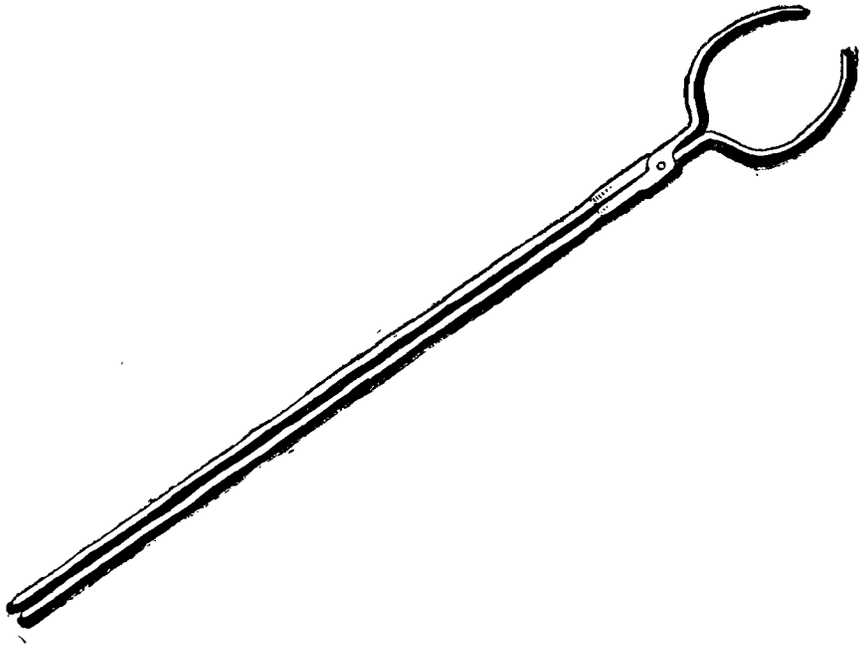
Tongs

They are made of mild tempered steel and are used to lift the heated crucibles from the furnace and to pour the liquid metal into the mould.

Cross pane Hammer for nicking pin points



Small hammer

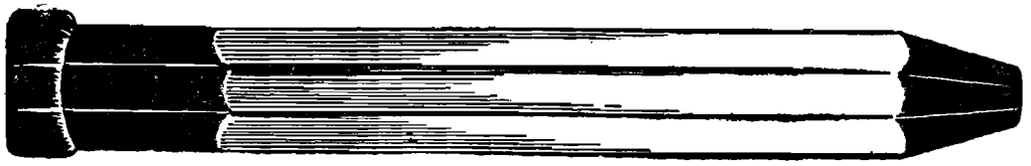


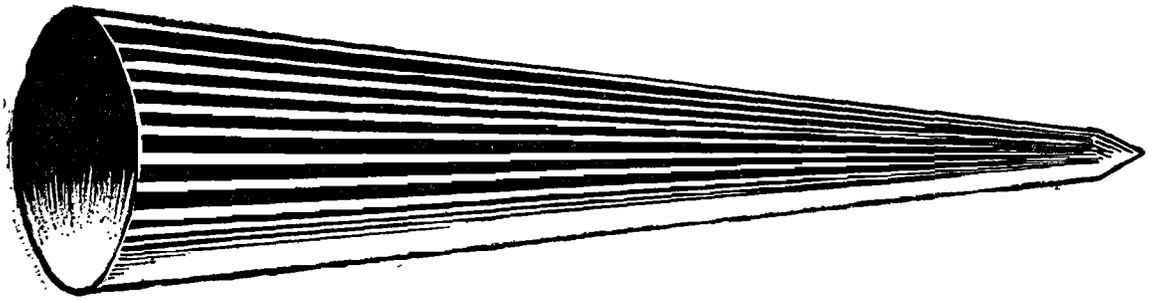
Crucible Tong

Chisels

They are used for chipping metals. They are made of cast steel with octagonal shape, the length of each chisel varying from 4" to 6". The cutting edge is hardened and tempered. Most of these tools are purchased from outside.

Flat chisel





Round stake

MANUFACTURING PROCESS

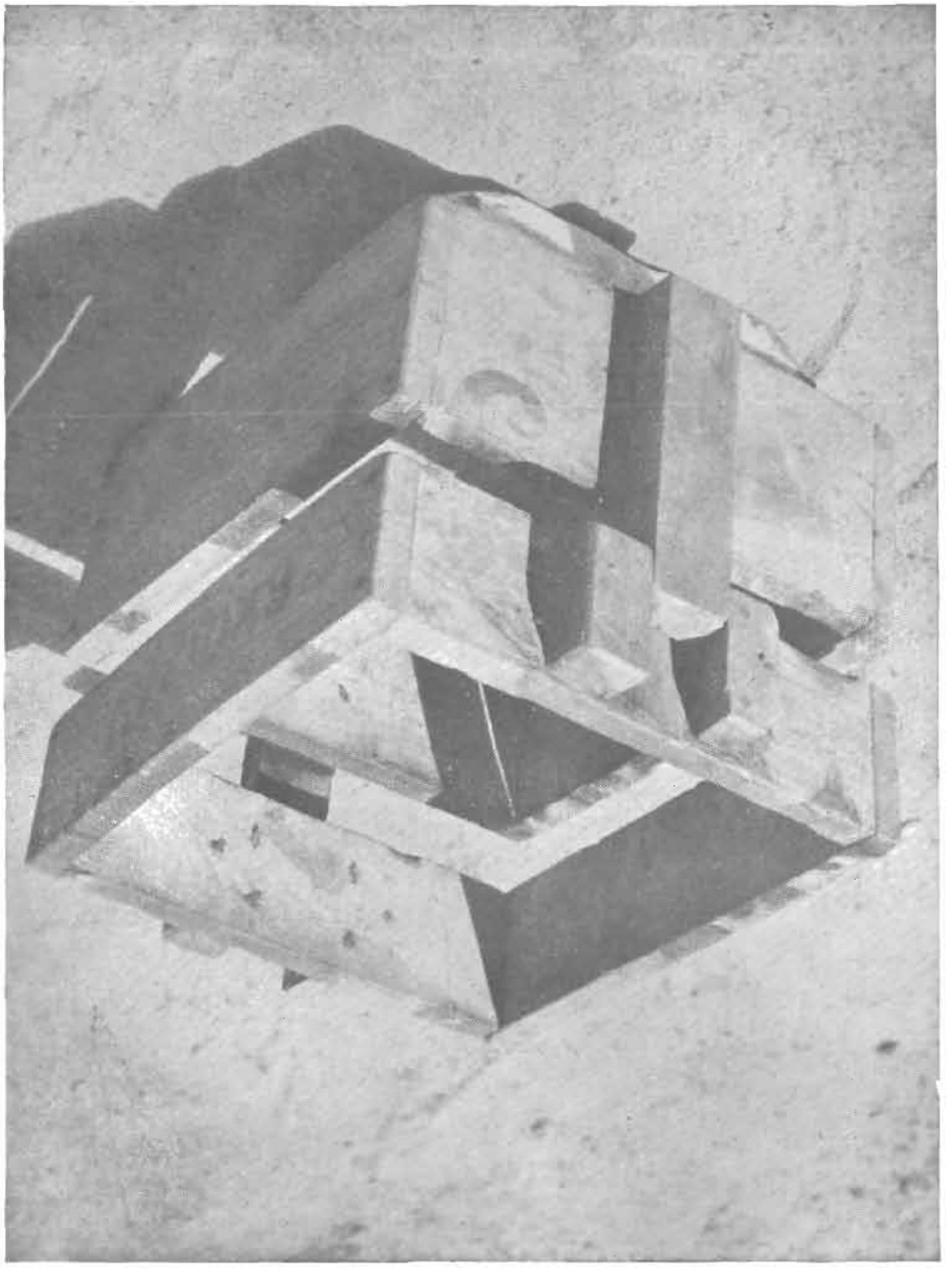
STAGE I

Vandal sand is dug out of the Cauvery river bed and brought by cart loads to the workshop. This sand is of light yellow colour and contains a certain percentage of moisture and so it has to be dried to drive out moisture and sieved well to remove small stones, pebbles and other impurities. This cleaning and drying takes two days after which water is added to the sand and it is kneaded with both hands. This breaks up any clots and the sand turns out soft and smooth. After the vandal sand is thus treated, the moulds have to be prepared. Patterns of round and irregular shapes of articles are made out of brass. If the articles are very large, the patterns are made in aluminium. If circular shaped articles are to be prepared by wax moulding, they are done by turning on electrically operated metal turning lathes. With the help of these patterns, the articles are cast in vandal sand by the process of box moulding. In the case of articles like Kuthuvilakku (pedestal oil lamp), three different moulds are utilised and three different parts are separately cast before they are joined together. In the case of small articles which are simple in design, loam moulding and casting is utilised. The surface of this mould has to be smooth and pinholes and depressions, if any are visible, should be filled up. The moulds have to be handled with great care. If the articles are hollow, the wax moulding process is adopted. The pattern is turned on electrically operated metal turning lathes. Then it is cut into two equal and vertically hollow pieces. With the help of this mould and an inner core the hollow articles are manufactured. The inner core is made out of 50% clay and 50% river sand and then pressed with the prepared mud into two halfs of the mould along with an iron rod wrapped in cloth and fixed down the centre in order to provide reinforcement for the inner clay core. That will be required when the two sand-filled halfs are pressed together to form one solid block that will then be referred to as the inner clay core.

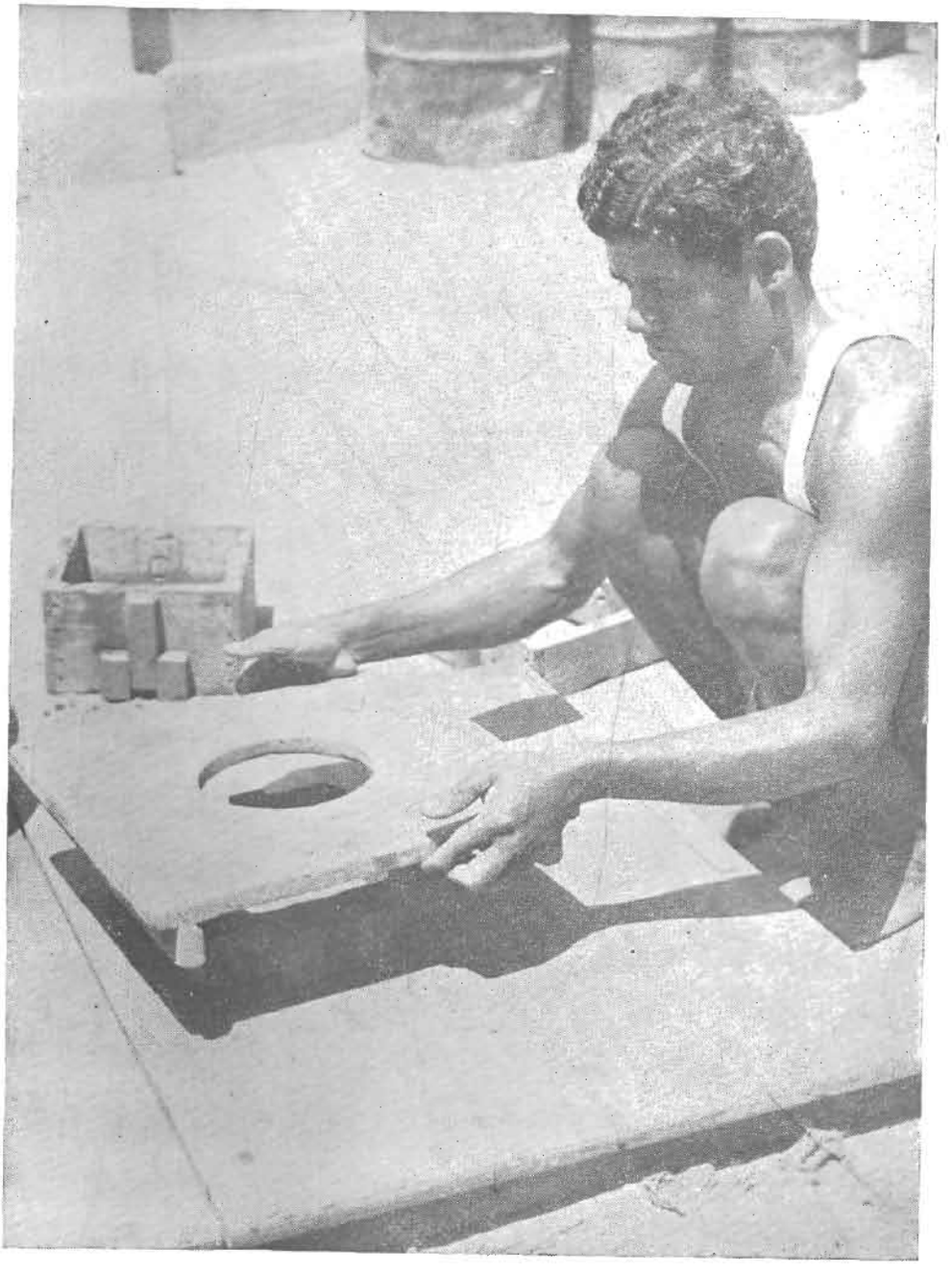
STAGE II

Preparation of mould for casting

Before describing the processes in detail, a brief description will be of interest to the reader to know that he is being introduced to the intricacies of the sand box method, lost wax (cire petdue) and loam moulding process. Vandal sand thoroughly sieved to remove

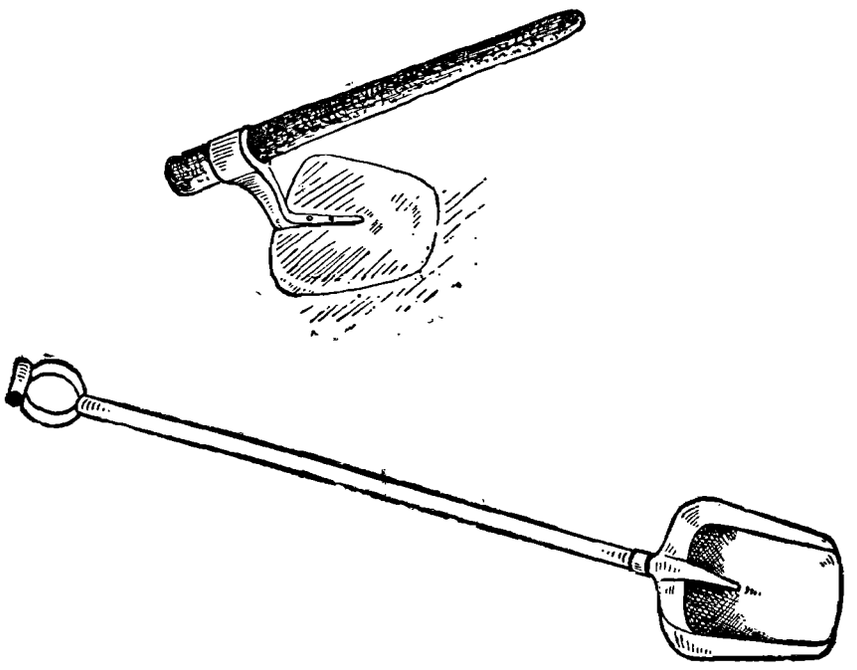


Moulding boxes are generally made out of Mangowood with teakwood reapers. Note the hollowness at the top and bottom and the two sides provided with a locking device which fit together perfectly.



A smooth wooden plank with a centrally bored hole known as moulding board is kept ready to start moulding.

Spade



Shovel

impurities is mixed with a small quantity of water, kneaded and filled into the appropriate box before casting. For bell-metal articles, manufactured according to the lost wax hollow casting method, a mixture of vandal sand, savuttu sand of light grey colour and clay sand in the proportion of 4: 4: 1 is prepared. Liquid cowdung, generously diluted with water, is added to this sand mixture and the resultant product used for the wax mould. The addition of cowdung facilitates the application of heat and prevents the wax mould from cracking. In the case of loam moulding, vandal sand and jute fibre are mixed in the ratio of 9: 1. Some artisans substitute a mixture of clay sand and river sand in equal proportions for vandal sand.

STAGE III

Melting of Brass

Crucibles purchased in the open market and used for the first time are heated for half an hour, the temperature being gradually raised before metal is melted in them. After the crucibles have cooled, brass scrap is put into these crucibles and subjected to extreme heat in a coke furnace. To remove impurities floating on the surface of molten brass, three grams of Borax are added to the brass before heat is applied and again 1 to 1½ grams at the final stage. Borax acts as a flux and the impurities which come to the surface of the molten brass can be skimmed off with the help of a metal spoon.

STAGE IV

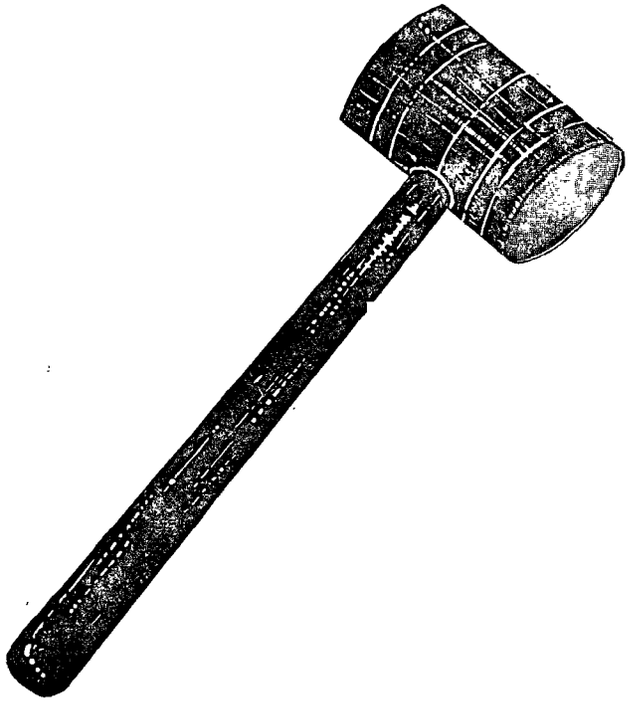
Casting

Brass castings are made in the moulding boxes or flasks of different shapes and sizes according to the shape and size of the articles. Moulding boxes or flasks are generally made out of wood in two parts, top and bottom held in alignment by means of dowel pins. Dowel pins are made out of teakwood reapers of 1½" x ½" size. The top part is called the Cope and has one pin on either side which engages in the lower part called the Drag which has two reapers fixed few inches apart.

The first step in making a mould is to keep the pattern on a moulding board. Moulding board is nothing but a perfectly planed smooth wooden plank reinforced by screwing buttons at the bottom to avoid warping. The pattern should be placed carefully on the moulding board. Next the drag is placed. Parting sand is strewn lightly over the pattern to facilitate easy removal of the metal pattern when the process of moulding is over. A wooden runner is placed on the pattern at the appropriate place and moulding sand is filled. The runner is nothing but an ordinary wedge-shaped wooden piece used to form a runway for the

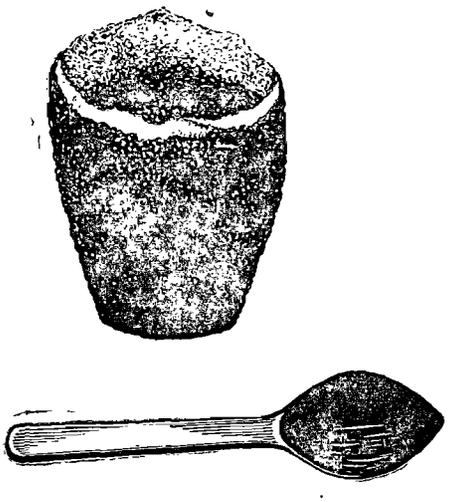
molten metal at the time of casting. The moulding sand is filled, tapped with a wooden mallet and levelled with an iron leveller. The wooden runner is carefully removed with the help of pliers which forms the channel for the molten metal to flow. The box is now overturned, the moulding board is removed and kept on the bottom board and the sand is levelled again. The upper moulding box is then placed on the lower box and parting sand is sprayed inside the metal pattern mould. The upper box is now filled with moulding sand which is packed and levelled with a wooden mallet and an iron leveller. The upper box is removed. Now the metal pattern mould is carefully removed from the lower box and the edges smoothened so that the impression of the pattern is perfectly preserved in the hard packed sand. The upper box is once again replaced over the lower box. The molten brass in the crucibles is now ladled out and poured into the box through the runner. After about five minutes of cooling the upper box is removed and the cast article is taken out of the sand. At first, the cast piece has a whitish hue but on cooling rapidly assumes its natural tinge of dull yellow. Similarly other parts of the article, if it consists of more than one part, are now cast.

If brass scrap is not available, copper, zinc and aluminium are mixed in the ratio of 60: 39: 1 and heated together in a crucible. A minute quantity of aluminium is added to permit the metal to flow easily into the moulding box.



Wooden Mallet

Crucible (Kuvai)



Brass Spoon

STAGE V

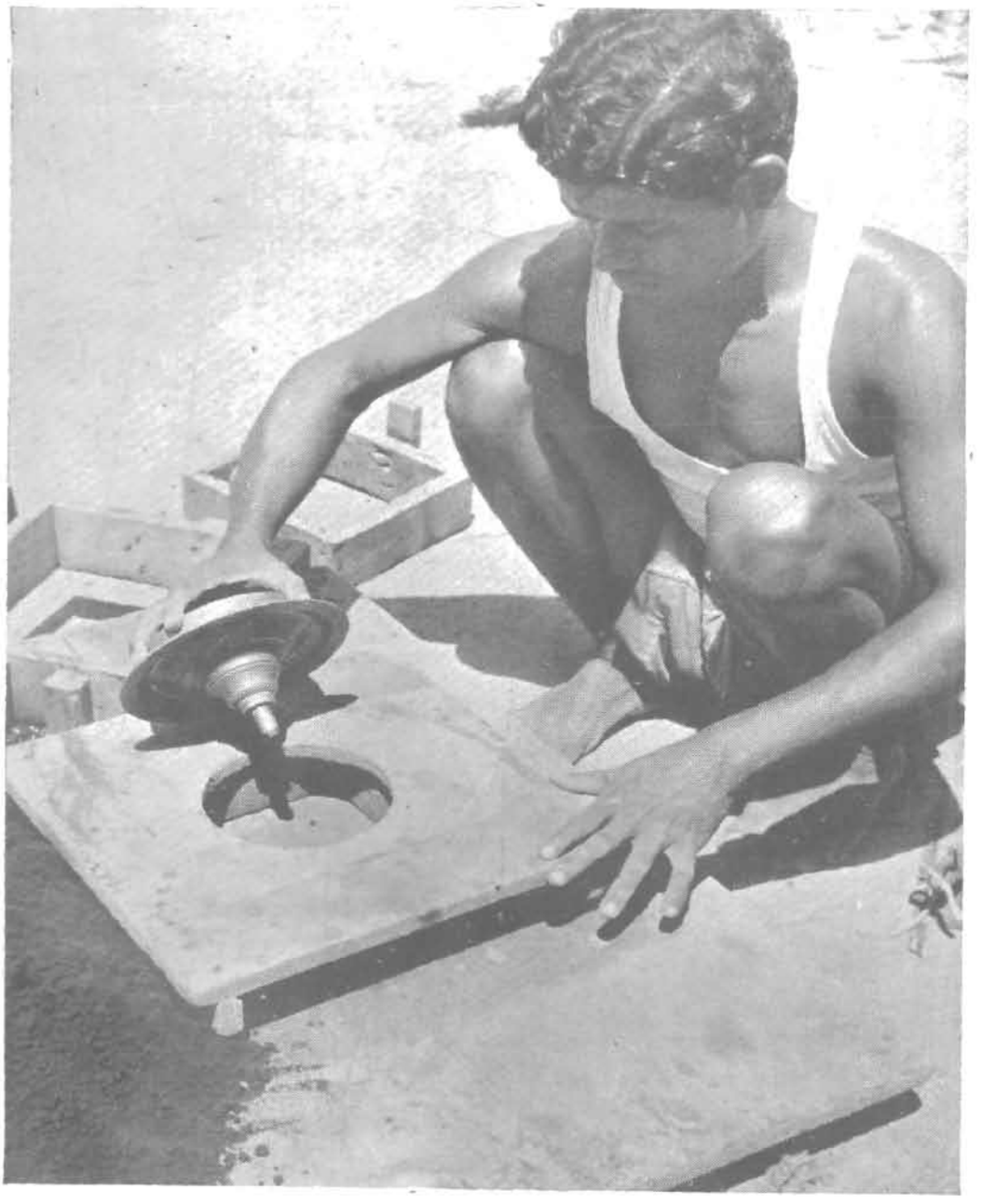
Joining the Parts of the articles

If two or three castings have been made corresponding to the parts of the article to be manufactured, these parts are connected together by either providing grooves on the connecting surfaces or by soldering. Superfluous appendages are removed and the edges to be joined are smoothed with steel files. The solder is prepared by mixing 50% tin and 50% lead. The two parts to be connected are subjected to slight heat and are joined together with the help of the solder.

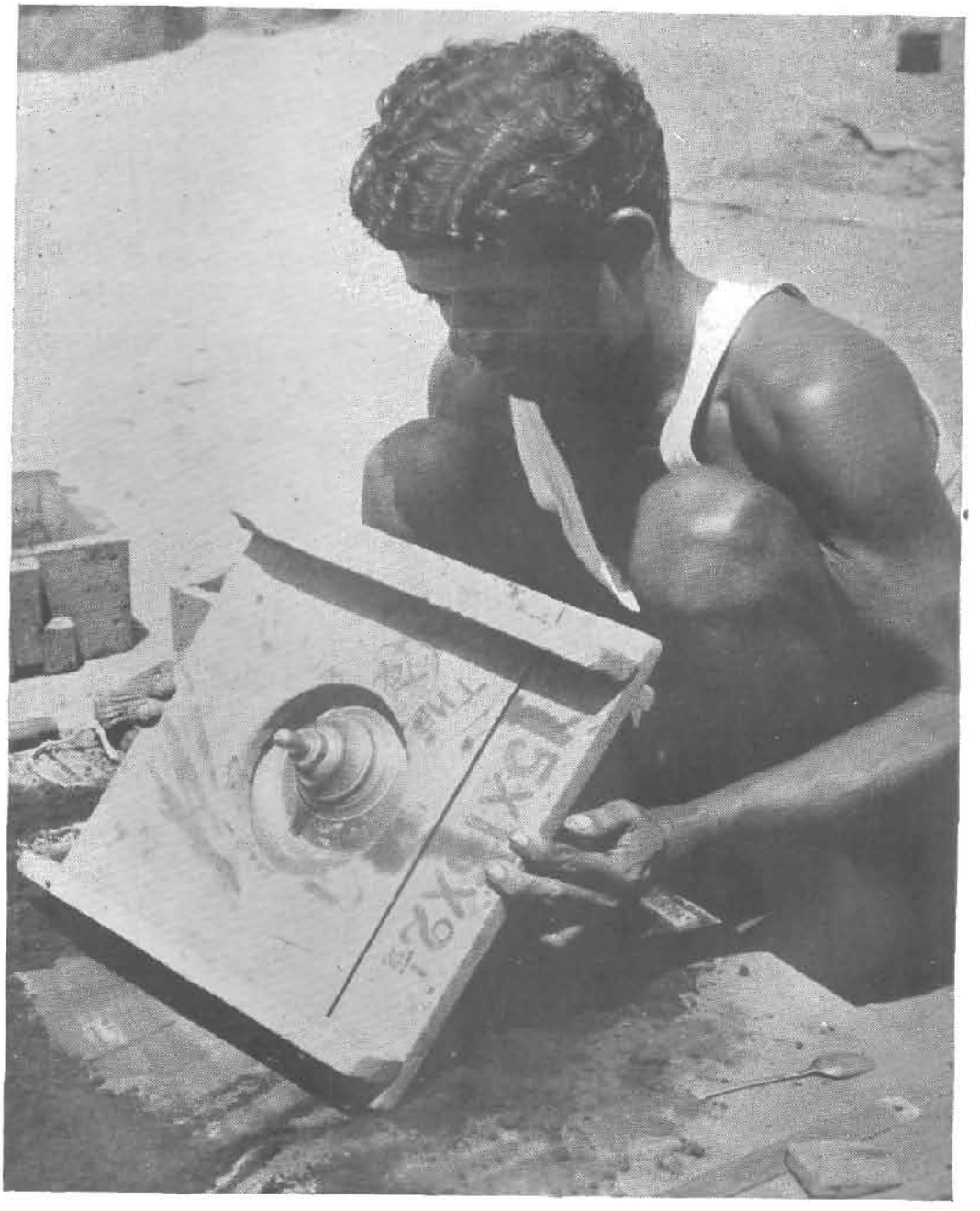
STAGE VI

Shaping and Casting

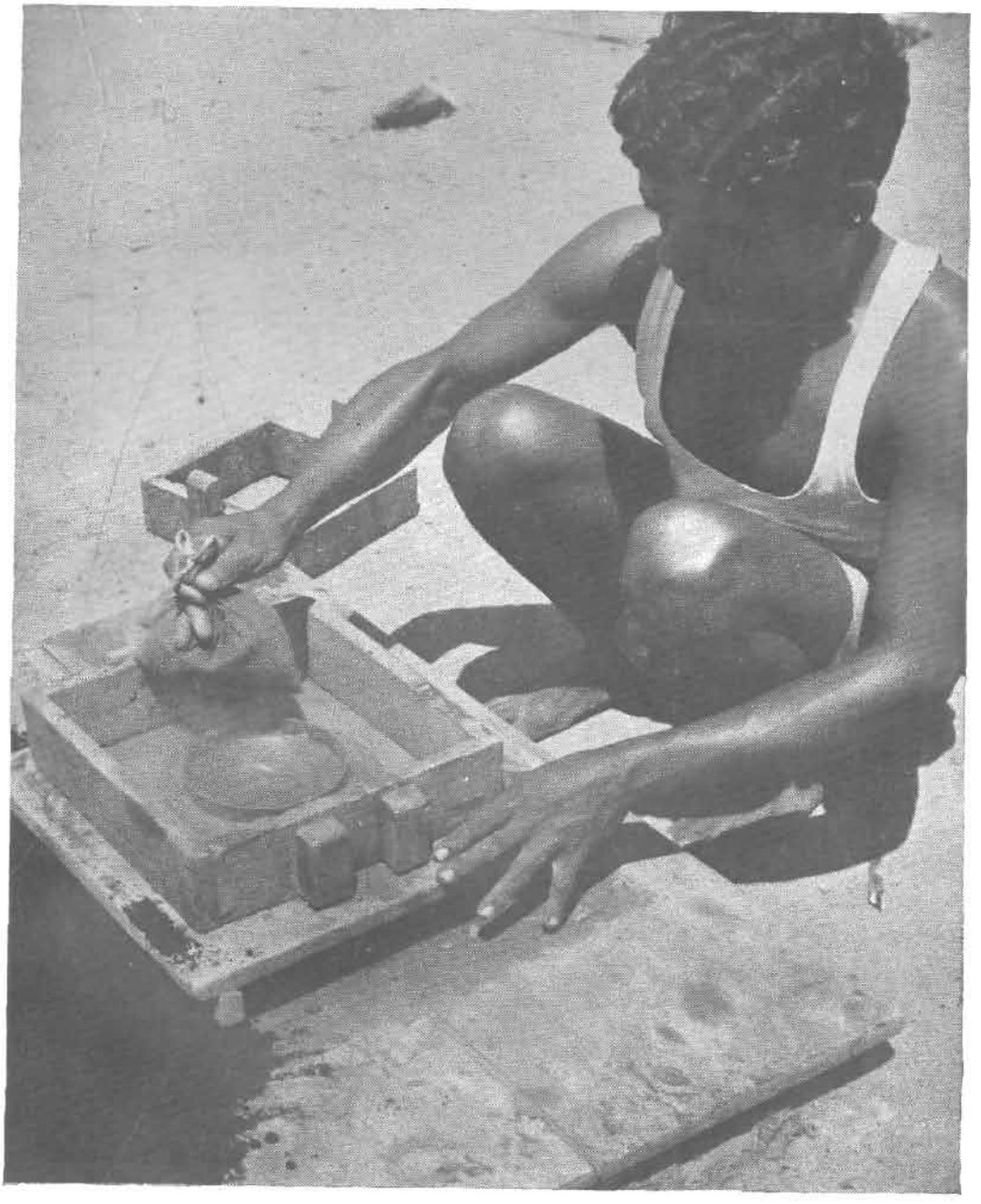
Some of the local artisans of Nachiarkoil use manually operated wooden cart wheels to turn brass and bell-metal articles. However, we found only a few of these archaic wheels in the village. Because of their size, these are set up in separate sheds, away from the normal workshed. The wooden cart wheel is connected to a small wooden pulley by a belt. A wooden piece coated with shellac which forms the lathe is set at right angles to the pulley. The articles to be turned are first heated and then fixed by adhesion on the wooden piece thickly coated with shellac. A man now operates the wheel, both in the clock-wise and anti-clockwise direction, alternatively. Another person sitting beside the pulley applies the burnishing tools to the article as it turns on the home-made lathe. Thus two persons are required for this operation. However, many artisans have now substituted the archaic wooden wheel with an



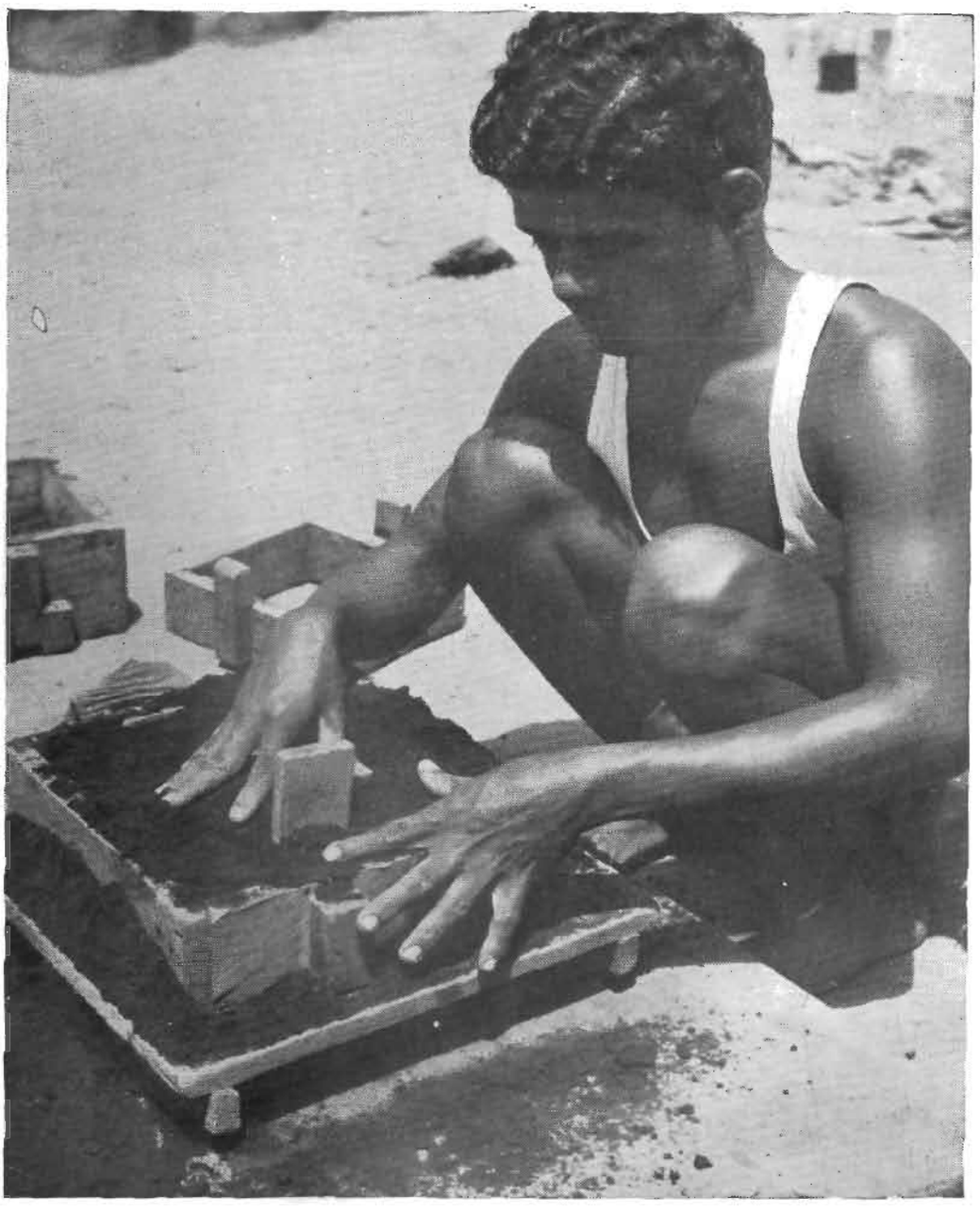
The pattern of the Kuthuvilakku base is being placed in centre upside down over a hole on a wooden plank.



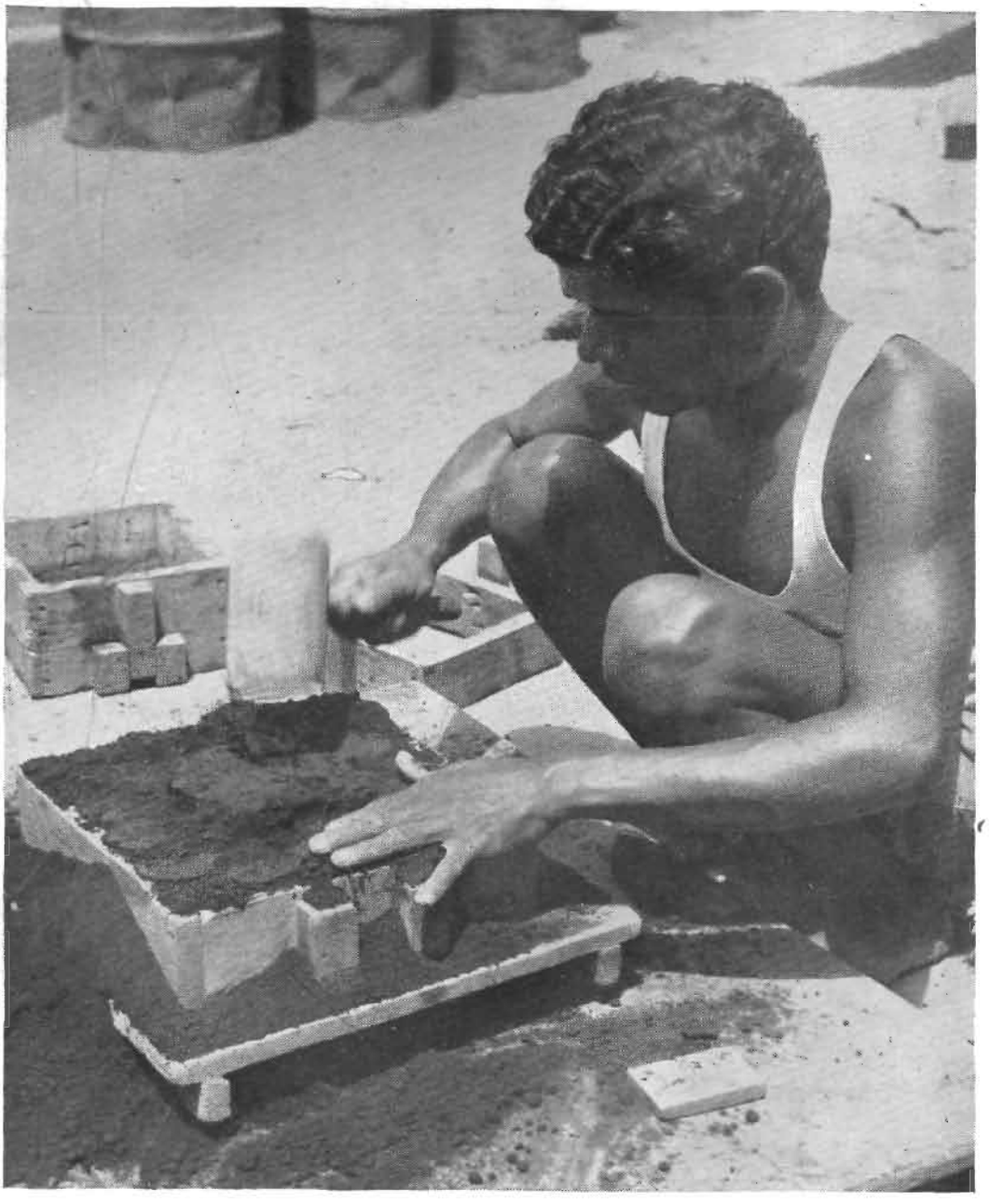
The pattern of the Kuthuvilakku placed upside down in the middle of the centrally bored moulding wooden plank.



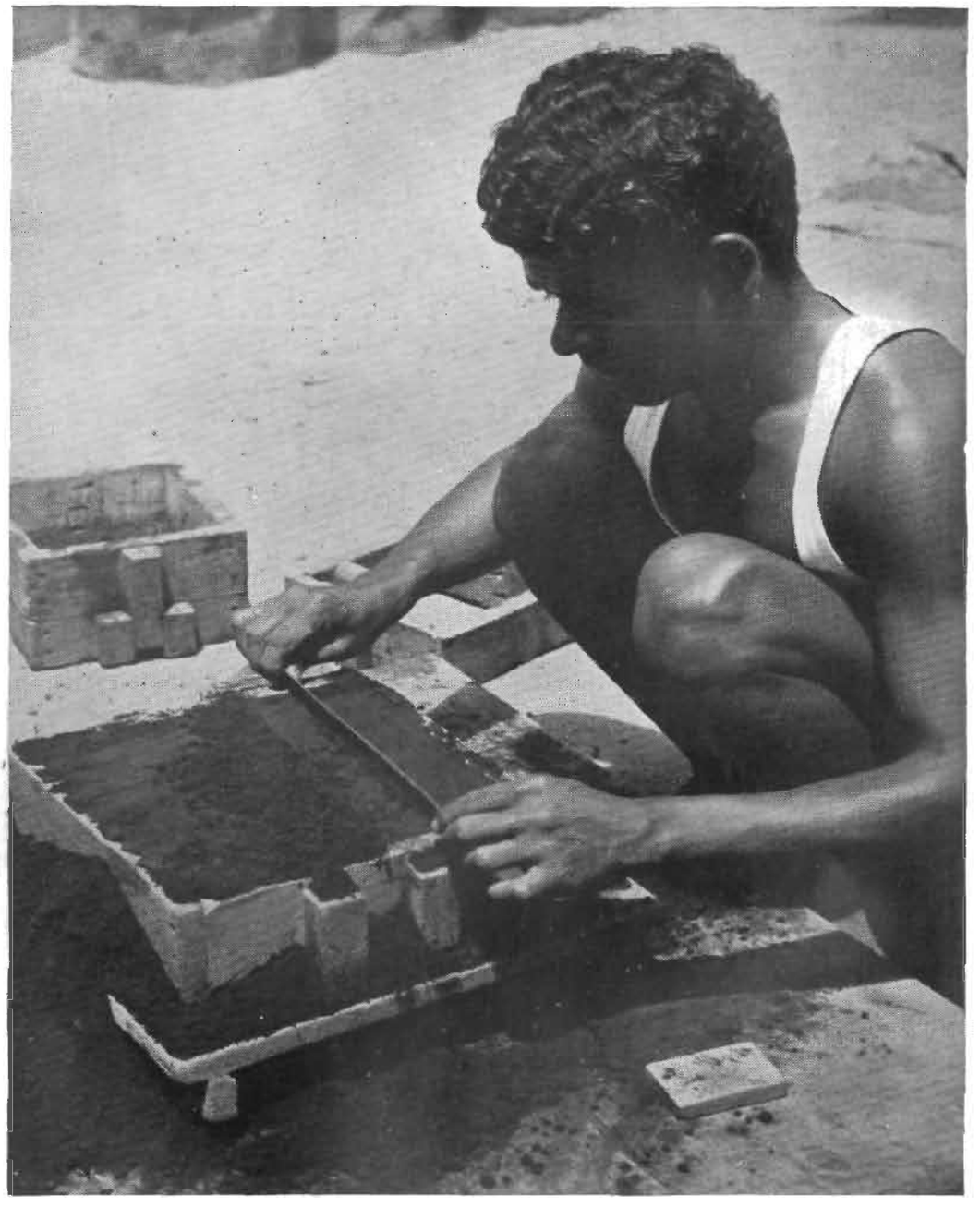
Parting sand (brick powder) is sprinkled over the pattern mould to facilitate easy removal of the pattern from adhering to it when the top and bottom boxes are eventually separated after the process of moulding is over.



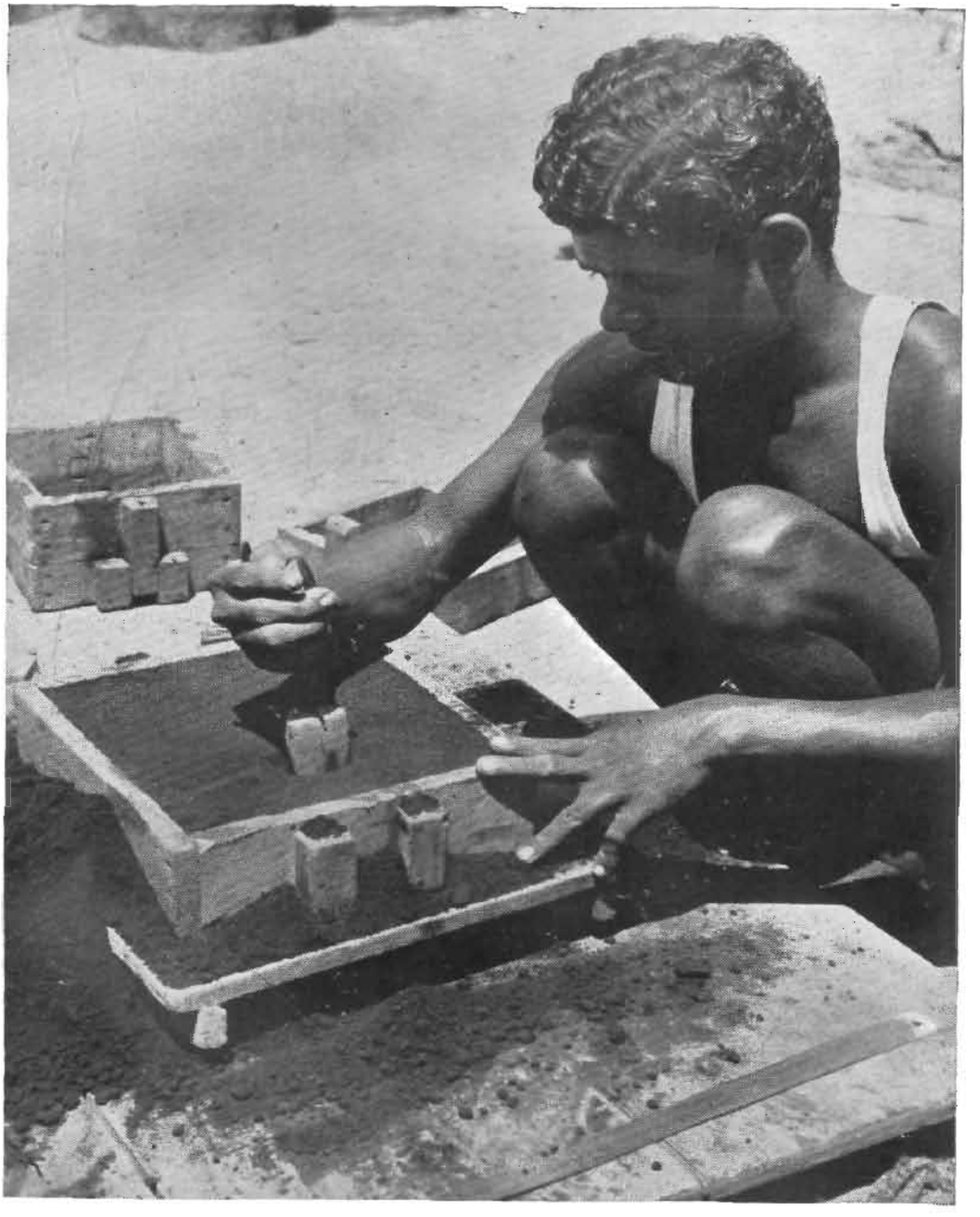
The moulder having placed the metal pattern mould of the base of the Kuthuvilakku (pedestal oil lamp) upside down over a centrally bored hole on a wooden plank and over that laid the bottom moulding box, and having dusted parting sand over the pattern mould, with his left hand he places the runner about an inch away from where the pattern mould of the oil lamp's base lies on wooden plank, what is referred to as the mouth and cavity (that will assist in forming a smooth ingress for the molten metal when casting takes place). With his right hand he will then fill the interior of the box with vandal sand to hold the mouth and cavity in place.



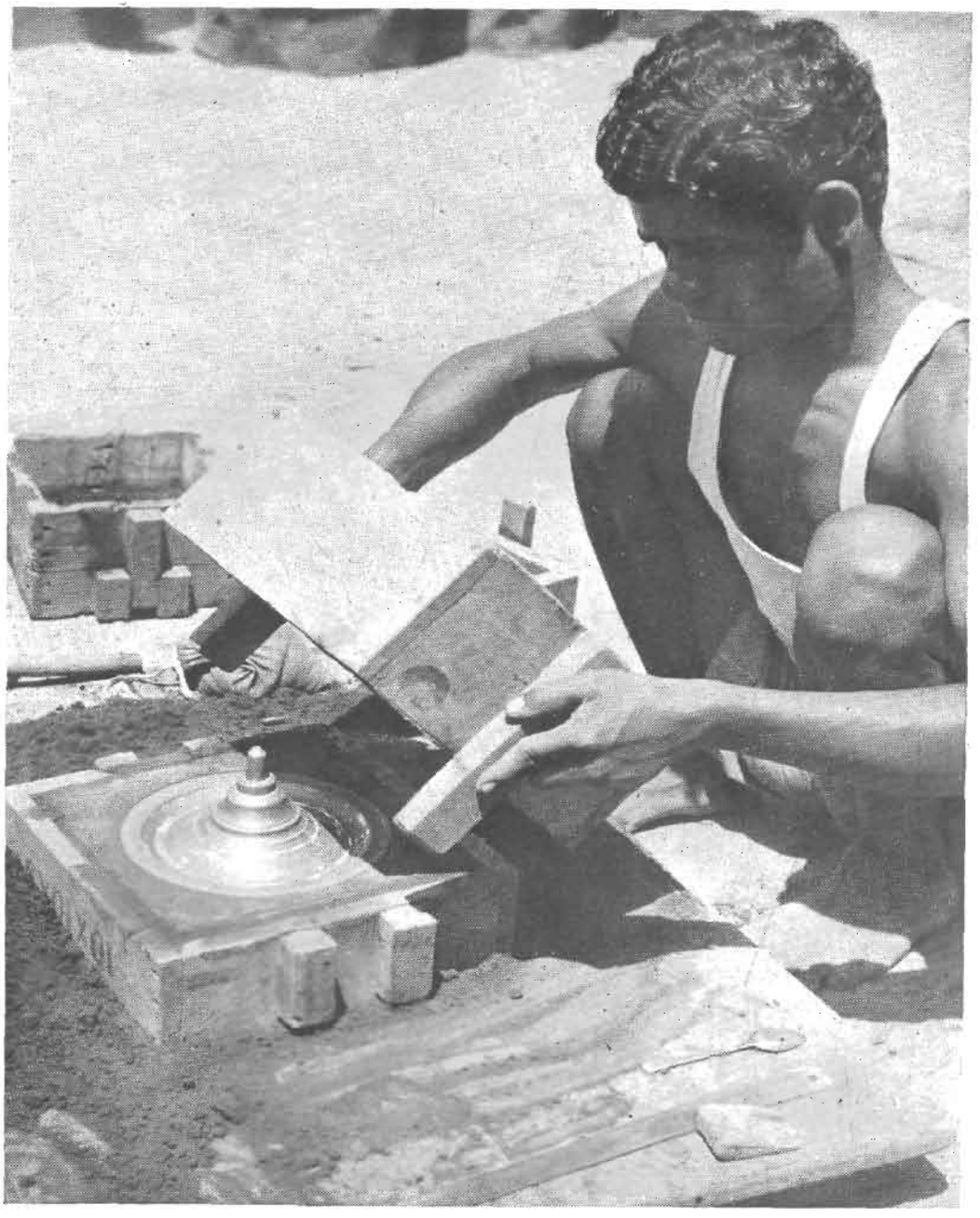
The moulder fits a wooden runner over the metal pattern mould so that it connects with the mouth and cavity in the bottom box. With his right hand he then fills the top box up with vandal sand to the top of the runner and with a wooden mallet he rams the sand flush with its upper edges.



After ramming is over the sand is levelled in the box by means of an iron leveller.



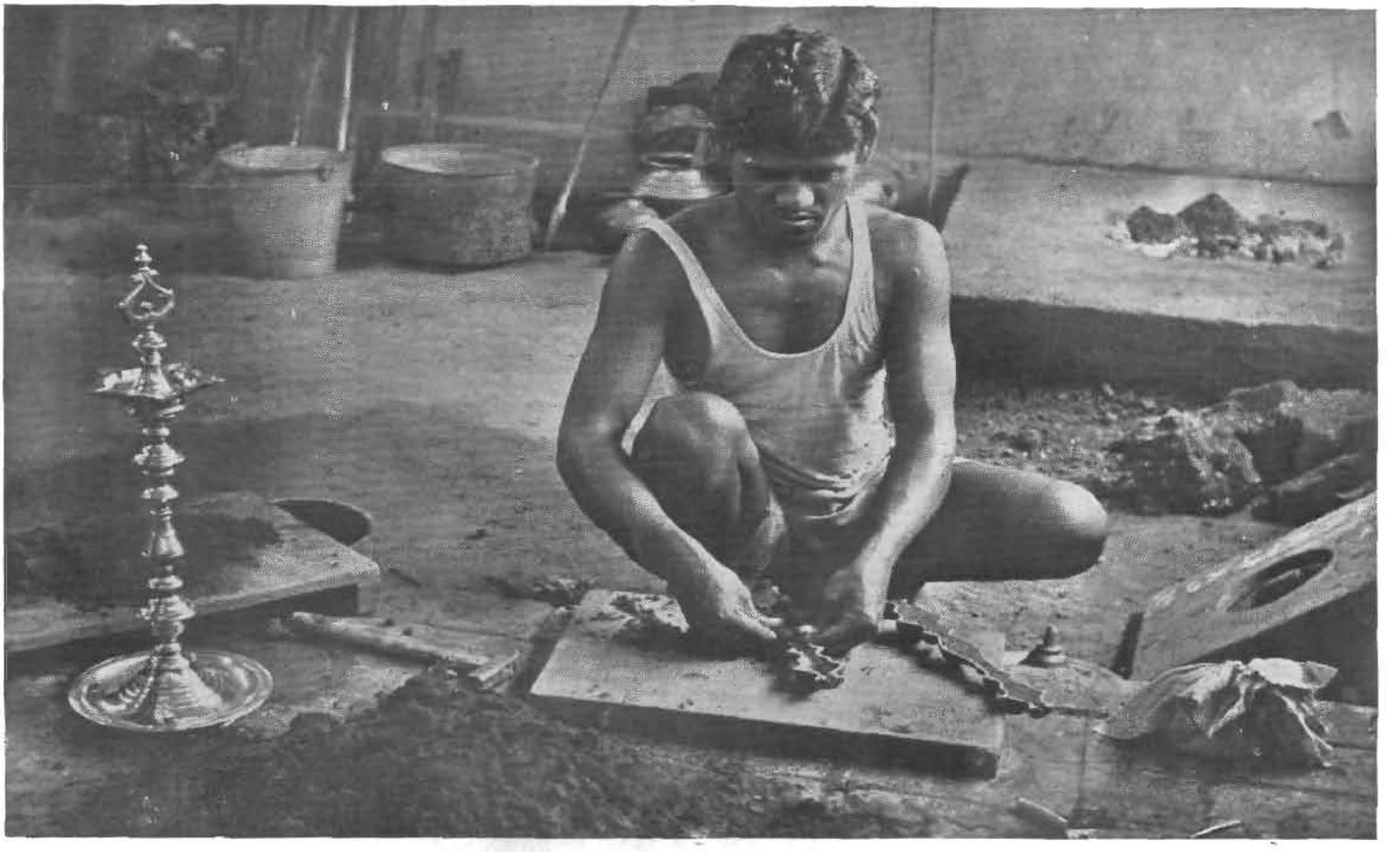
Runner is being pulled out from the hard-packed sand by means of pliers which will form a hollow passage way for an easy flow of the molten metal at the time of casting the base of the Kuthuvilakku.



The upper moulding box is being placed to complete
the other side of the runner.



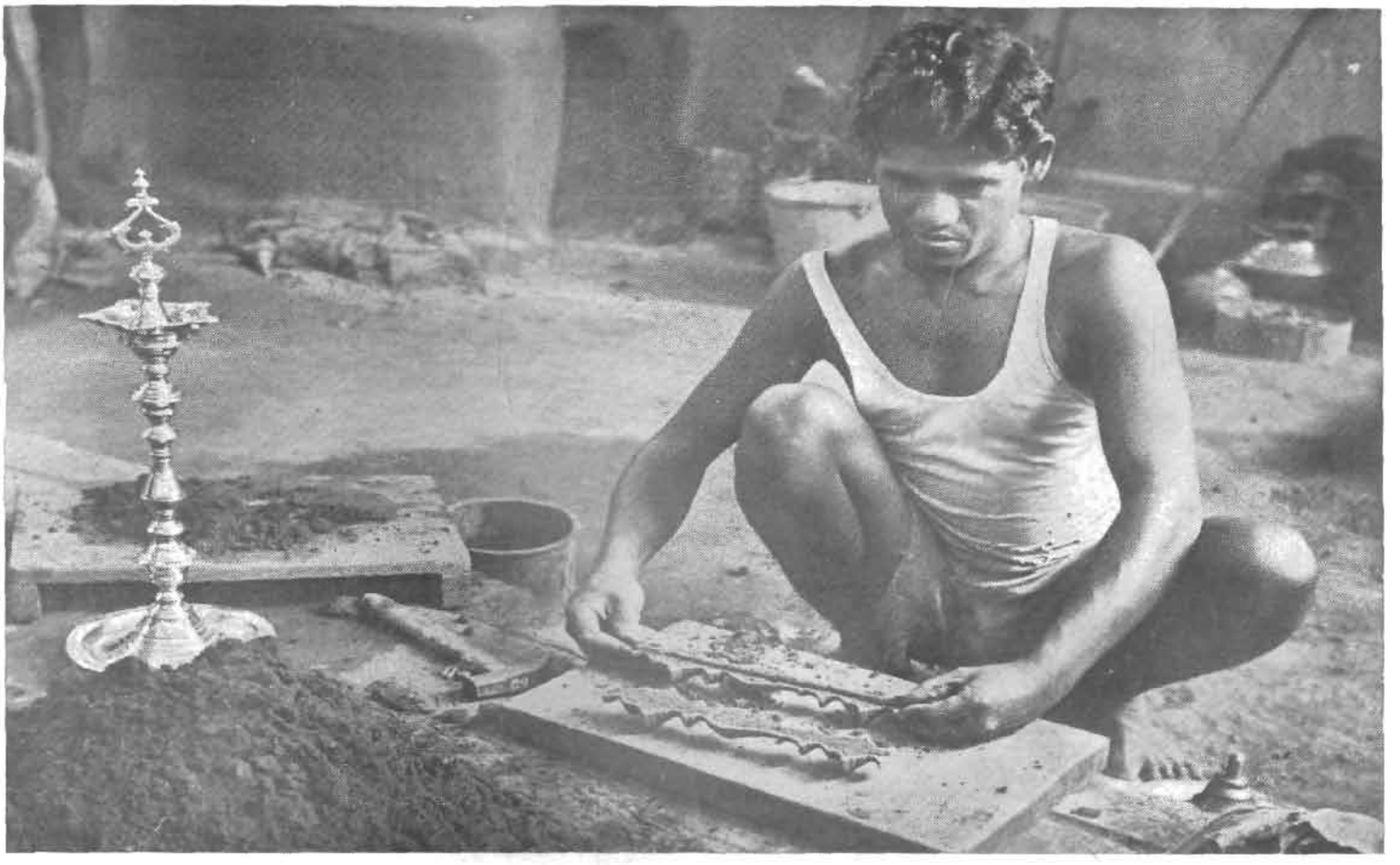
The upper box is being taken off to remove the pattern from the mould.



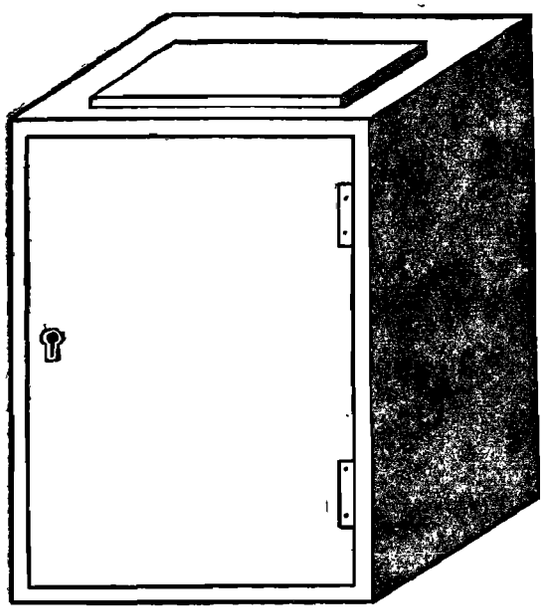
The prepared vandal sand piled in front of the moulder is being pressed with his thumb into the metal pattern mould of the Kuthuvilakku's stem, which in design is made up of a number of connecting curvilinear and bell shaped forms.



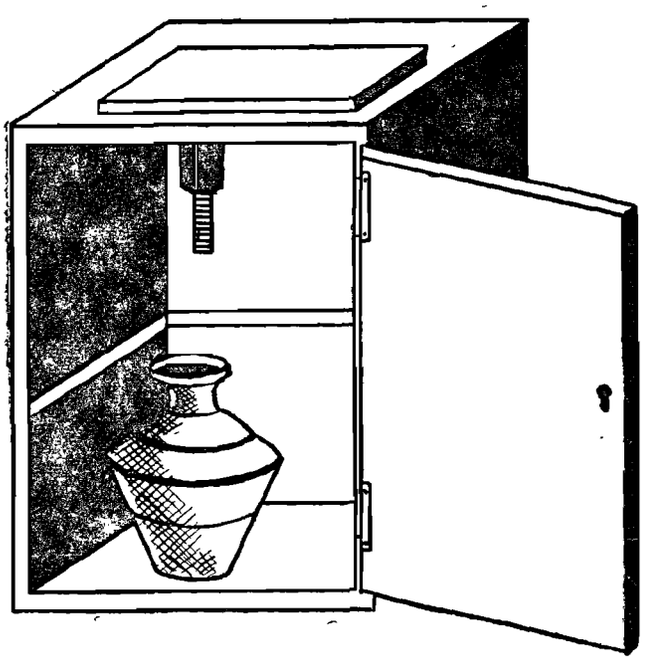
The prepared mud for the inner core is being rubbed over the iron rod covered with cloth to provide a good grip to it.



In one half of the stem's pattern mould both halves of which have already been filled with the prepared vandal sand, an iron rod wrapped in cloth is being fixed down the centre of it by the moulder in order to provide reinforcement for the inner clay core that will be required when the two sand-filled stem patterns are pressed together to form one solid clay stem that will then be referred to as the stem's inner clay core.



Covered brass stand for oil Container



Brass Kudam or oil Container

electrically operated burnishing lathe as adopted by the Departmental Training Centre of the State Directorate of Industries and by availing themselves of the various aids and grants offered by the State Government. This improved contrivance permits speed, ease of movement and better turnover besides cutting down the number of persons required for the operation by one.

Although castings are thoroughly examined and any defects noticed, such as holes etc. are rectified, many of these defects are not visible till the articles are turned on the lathe. These defects, such as pin holes which come to light are rectified by gently nicking the metal. The surrounding parts of the pin holes which come to light are rectified by gently beating the metal with a small stretching hammer until the hole disappears.

STAGE VII

Engraving

Engraving is done with the help of engraving tools. This depends upon the specific design to be intagliated on the article. At the outset, the required design is carefully drawn on a sheet of paper. The master craftman–he has to be one for this work–minutely studies the design which s sometimes kept by his side and then marks its outline on the surface of the article with a sharp steel needle. For ornamental sheet work the design is drawn on the brass sheet by placing the carbon paper over it and tracing it with a pencil. Then the outlines are firmly stroked on the brass sheet with a pencil and finally tapped with various chisels. He nowp roceeds to do the engraving work. The design to be engraved is pressed on a shallac plaster prepared on a wooden plank. The engraving tool is held in position with the help of three fingers of the hand, the thumb, the first and index fingers and guided over the surface to conform to the design. Pressure on the ornamenting chisel is regulated with a small hammer according to whether the cuts have to be on the surface or have to go deeper as per the design or the desire of the customer. In a majority of cases engraving is done immediately after the casting of the fancy article is completed.

STAGE VIII

Cleaning and Polishing

The brass and bell-metal ware are polished on a cotton mop fixed to the spindle of a buff polishing machine having a speed of about 3000 revolutions per minute. A lustre polishing soap is applied to the revolving mop and the article to be polished is pressed against it. The soap acts as an abrasive mate-

rial and helps to remove scratches on the surface of the article. After this is done, the article is thoroughly cleaned with the help of a cotton cloth.

The following Table indicates the time taken for each process for some of the articles manufactured at Nachiarkoil.

Process	Kuthu-vilakku (single)	Kooja 4½ seers	Pooja bell 2½ seers	Tumbler one seer	Small vasa-malai	Paper weight dragon shape
	Hrs. Mts.	Hrs. Mts.	Hrs. Mts.	Hrs. Mts.	Hrs. Mts.	Hrs. Mts.
Moulding	0 15	4 00	1 00	0 45	5 30	0 15
Casting	0 45	1 00	0 30	0 30	3 00	0 30
Fitting	0 30	1 00	0 45	0 30	16 00	2 00
Turning	0 45	1 00	0 15	0 15	20 00	0 15
Polishing	0 15	0 15	0 10	0 10	3 00	0 15
Total hours	2 30	7 15	2 40	2 10	47 30	3 15

The following is a brief description of some of the articles manufactured.

1. Kuthuvilakku—(Vertical pedestal lamp)

This oil lamp usually consists of four parts, viz. base (keezh-bagam), stem (kandam), oil container (Thaguli) and the apex or Prabai. The Thaguli or oil container consists of five 'V' shaped spouts to hold the wicks. These four parts are joined together with the help of screw threads. Kuthuvilakkus are manufactured in various sizes capable of holding 1/8 measure of oil to 2 measures. They are used on religious and ceremonial occasions and are fashioned out of brass.

2. Hand kerosene lamp

It consists of the base, stem, the oil container and the burner. All parts except the burner are soldered together. The burner is fixed by screw threading. The article is made out of brass.

3. Spittoons (Patikam)

Since in Tanjore district most of the inhabitants chew betel, spittoons are in great demand. Ornamental spittoons are manufactured at Nachiarkoil. This article consists of two parts and is made out of brass. The base and the container are connected to one another by means of soldering.

4. Tumblers

Plain as well as ornamental tumblers are produced in this place. These tumblers are used for drinking water and are fashioned out of brass or bell-metal.

5. Koojas

This consists of three parts—the container, the cover and a separate appendage, the cup. This is produced by the wax mould process. The cover is fixed on screw threads and a handle is provided to lift the kooja. Koojas are made out of bell-metal as well as brass.

The following statement indicates the type of articles produced and the prices as current in various workshops, the Government Bell-metal Unit and the Nachiarkoil Co-operative Society.

Name of article	Unit	Co-operative Society	Work-shops	Price
				Rs. P.
1. Flower vases (small)	Yes	Yes	Yes	8·00
2. Small Vasamalai	,,	,,	No	35·00 to 80·00
3. Big Vasamalai	,,	,,	No	400·00
4. Tumblers (bell-metal)	,,	,,	Yes	4·00
5. Mundhiri kooja (bell-metal)	,,	,,	,,	28·00

Name of article	Unit	Co-operative Society	Workshops	Price Rs. P.
6. Milk Chembu (bell-metal)	,,	,,	,,	8·00
7. Spittoons	,,	,,	,,	4·00
8. Special Kuthuvilakku	,,	,,	,,	18·00
9. Toonda vilakku	,,	,,	No	8·00
10. Oam deepam	,,	,,	,,	6·00
11. Tiffin and coffee kooja (bell-metal)	,,	,,	,,	32·00
12. Paper weight dragon	,,	,,	,,	4·00
13. Picnic carrier	,,	No	No	45·00
14. Sodasa deepam	,,	,,	,,	25·00
15. Peacock punching bell	,,	,,	,,	500·00
16. Pradosha deepam	,,	,,	,,	100·00
17. Praba deepam	,,	,,	,,	1,000·00
18. Sannathi bell	,,	,,	,,	120·00
19. Branching lamp	,,	,,	,,	150·00
20. Camphor stand and combined lamp	,,	,,	,,	500·00
21. Kerosene lamp	,,	Yes	Yes	3·00
22. Bathi stand	,,	,,	,,	1·50

Our study would be incomplete without a description of certain articles produced according to three different processes, viz. box moulding, wax moulding and loam moulding. The processes differ only in the type of moulding and casting. Otherwise turning, polishing and engraving are the same, differing only according to the particular design.

BOX MOULDING

1. Kuthuvilakku manufactured according to the sand box moulding process

The Pather emigrants from Nagercoil were from time immemorial manufacturing articles by means of the wax mould process. However, bell-metal wares being costly and delicate, great difficulty was experienced by the artisans in depending solely on the manufacture of bell-metal wares for their liveli-hood. Therefore, many discarded this traditional method of eking out their livelihood and took to the manufacture of brass ware which was more common in Nachiarkoil and the surrounding areas, particularly in Kumbakonam town. About 30 years back, two artisans of the Pather community in Nachiarkoil started manufacturing brass metal ware by the sand box moulding process they had learnt from the artisans in Madras and in Kalahasthi which formerly was in Madras State. Zealous to guard their secret, these artisans refused to divulge the box moulding craft techniques to their fellow metal smiths and practised this process behind closed doors. Since they were able to quickly turn out a number of articles by this process, the news that they had adopted a novel method of casting brass and bell-metal spread like wild fire and other artisans became curious to know the techniques of the process, but without avail. At last a blower who used to sit outside the workshop and blow the furnace succeeded in spying and learning the craft techniques and processes. He then taught it to others and from that day onwards many artisans in Nachiarkoil turned their attention towards box moulding for fashioning brass ware.

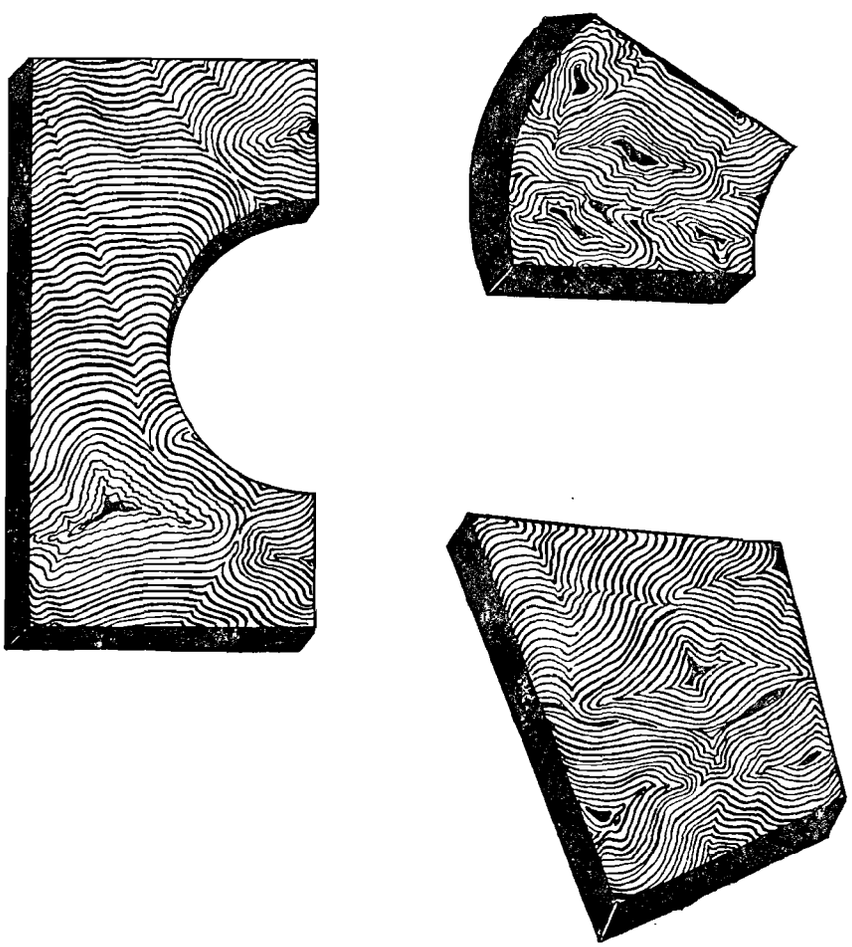
The Kuthuvilakku (pedastal oil lamp) consists of four parts which have to be separately cast and screwed to one another to form the complete article.

Base

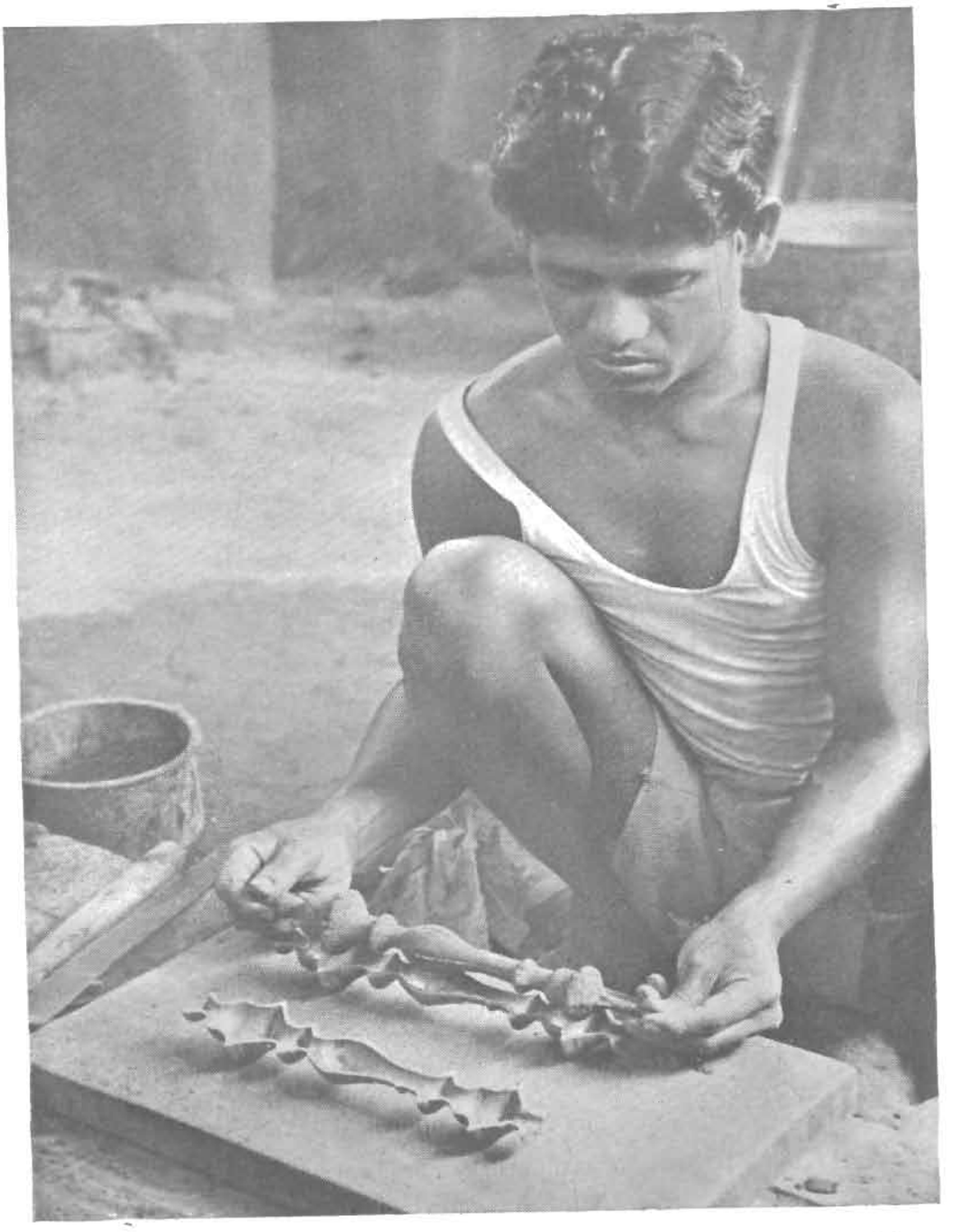
Vandal sand is thoroughly sieved and mixed with small quantities of water till it is of the right consistency to be used for box moulding process. The pattern mould of the base of the Kuthuvilakku is prepared out of brass and is then placed in the appropriate box which is made locally. The box fitted on two sides with a locking device, open at the top and bottom is selected according to the height and the size of the base of the Kuthuvilakku and is placed over a wooden plank, approximately the base size of the moulding box. The plank has a centrally placed hole and the base of the pattern mould of the Kuthuvilakku which is of conical shape is placed face downwards on it. The bottom moulding box is slightly

smaller to fit in properly with the upper one having been placed over the plank, parting sand is sprinkled over the brass pattern mould. Vandal sand is then filled in this box to the top and rammed with the help of a wooden mallet. A wooden runner is placed only about one half to one inch away from the base plate and is held in position with the moulder's left hand and vandal sand is filled up to the top of the runner in the upper box. The left hand is now removed and the box once again filled with the sand and the process of ramming repeated till the sand is firmly fixed and evenly distributed. A sharp curved spoon is used to remove the sand from the mouth of the runner in the lower box to allow the molten metal to be poured into it more expeditiously when casting takes place. The runner is now slowly and carefully pulled out with the help of pliers and the surrounding edges are levelled. The plank and the bottom box is then turned over, the plank removed and the upper or top moulding box is placed over it ; parting sand is again strewn and the box packed with the moulding sand and levelled.

Now comes the most difficult process where the artisan has to display all his skill. The two boxes have to be separated very carefully in order to remove the pattern mould. The artisan holds the lower box firmly between his feet and bending, lifts the top box gently and carefully so that the packed sand is not disturbed. After the removal of the top box, he directs his attention to the lower sand box where the metal pattern mould was placed and he now removes it by tapping through a small light ruler over it. Needless to say this is also a difficult process calling for a great deal of patience and skill. Now it is examined carefully to see whether the passage way created by the runner for carrying the molten metal has been blocked or is clear. After satisfying himself as to this, the artisan again places the top box over the bottom box and presses it down firmly. The molten brass metal which has been heated in crucibles is ladled into these boxes through their runner within eight hours of the preparation of the moulds. After the metal has been allowed to cool for five to ten minutes the boxes are separated and the



Wooden Runners of Various sizes



The joined halves of the brass pattern mould of the stem of the Kuthuvilakku having been slowly tapped apart by the moulder with a wooden hammer, the now solidly joined halves of the clay core centrally containing the iron rod is carefully removed and allowed to dry for three hours.

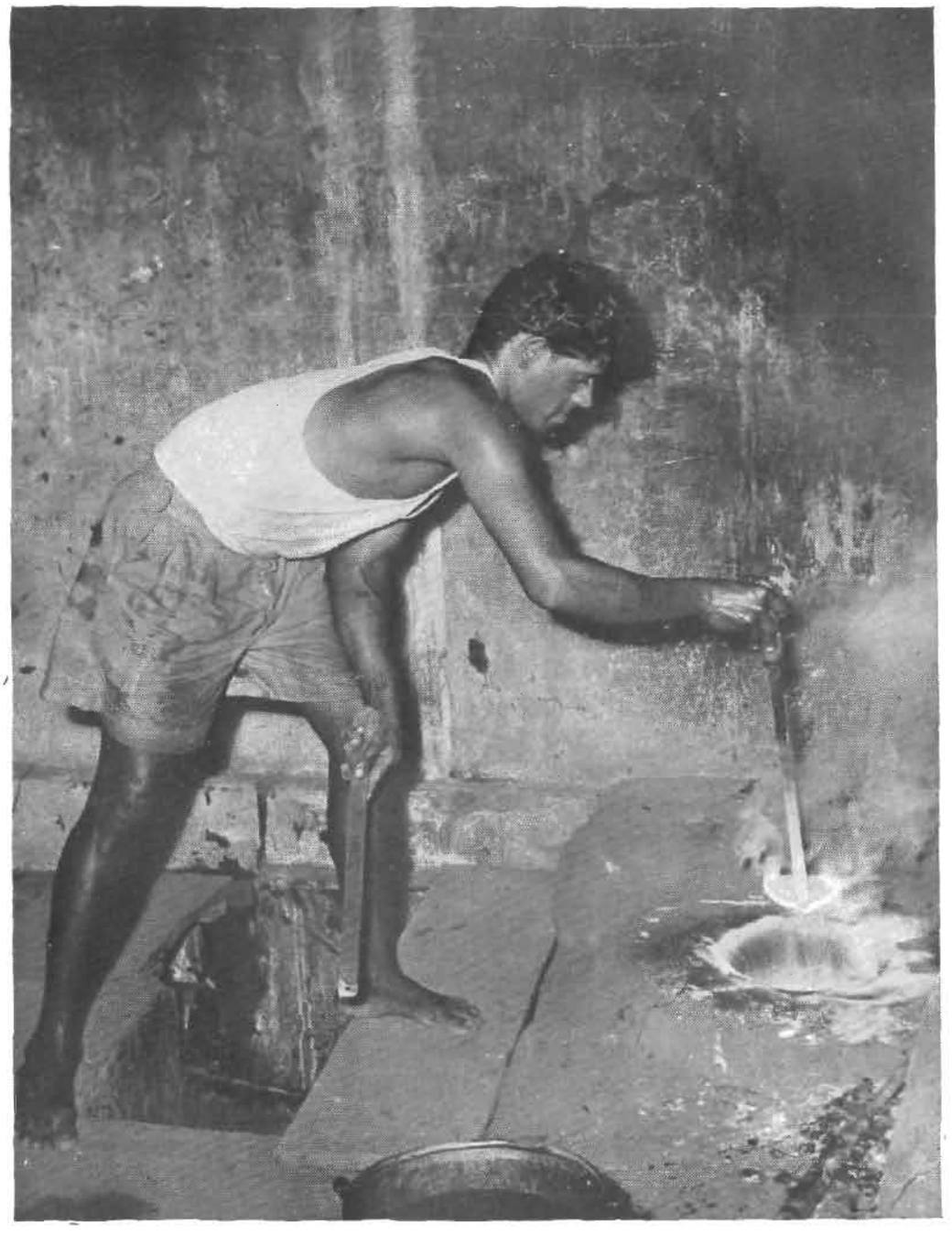


Different moulds of the Kuthuvilakku (pedestal oil lamp) in moulding boxes of various sizes grouped together to indicate the number of boxes required for producing a single Kuthuvilakku.

1 & 1-A	Kuthuvilakku	base mould
2 & 2-A	,,	stem ,,
3 & 3-A	,,	Fancy cupasam only manufactured in the Government Unit.
4 & 4-A	,,	Oil container mould
5	,,	Prabai mould
6	,,	Ready for sale.



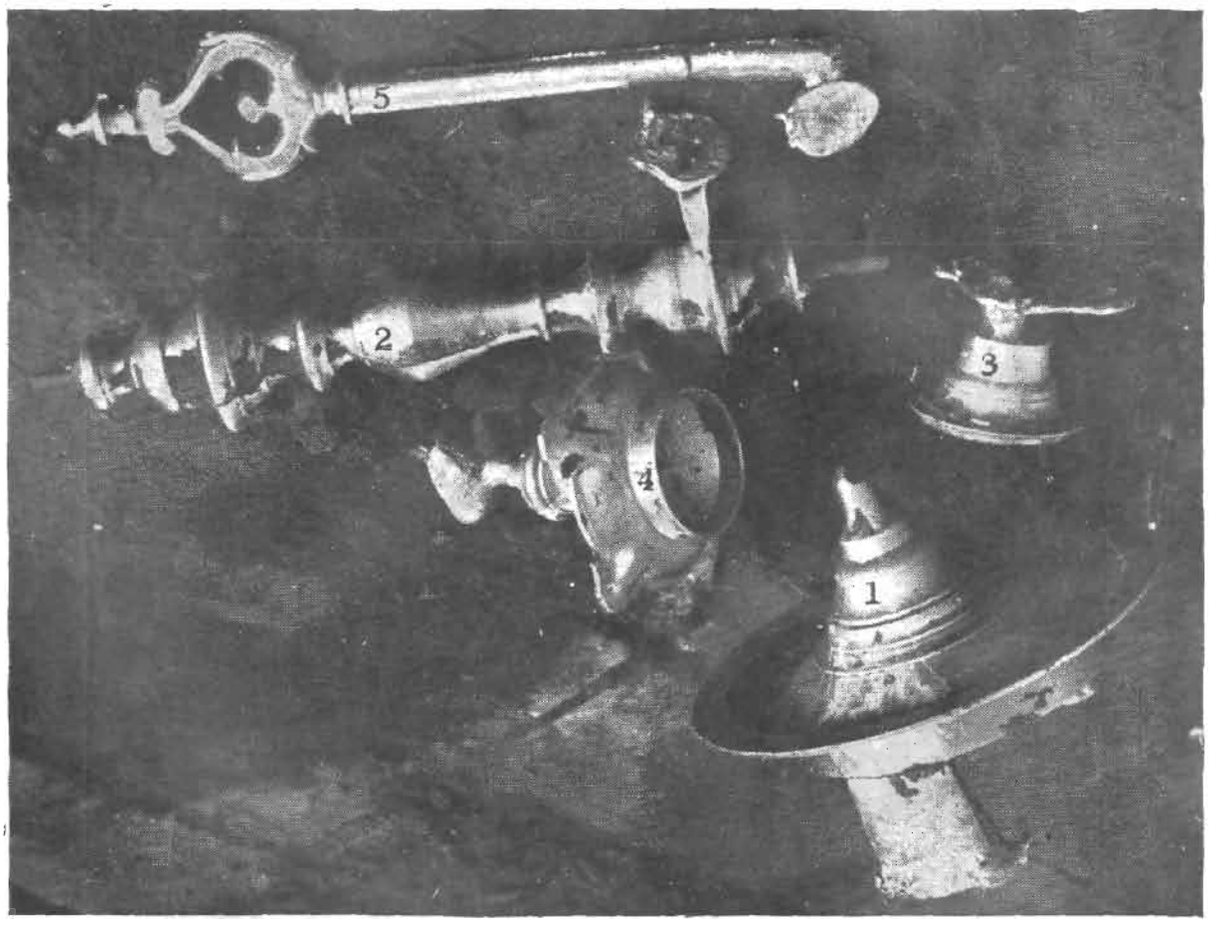
The scrap metal having been put into the earthenware crucible with the help of the crucible tong, the caster placing it in the centre of the coke-fuelled casting furnace in order to quickly bring the metal to the required molten state for casting.



A ladle is dipped in to the crucible and the molten brass is taken out to be poured into the moulds.

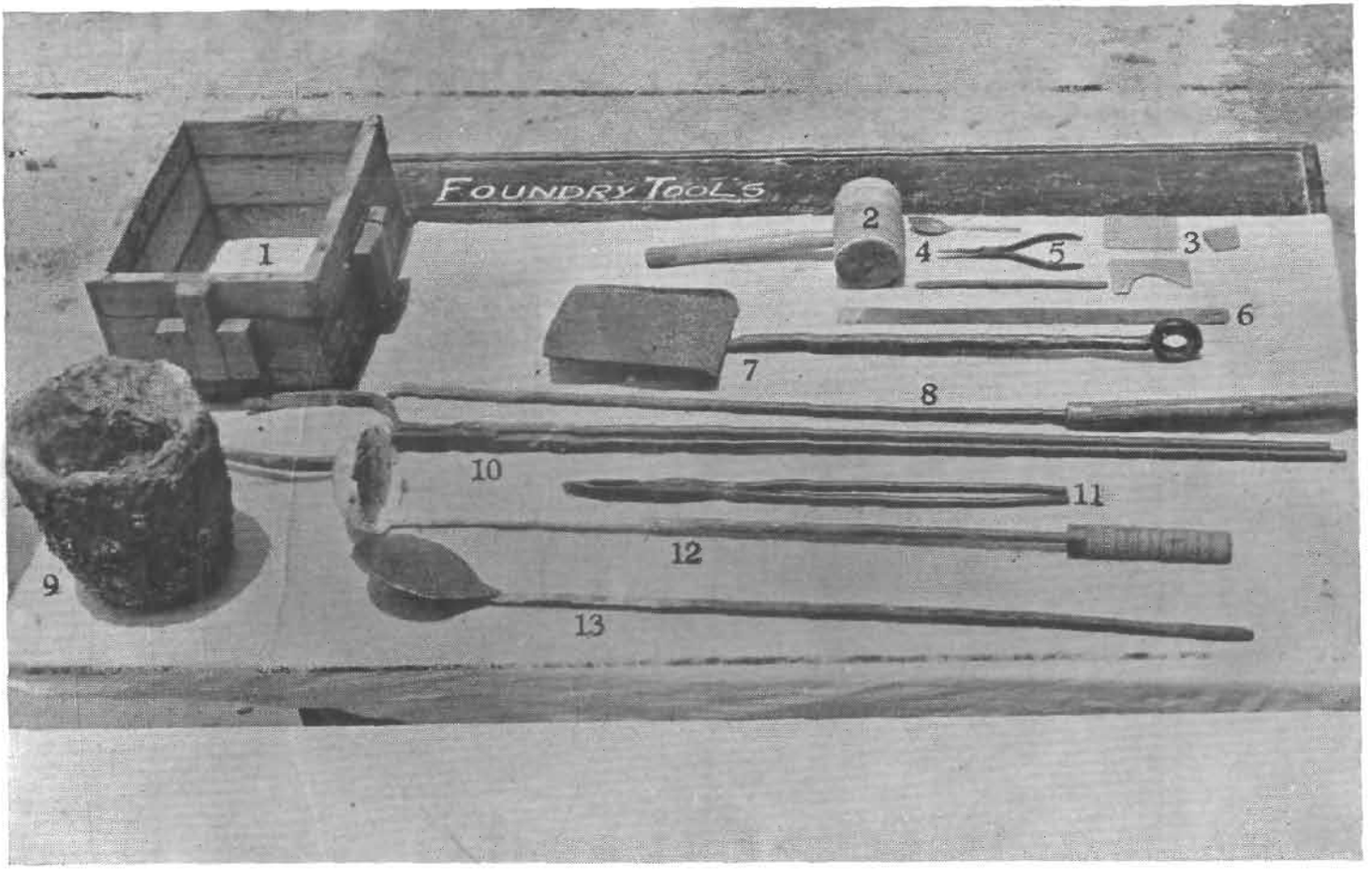


Molten brass is being poured into the mouth of the runner from whence it will flow down until it reaches the impression made by the pattern mould before it was removed from the box there to fill its empty space. In order to steady the joined moulding boxes during the pour, the other moulder holds them firmly together by means of two wooden rods held in either hand.



A few minutes after casting the moulds are broken open and the cast pieces of the Kuthuvilakku are taken out wrapped in vandal sand along with the runners attached to them.

1. Kuthuvilakku's base along with its runner
2. ,, stem ,, ,,
3. ,, cupasam ,, ,,
4. ,, Oil container ,,
5. ,, Prabai ,, ,,



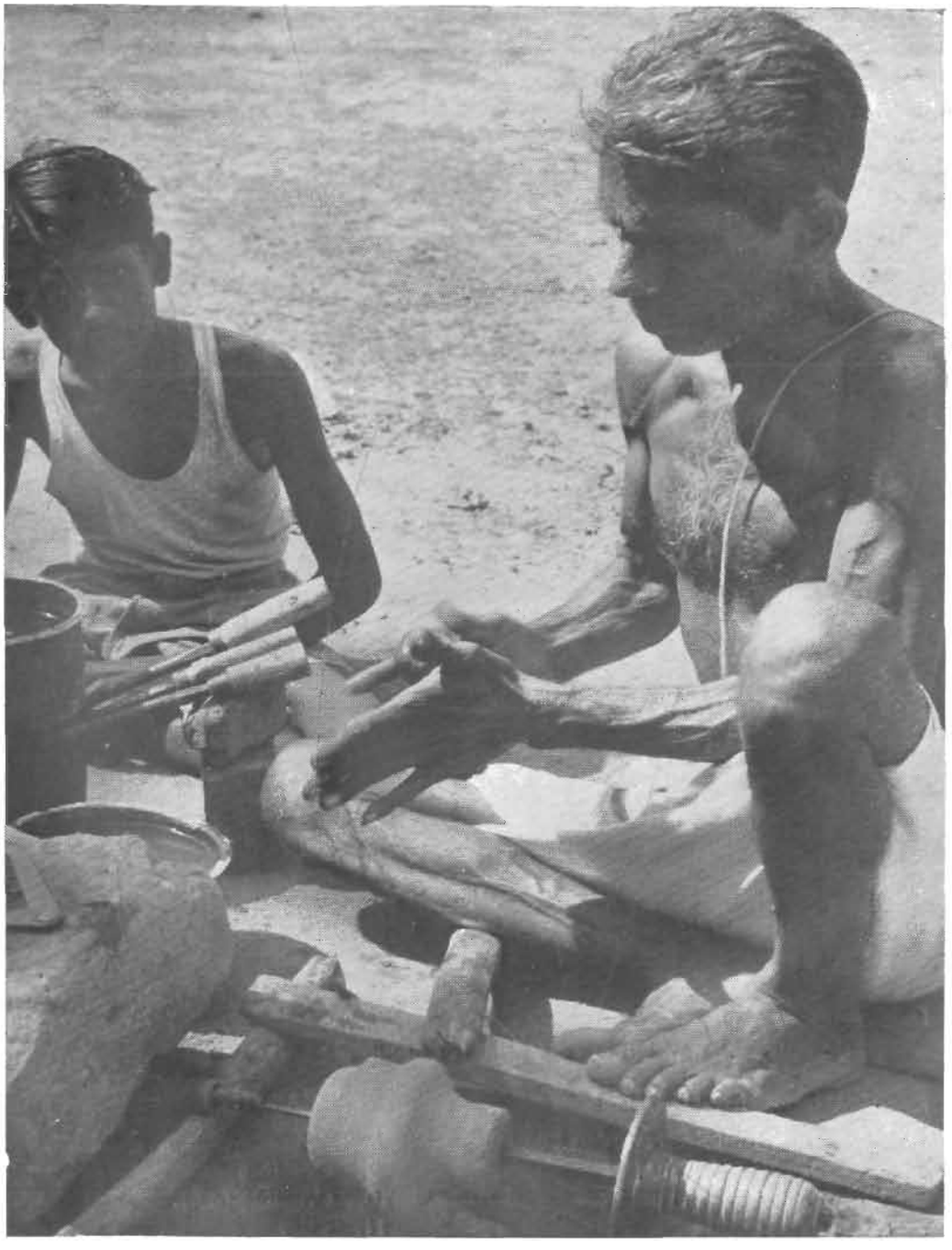
Foundry tools which are essential for moulding and casting

MOULDING

1. Moulding wooden box
2. Wooden mallet
3. Wooden runner
4. Spoon
5. Nose plier
6. Iron leveller
7. Shovel

CASTING

8. Poker
9. Crucible
10. Crucible tong
11. Plier
12. Ladle
13. Spoon



The model, or inner clay core, of the Mundiri Kooja (cashewnut design) is driven through the middle of the sharp point of the core mandal. Note the expert craftsman is preparing a special clay mixture of river sand, vandal sand and cow dung, this being referred to as "Veda core sand" to be smeared over it for its perfect shape.

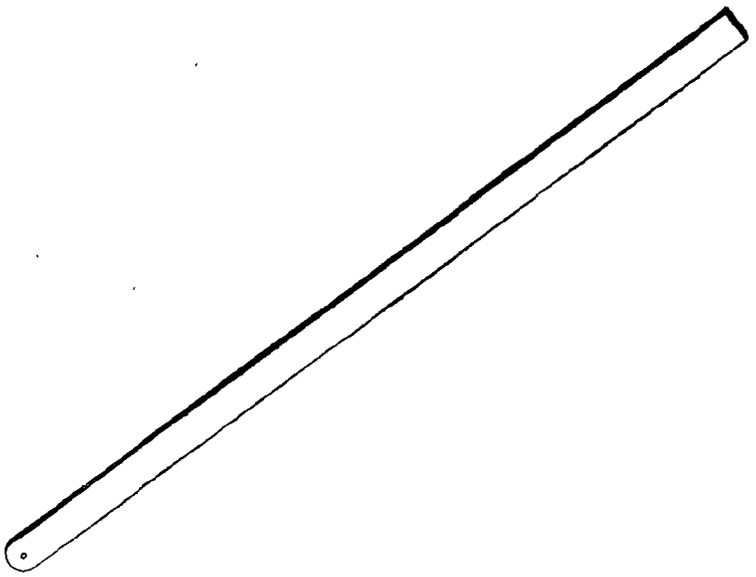
rough casting of the base of the pedestal oil lamp is removed for further operations. It is to be explained that the molten metal must be poured into these boxes within eight hours of the preparation of these impressions made by the pattern, as otherwise the vandal sand will become dry; the moulded area will expand as a result and instead of a perfectly cast brass object a monstrosity of ore may emerge.

Stem

The box moulds having been prepared for the base of the Kuthuvilakku, the artisan now turns his attention to the preparation of its vertical stem. The two hollow halves of the metal pattern moulds used for producing it being made up of a long slender pattern of curvilinear shapes, the moulding box for registering its impression will automatically be rectangular in shape. As before, the bottom box is placed over a plank. Now as has just been intimated, the pattern mould stem consists of two halves, but before the sand box casting can proceed further, a number of processes connected with the production of an inner clay core by means of these two halves of the pattern mould must first be undertaken by the craftsmen.

This inner core is prepared out of clay and river sand mixed in equal proportions and mud formed into a paste by the addition of some water. The craftsman now takes a long thin iron rod, 1/8" in diameter and winds a thin piece of cloth around it, so that when the rod is removed after casting, it should be easy to pull out. The two half portions of the brass pattern mould of the oil lamp's stem are now laid side by side and parting sand is sprinkled over their cavities. The clay and river sand mixture is pressed into these cavities which are then levelled even to their rim by means of an iron leveller. The iron rod covered with cloth, having first been rubbed with clay, is then laid down the centre of one of the half portions of the pattern mould of the stem, filled earlier with clay and pressed down into it. The other half of the stem's pattern mould is now placed over the first half and fixed into position by tapping it gently with a wooden hammer. Two hours later the stems' pattern mould is once again tapped with a wooden hammer and the inner clay core in which the iron rod is now firmly fixed to provide reinforcement is taken out, allowed to dry for three hours and finally placed in a chamber and slowly and lightly baked till the colour of the inner clay turns red.

Next the brass pattern mould of the Kuthuvilakku's stem is taken out and placed, hollow side downwards on the plank on which the bottom box was earlier placed. Brick powder which acts as a parting sand is now showered over the stem and vandal sand is packed into the box and levelled as explained in earlier paragraphs describing box moulding technique. The box, complete with plank, is now turned upside down and the plank removed. The inner core which has already been prepared is now fitted into one half of the pattern mould and then the other half of the stem is placed over it and slightly tapped, so that the edges are firmly fixed into position with no visible gap where they meet. Now the upper moulding box is placed over the



Iron Leveller

bottom box and parting sand (brick powder) is once again sprinkled over the pattern mould. The runner is then fixed to the bottom of the pattern mould and vandal sand is once again rammed into the upper box, tapped with the wooden mallet and levelled with the sharp iron instrument. As before the runner is pulled out and the upper box carefully removed. The two pieces of the stem's pattern mould are now carefully tapped free and removed. The inner core is taken out and heated in a fire till it becomes red hot and subsequently is allowed to cool, this being done to drive out any possible moisture remaining in the clay. The inner clay core is once again fitted into the impression of the stem's pattern mould left on the bottom box and then the upper box is carefully placed over the lower box. As before, molten metal is poured into the boxes within eight hours of the preparation of the mould and the brass casting of the stem with the inner core embeded inside it emerges.

Oil container

This consists of a special shallow pan for containing the oil or clarified butter, with five 'V' shaped edges in which the wicks are placed. Firstly the artisan takes a wooden plank with a hole in the centre. The pattern mould, known as Thaguli is placed upside down over the plank. A square, hollow sand moulding box of the same size is placed over the plank, parting sand is sprinkled and vandal sand is filled to the brim in the box. Runner is fixed on the pattern, some more vandal sand is added and again rammed and levelled with an iron leveller. The runner is removed and with the help of a curved spoon, a path way is formed from the mouth of the runner in the lower box to allow the molten metal to flow in. The box is turned over and the plank is removed.

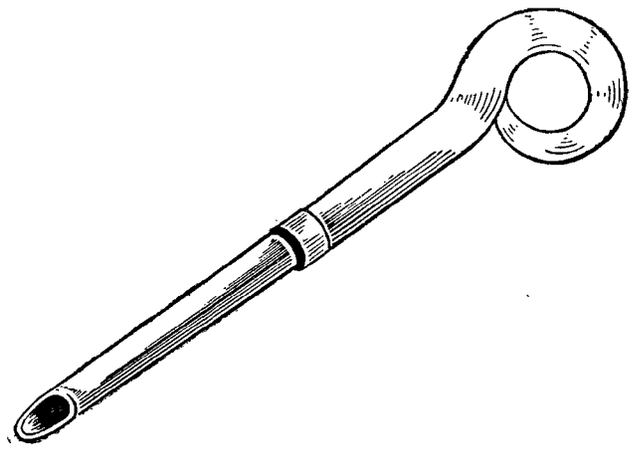
The Thagulikandam (neck of the oil container) is already prepared by the loam moulding process and kept ready. For its preparation vandal sand and bits of jute fibre are taken and mixed with some water. The pattern of the Kandam (neck) is held in the left hand and rubbed on one side with lubricating oil with the right hand. With the same hand the mixture of the prepared sand is plastered on one side of Kandam and the latter is slightly heated in a furnace to drive out the moisture of the mud. In the same way other half is heated. After a few minutes the two halfs are removed from the pattern by slowly tapping over it with the help of a small hammer. The two hollow sides are plastered with the same sand mixture and slightly heated. Thus the Kandam is prepared to be fixed to the upper part of the Thaguli. The upper box is placed over the bottom and parting sand is sprinkled over it as before and the moulding sand is filled, rammed and levelled. The lower box is fixed to the upper box filled with vandal sand, the runner is removed and the way is cleared for the molten metal to flow in.

Prabai - Top or Apex Flag

A rectangular plank is placed on the ground, the bottom box is placed over it and parting sand contained in a loosely meshed white cotton bag is shaken oven the plank. The box is filled with vandal sand, rammed and levelled with an iron ruler. The box is now turned over and the pattern mould of the prabai (decorative handle of the pedestal oil lamp referred to as the flag) is thrust into this sand upto half of its length by slowly tapping it in with a hammer. The sand is once again levelled. The upper box is now placed over the bottom box and parting sand shaken over it. The runner is fixed in position, the vandal sand is filled and levelled in the upper box, the runner is removed and the upper box carefully separated from the lower box. The pattern mould is pulled out with great care and again the upper box is removed from the bottom box. The main difference between the moulding of this part of the Kuthuvilakku as contrasted with its other part is that here the pattern mould is put into the bottom box so that half of its length protrudes out and the placing of the upper box over it allows the other half of the pattern mould to be formed in the latter. The casting is done as described before.

The brass castings are filed to remove casting blemishes and then turned on the turning lathe to acquire a more refined shape. These parts are screwed together by means of screw threads cut at the ends, after which they are cleaned and polished and the Kuthuvilakku is now ready to be sent to the bazaar.

Having carefully examined the processes of manufacturing a Kuthuvilakku in the various workshops of Nachiarkoil and those that prevail in the Government Bell-Metal Unit, it has been noticed that there are certain essential differences between the same article produced in a workshop and that manufactured at the unit. Those produced at the unit are more pleasing to the eye in as much as there pains have been taken to produce an oil lamp, the parts of which are workable and beautiful. Those produced in the bazaar consist of only the base, the stem, the Thaguli and the Prabai (handle) whereas those produced in the unit feature an additional part known as the Cupasam, produced by the sand box moulding process which has already been described in the above pages. This is a small, round cup shaped form which is fitted between and swelling gracefully up from the stem to the Thaguli (wick holder)



Poker

and thus enhancing the pleasing effect of the Kuthu-vilakku as a whole. In short, it serves as a decorative base of the Thaguli.

Castings

The furnace, lined with fire clay and bricks, is lighted and coke is added to the fire at the rate of twice the weight of the metal to be melted. The metal scraps or ingots are placed in crucibles and heated till the maximum temperature is reached.

The following Table indicates the temperature required to melt the different metals.

Name of the metal	Required temperature to melt	Time to melt Hrs. Mts.
Copper	1996°F	2 00
Tin	442°F	0 30
Zinc	773°F	0 45
Brass	1700°F to 1900°F	1 45

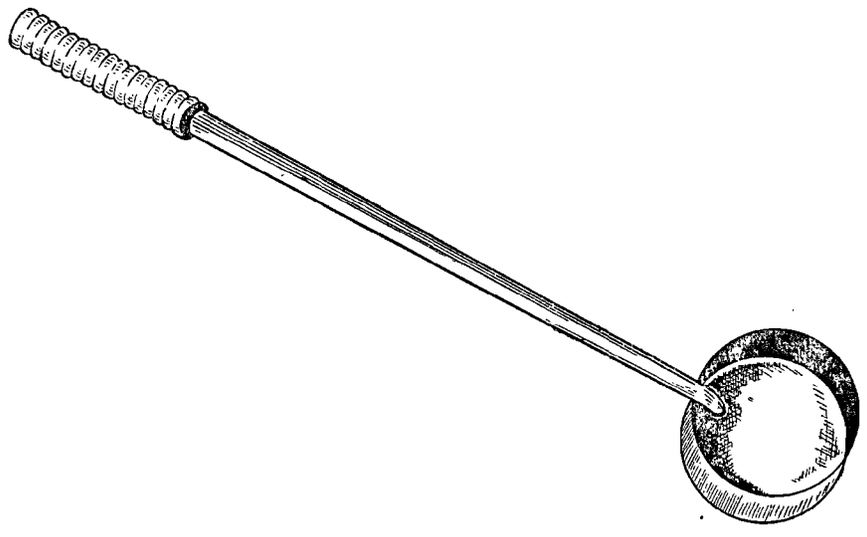
The crucible is placed in an iron grating within the furnace. A metal spoon is used to skim off dust or impure particles floating on the heat liquified metal and then with the help of a metal ladle, the molten metal is poured into the moulds which are kept near the furnace. After ten minutes the mould is broken and the castings are scraped, scoured clean with vandal sand and allowed to cool for half an hour.

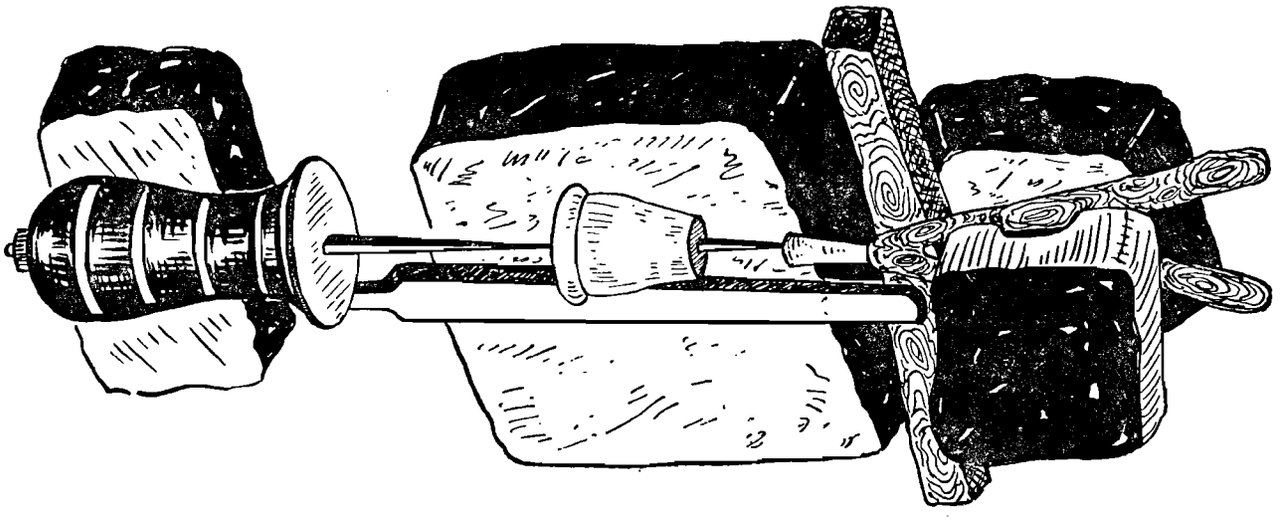
WAX MOULDING

Manufacture of Mundhiri Kooja, i.e. Kooja with a cashewnut design

This article has become the trade mark of the artisans of Nachiarkoil and is well known throughout South India. Wax moulding is a dfficult process and is

Ladle

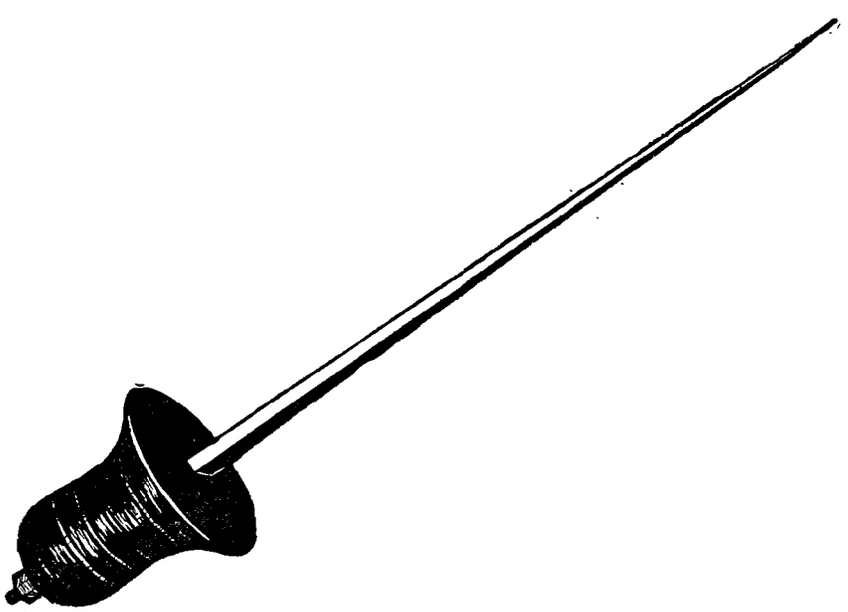




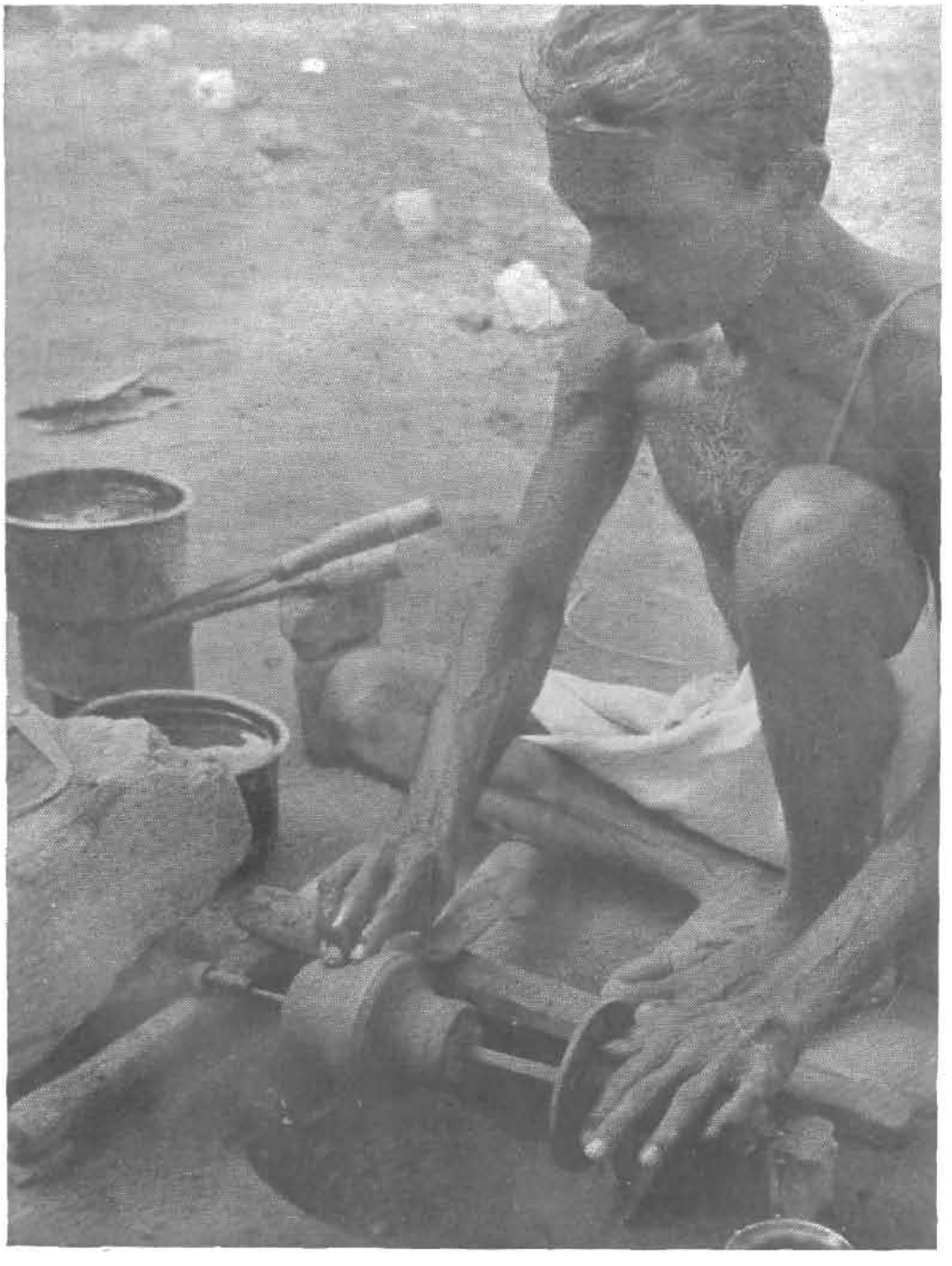
Wax moulding of Mundhiri Kooja on core mandal

only practised by some Pathers in Nachiarkoil. Of the 160 artisans only 41 practise wax moulding in the manufacture of bell-metal wares. These Pathers are also experienced in box and loam moulding. The Mundhiri Kooja design (cashewnut design) is a patented one and is fashioned exclusively by the craftsmen of Nachiarkoil. The following description of the techniques of production of this article is worthy of mention, not only because today they are helping to produce such distinguished metal artefacts of everyday use, but also historically they reach back without break to one of India's most ancient methods of casting metals that is known as the Cire Perdue (Lost wax) hollow casting technique.

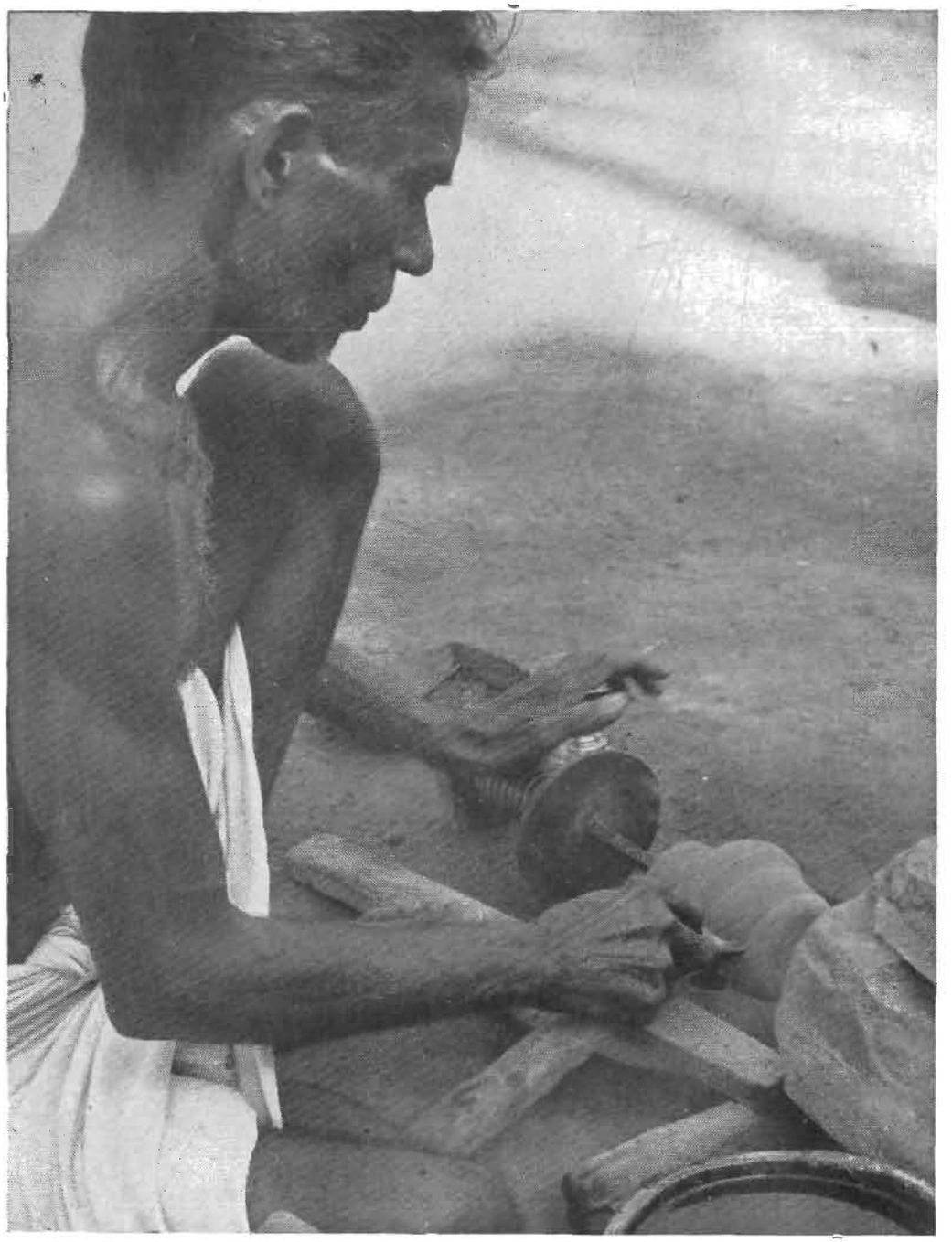
A pit is first dug in the ground and a wooden plank shaped in the form of an 'M' and having three legs is placed inside it and filled with mud so that the top portion of the plank is visible above the ground. On this plank is placed a 'V' shaped piece of wood having two arms not unlike the wooden parts of a catapult converging to a point to which a wooden button is



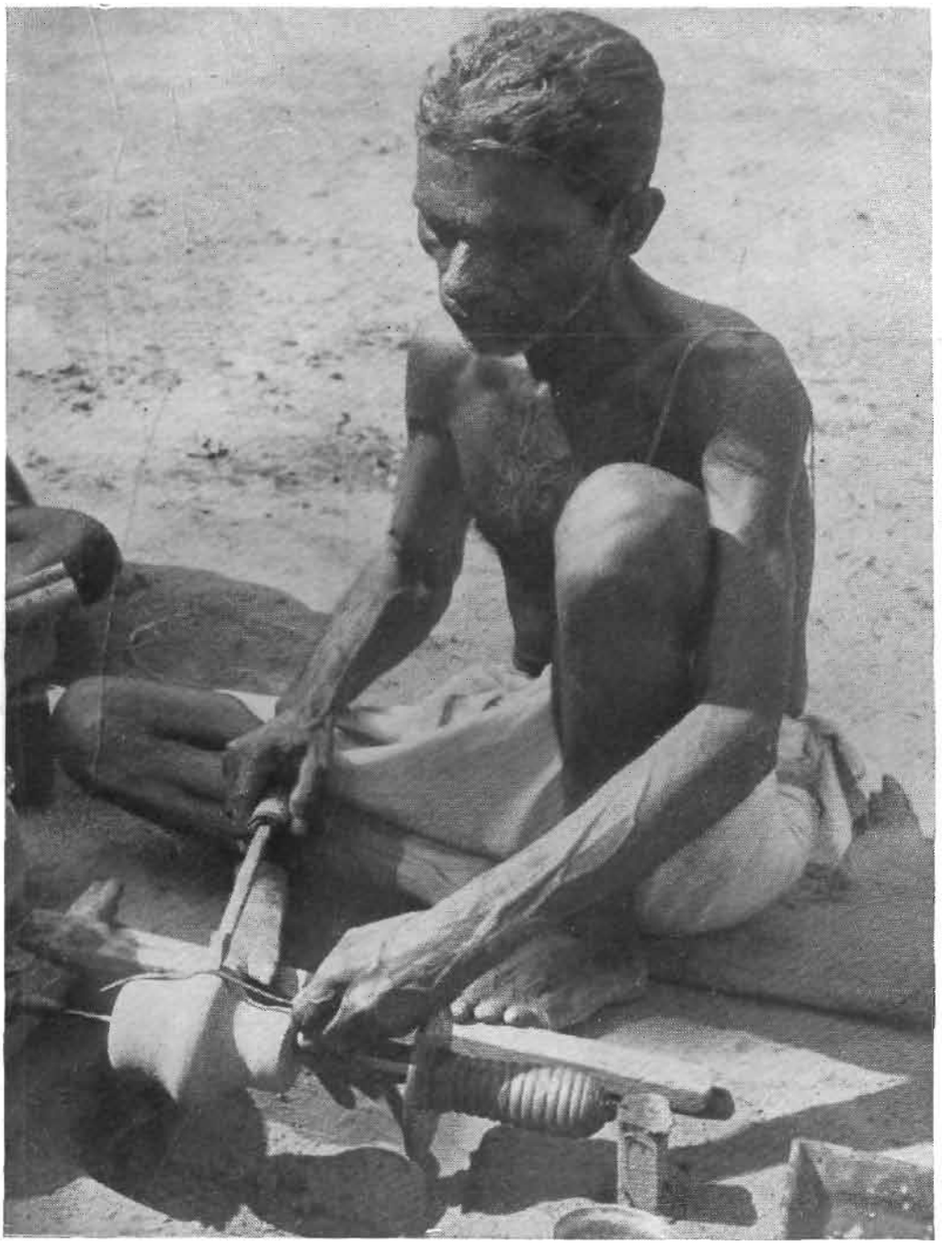
Core Mandal



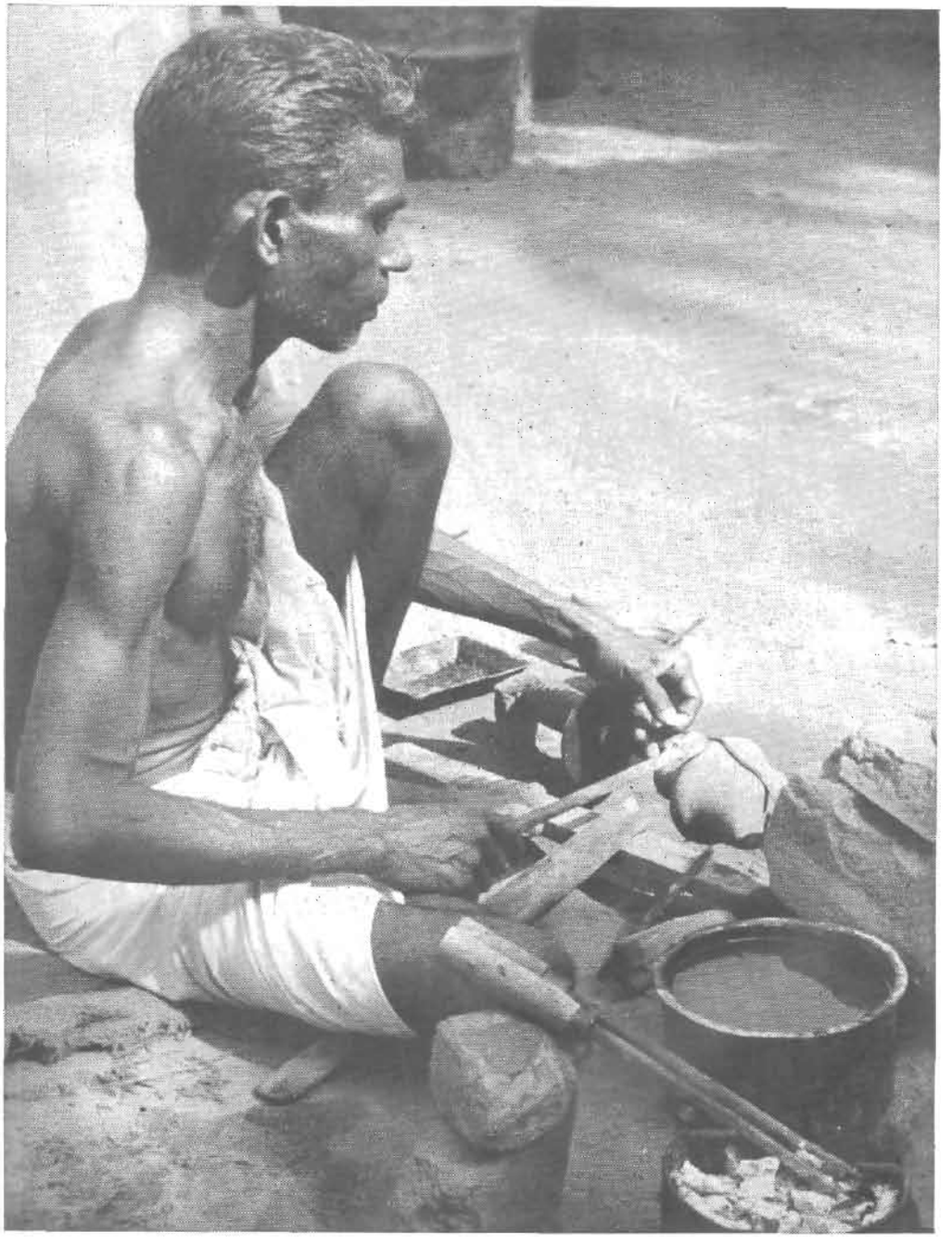
In order for the model, or clay core, of the Mundiri Kooja to attain its proper traditional shape, more of the damp prepared clay is smeared over the model and then smoothened with the flat of the artisan's right hand whilst he rotates the core mandal with his left hand.



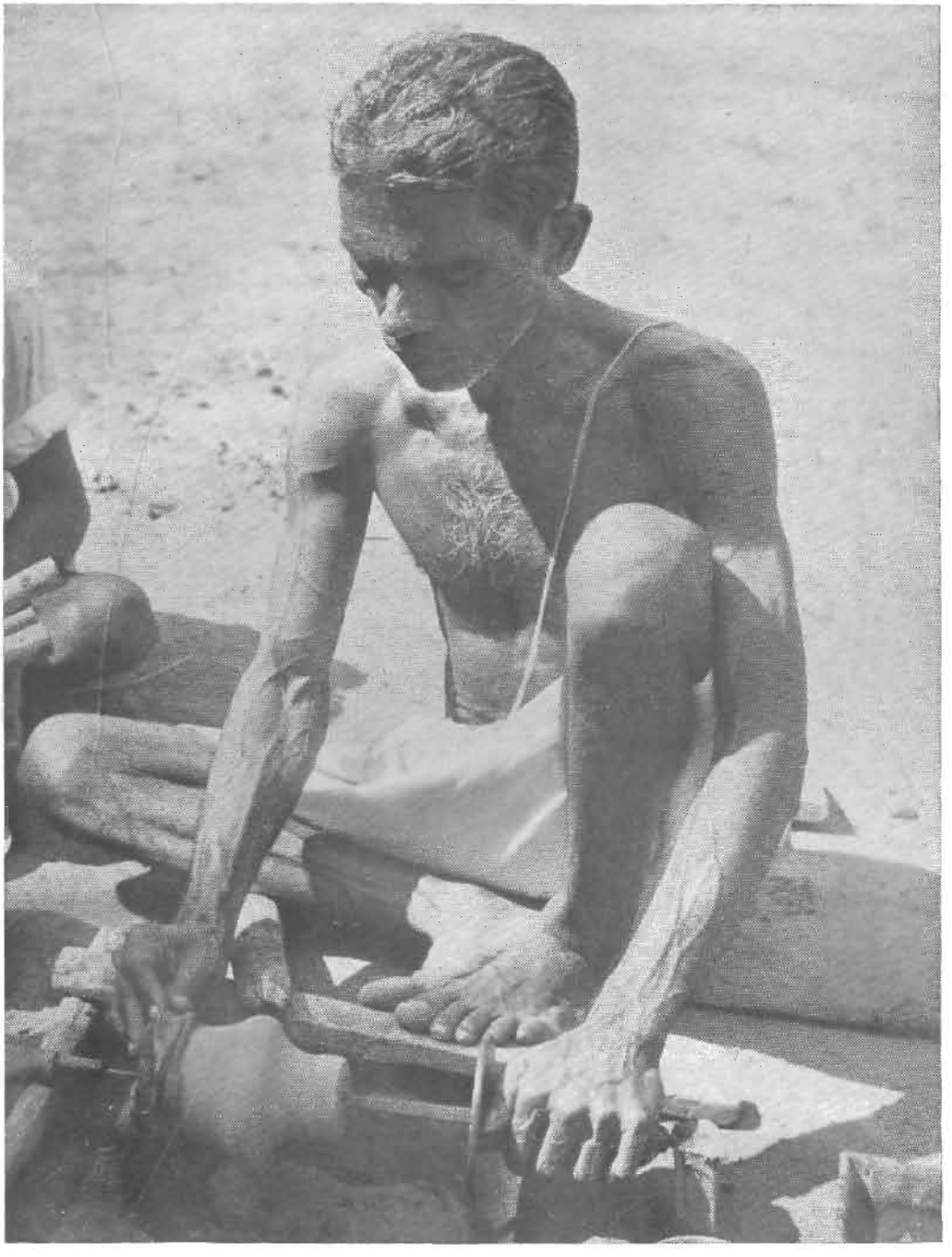
With the help of a core turning tool (a flat iron strip of 9″ in length) the artisan displays his skill in fashioning the model to the required shape.



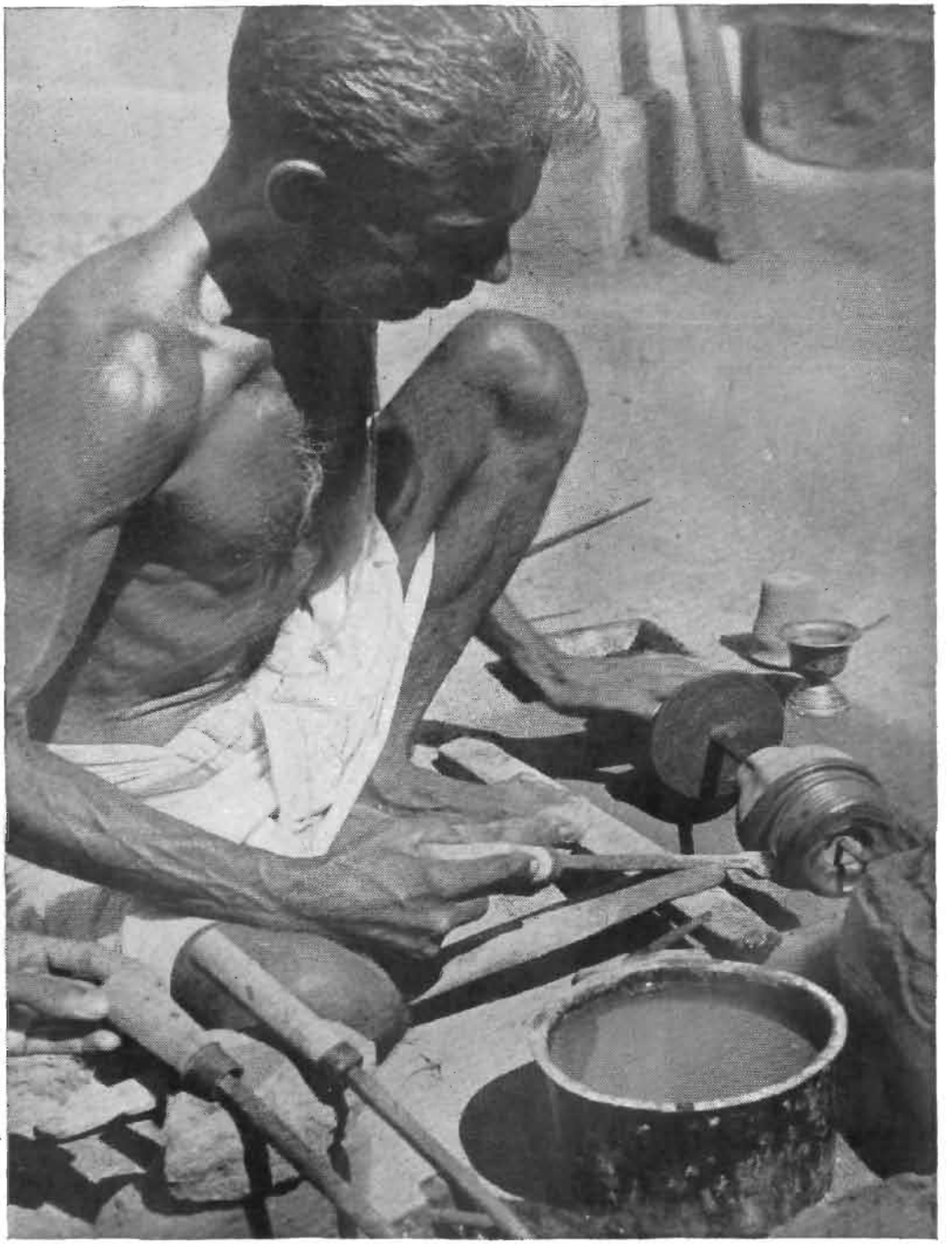
The reference wax strip which is harder and black in colour is placed over the core as a reference to coat the wax to its thickness.



With the help of the preheated wax turning tool (Kadai Irumbu) the wax strip is fixed over the core.



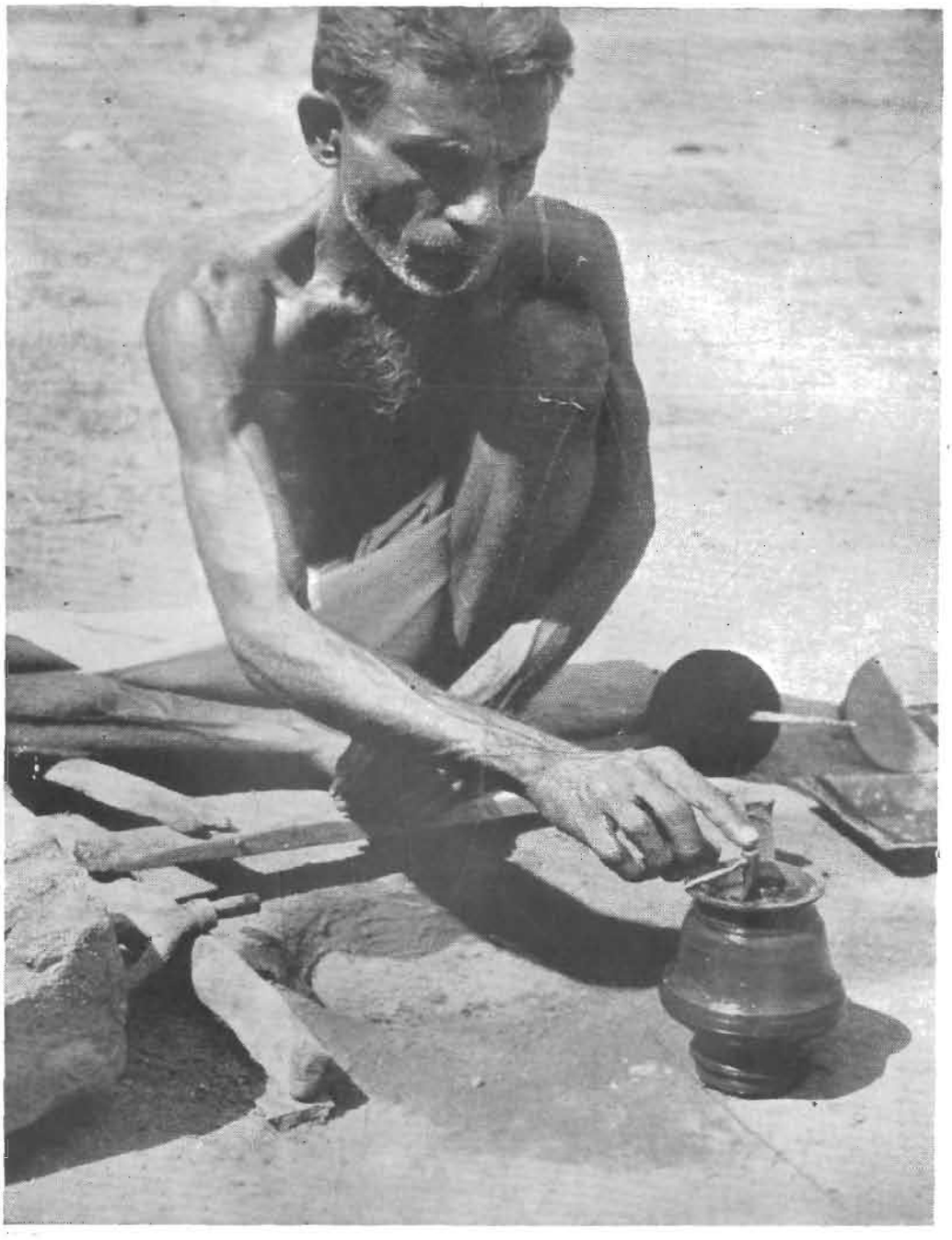
The prepared wax is taken and applied smoothly over the core.



Taking a preheated wax turning tool the expert wax moulder displays his workmanship by applying it gently over the wax which has melted and spread on half the portion of the outer surface of the core.



The expert wax moulder slowly rotates the core mandal (Narasam). Carrying the wax sheathed clay model or inner clay core, he presses the pre-heated wax turaing tool which is heated once every two minutes against its revolving surface so that the wax is smoothly and evenly distributed on all sides.

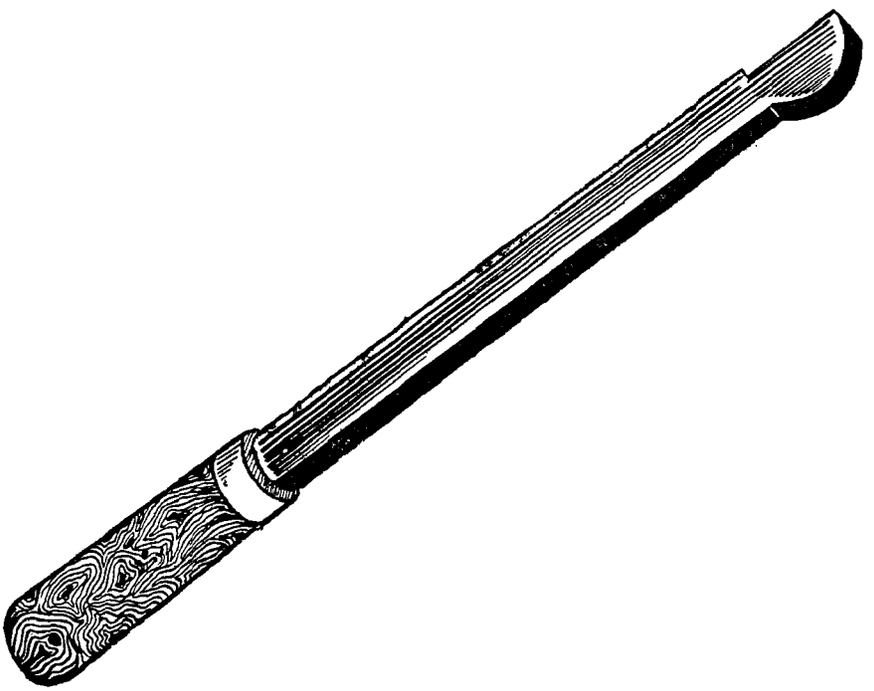


The wax sheathed replica or model is removed from the core mandal and a wax runner is fixed at the bottom of the model.

fixed. On the 'V' shaped piece of wood is placed a medium sized stone, serving as a weight. Two feet away another plank of wood is buried in the ground. These two planks are connected by what is known as the core mandal (Narasam), which is a steel rod one foot in length and narrowing down to a sharp tip fixed to a balanced iron pulley 4" in diameter, this in turn, being fixed to a wooden handle. The tip of this steel shaft of the core mandal rests on the wooden button fixed to the 'V' shaped piece of wood. Between the plank on which rests the steel rod and the other plank, earth is dug out so that the artisan can rotate the core mandal safely. In order not to deviate one iota from the traditional design of the Mundhiri Kuja, this is drawn on paper and kept by the side of the artisan to be referred to whenever necessary. A special mixture containing river sand, vandal sand and cowdung mixed in equal proportions known as 'veda core sand' is prepared. The skilled artisan now utilises this sand mixture to prepare the model or clay core of the Mundhiri Kooja according to the specification and design and this is allowed to dry for two hours. Ehe model of the Mundhiri Kooja is now held firmly in an upright position on the ground by the craftsman while with his right hand he plunges the steel point of the core mandal into the centre of the upper face of the Mundhiri Kooja. Turning, twisting and pressing the core mandal's handle he finally succeeds in piercing a hole right through the middle of the model. The core mandal is now fixed within the two centres and rotated. By rotating it slowly the artisan carefully checks whether the shape is according to the required size and design. If not he takes some clay sand in his hand and coats it over the model. Eaking the core turning tool (Vthukku Irumbu) which is a flat iron strip of 9" in length with both ends flatly sharpened, he smoothens the model. If found satisfactory, the steel tip is withdrawn, the model or clay core detached and dried for two days in the open sun.

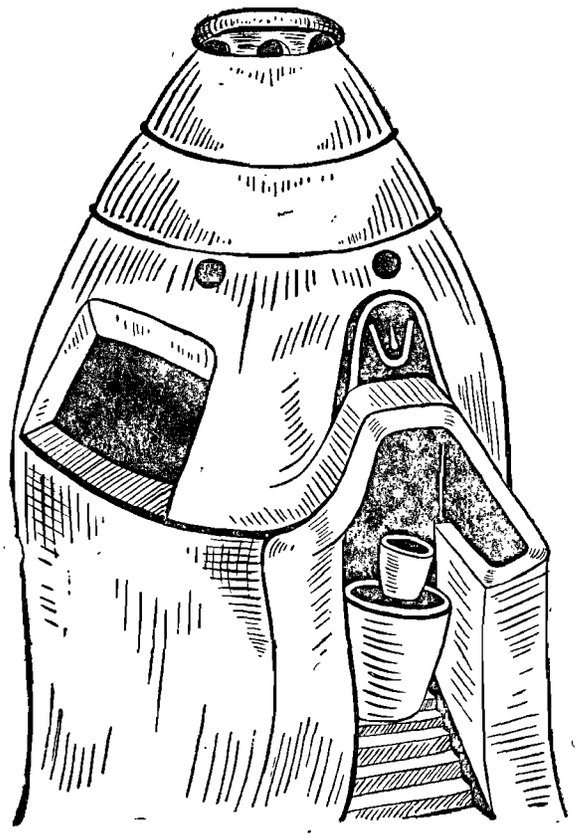
After drying, the clay model or core, is again fixed for rotation by inserting the steel point of the core mandal through the hole. The core mandal is rotated with the left hand by the artisan while with his right he gives the necessary shape to the model with a core turning tool.

The sand mixture, already prepared as described earlier, is taken by hand and applied over the model and smoothened with the core turning tool, to impart an extra finish. This is the most difficult and delicate process of the manufacture. Once the required shape and size has been obtained, the model is detached from the core mandal, allowed to dry for half an hour and again refixed. Vandal sand, savuttu sand and cowdung is mixed in equal proportions and sieved to remove impurities in the shape of grass and small stones. Now



Wax Turning Tool

a coating sand is prepared out of this mixture by adding some water. By rotating with his left hand the core mandal on which the model or clay core has been fixed it is possible for the artisan to apply this coating with his right hand, thereby allowing him to smoothen the model's outer clay surface evenly. The coating is uniformly applied over this outer surface to a depth of 1/8". The rotary motion of the core mandal is stopped, the model detached and dried in the sun for half an hour and then once again fixed on the core mandal. The core thus made to the exact shape and size with a smoothened surface is now ready to take up the wax coating. The thickness of the wax to be coated is equal to the thickness of the metal sheeting of the Kooja to be manufactured. In order to keep to this dimension a reference wax strip is attached to the core already prepared. This mixture of wax is slightly hard, black in colour and cannot readily melt at the temperature the ordinary wax coating will. After the reference wax is fixed on to this core, the ordinary prepared wax, having a very low melting point is now taken and the moulder, utilising a little of it at a time, presses it gently on the outer surface of the model, and with the help of the wax turning tool (Kadai Irumbu) which is heated once in two minutes, applies

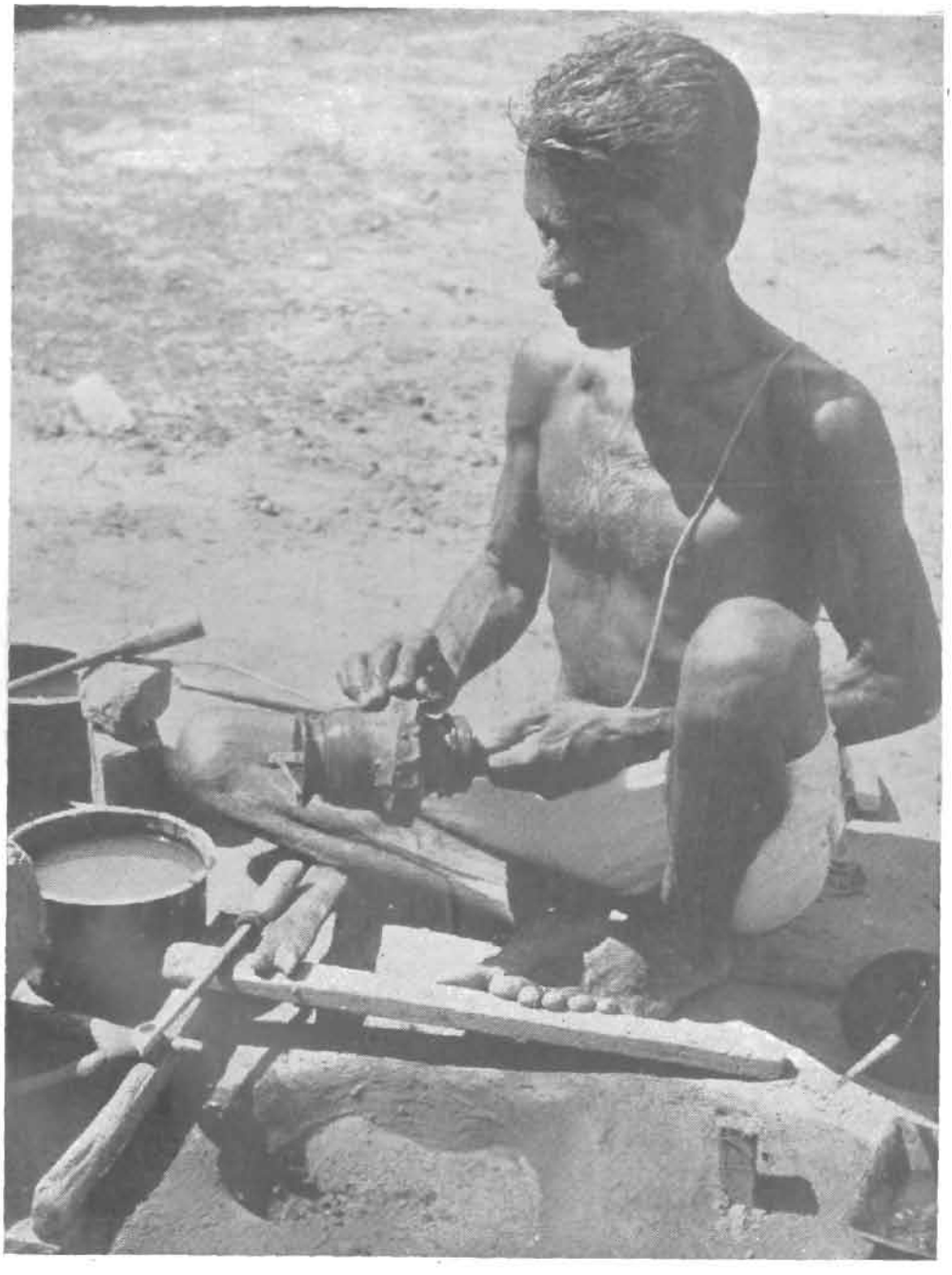


Wax Moulding done shaped furnace

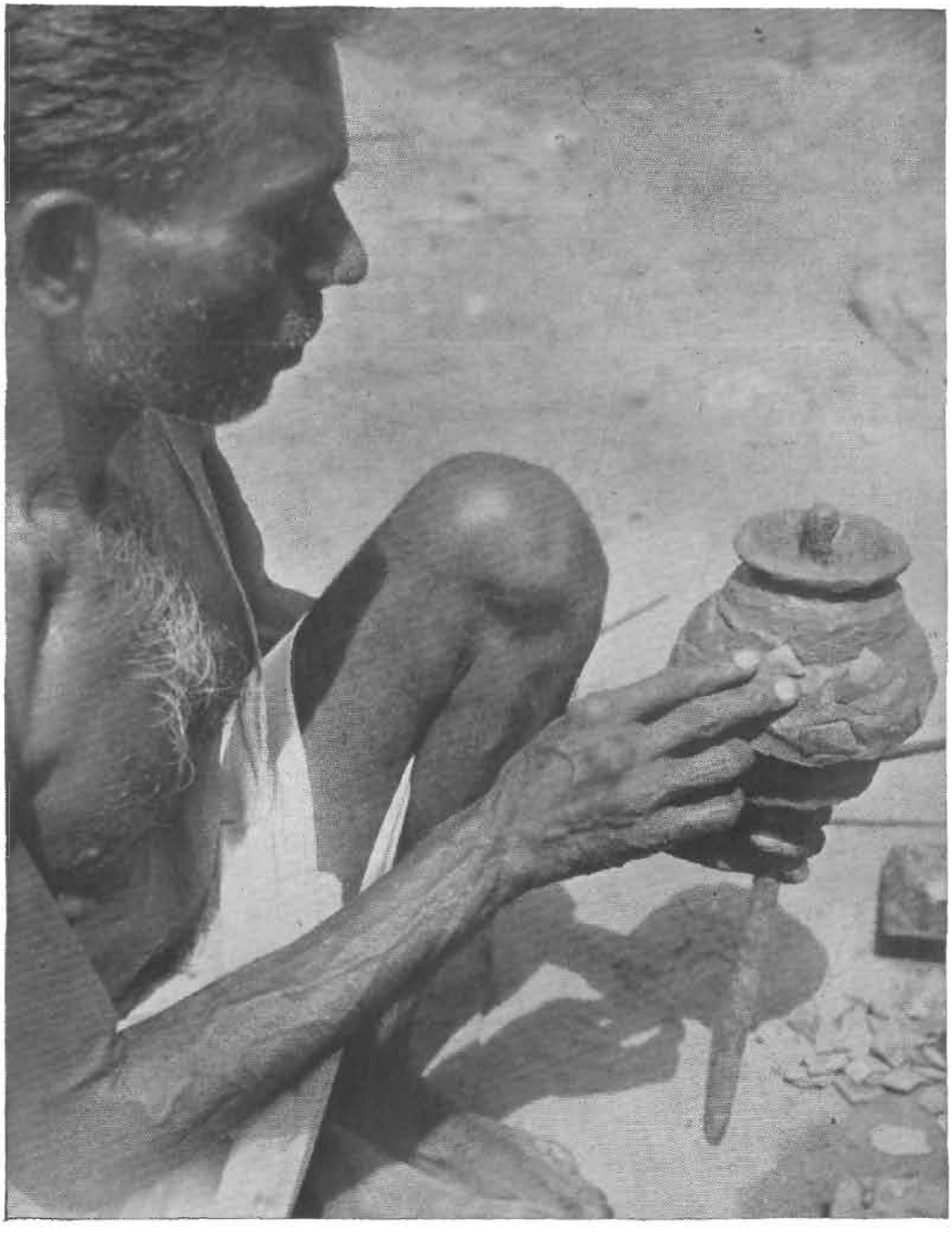
it gently over the wax, so that it melts and spreads uniformly on all sides. The core mandal is slightly rotated with his left hand and by constant application of the wax and constantly smoothening it with the wax turning tool with his right hand, the outer surface of the clay core or model is completely and evenly plastered to this thickness with reference to the "Reference wax strip". The wax plastered model is removed from the core mandal and a wax runner of 1½" in length is prepared by the moulder out of hot wax and inserted into the small hole found at the bottom of this wax - covered clay core which was made earlier by the insertion of the steel point of the core mandal. An iron rod of 1½' length is taken and the wax plastered inner clay core or model is pierced by it and the expert wax moulder holds the model and coats it over with coating sand. It is afterwards dried in the shade in a cool place. The coating sand covers the wax sheathed clay model to a uniform thickness of 1/8". Karuman, which is a mixture of 75% Karu sand and 25% river sand is then plastered all over the coating sand mould. Pieces of broken pottery sherds are placed on all sides of the outer mould evenly as well as firmly to give extra strength to the mould. This is allowed to dry for a day. Taking a sharp and pointed tool, the inner mud of the model is removed to half of its thickness so as to reduce the thickness of the model and to give way for the broken bits of pottery to be plastered along with some mud to the inner sides, to add extra strength to the model when it is fired. Now it is allowed to dry for a day in the open sun.

By plastering these broken bits of pottery and sand the thickness of the outer wall increases by 1½" and the inner wall by ½". A small hole is dug in an open space upto a depth of 6" and by the side of it the mould is heated with cowdung cakes. After heating it for half an hour, the moulder lifts the model with both his hands, turns it upside down, places it in the hole, covers it up with the cowdung cakes and fires it for one hour till the wax melts and is drained out of the hole. Now the outer mould is ready to receive the molten bell-metal.

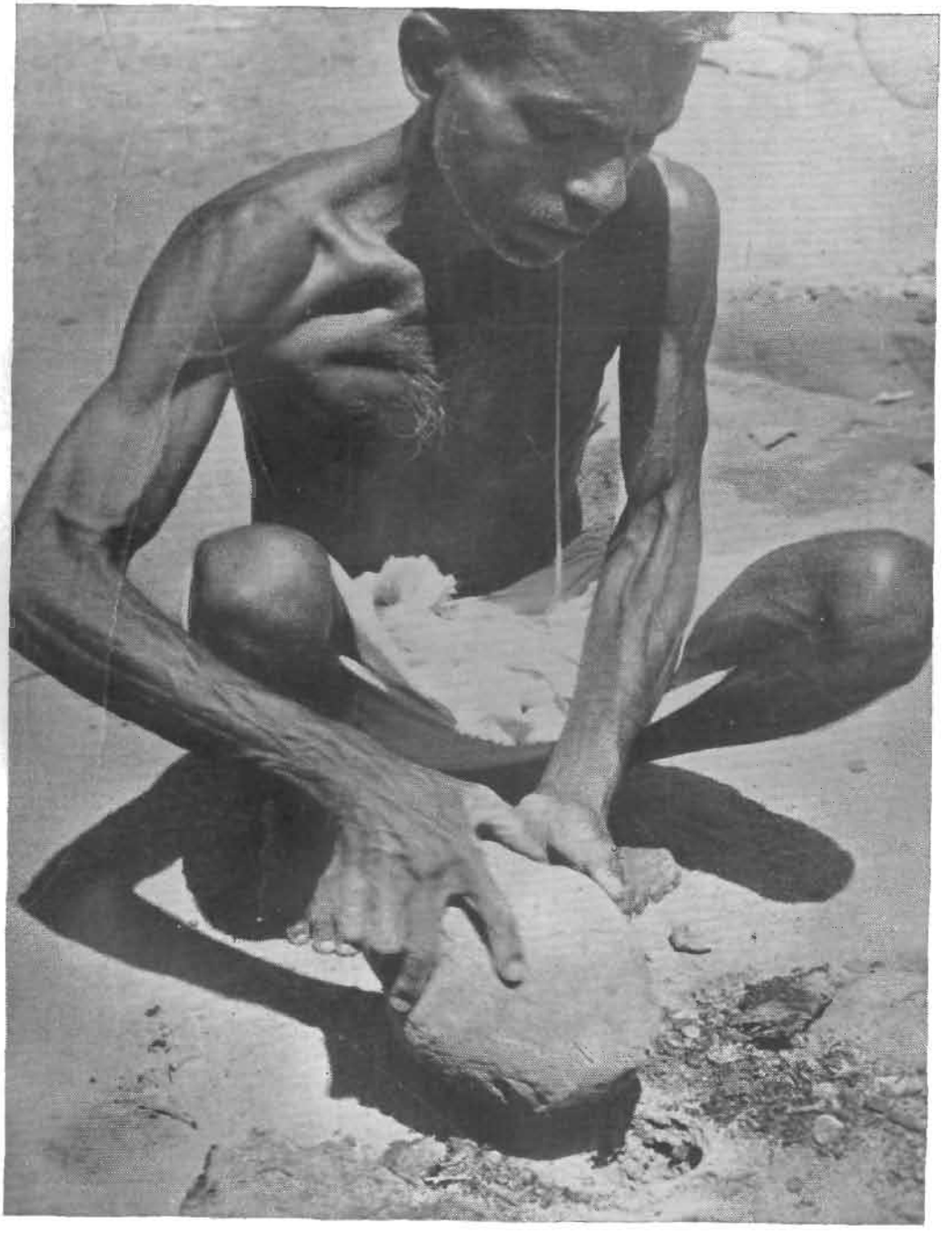
After sometime water is poured into the hole and the molten wax is filtered so that it can be used again for the next casting. The casting furnance is dome-shaped with two openings, one placed at the bottom and the other at the top, the entire height of the furnance being 2 to 3 feet. In the opening at the bottom, a crucible with bits of copper and tin which produce bell-metal is placed. At the top which is separated from the bottom by a silica plate, a few opening holes are provided for easy passage of the heat from



The wax model is removed from the core mandal and an iron rod is pierced into it to hold the model. The moulder takes the prepared coating sand and plasters over it to a uniform thickness.



Broken bits of pottery are inserted all around the wax and sand covered outer model for extra reinforcement when it is fired to drain out the wax.



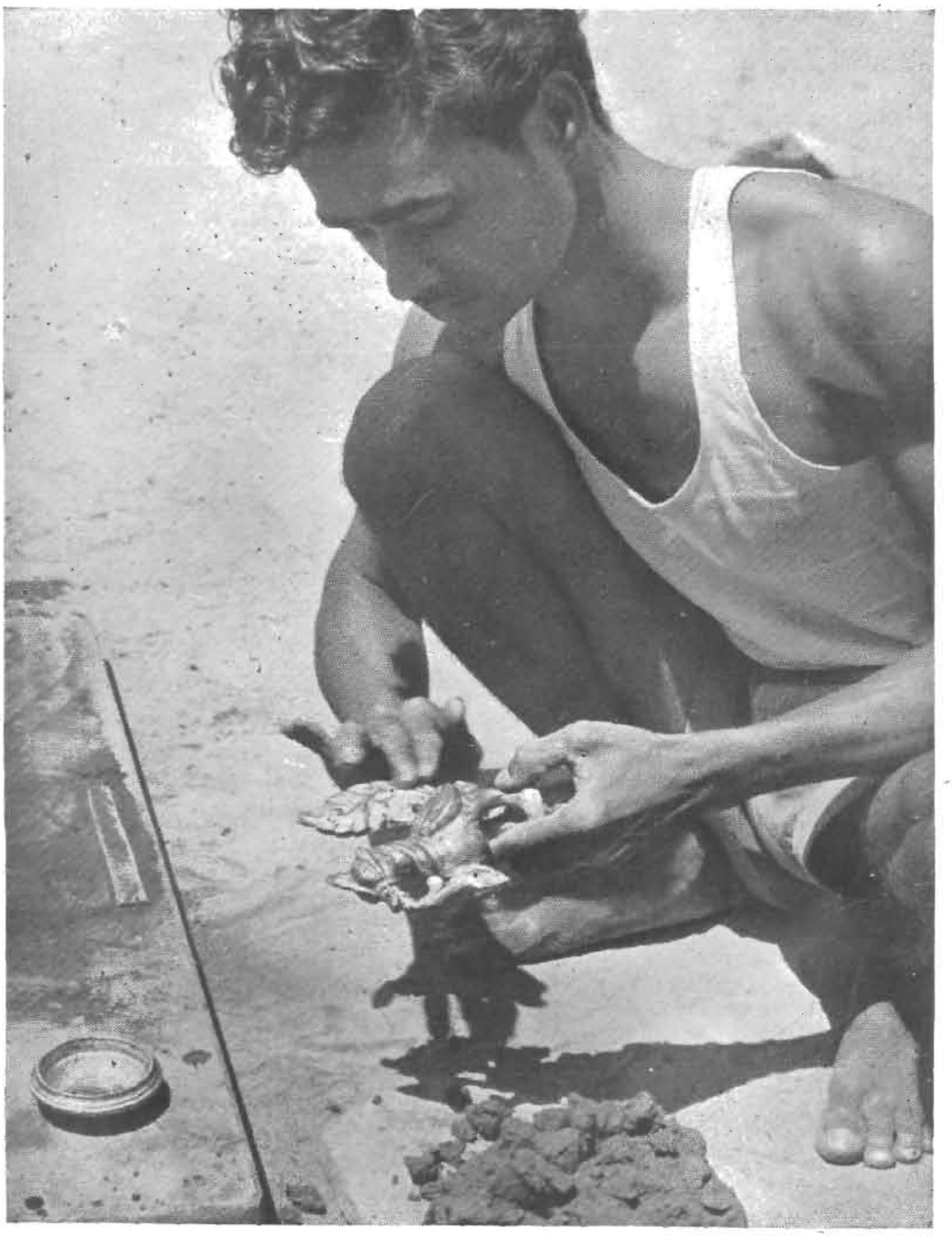
After heating the Mundiri Kooja mould for half an hour the moulder lifts it with both his hands, turns upside down on to the hole nearby to extract the wax by heating it for another one hour.



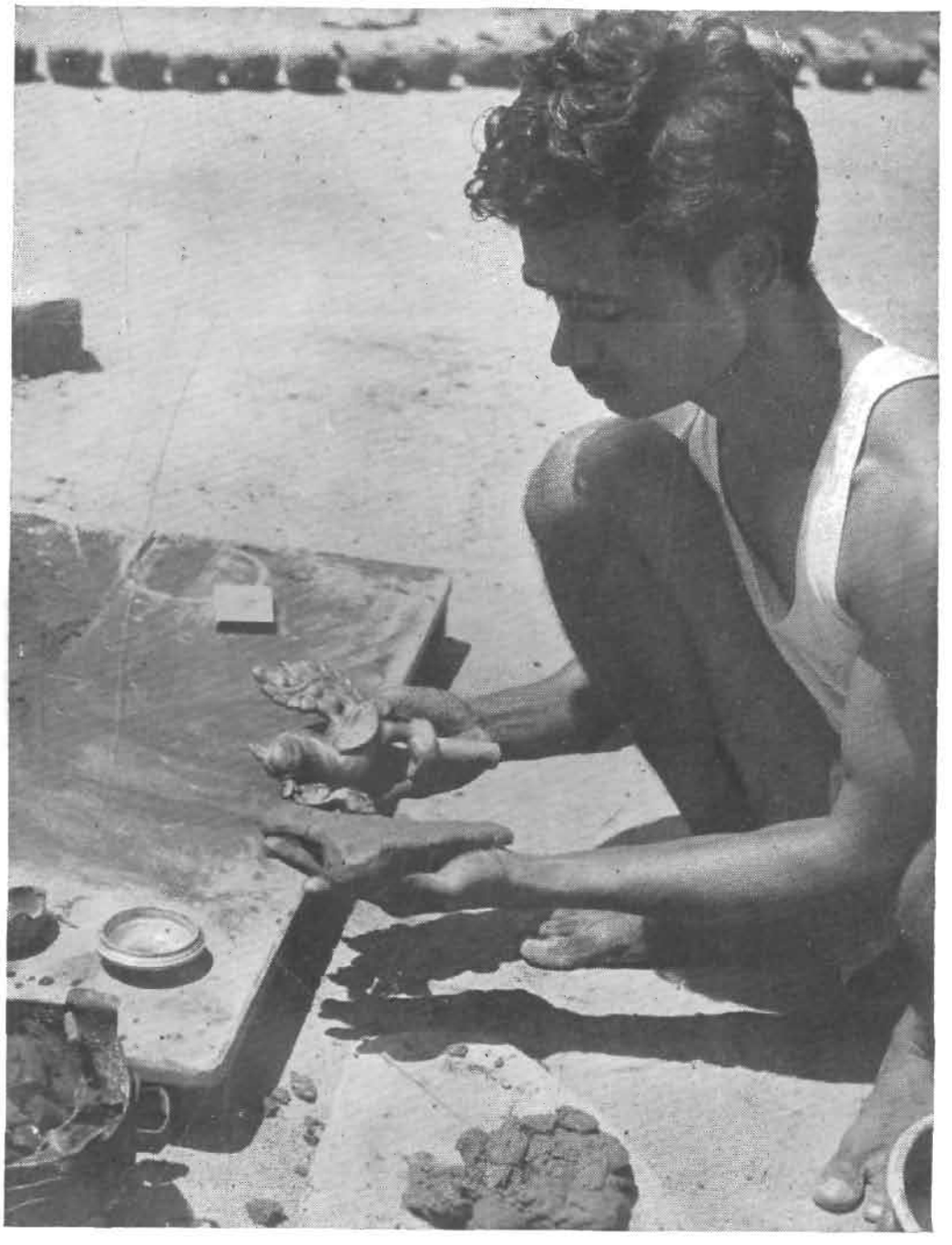
The crucible with the molten metal is lifted by the help of the tongs and poured into the hollow mould. Note the other moulder keeps over the mouth of the mould a dipped castor oil cloth rolled on an iron rod to keep the pouring molten metal temperature steady.



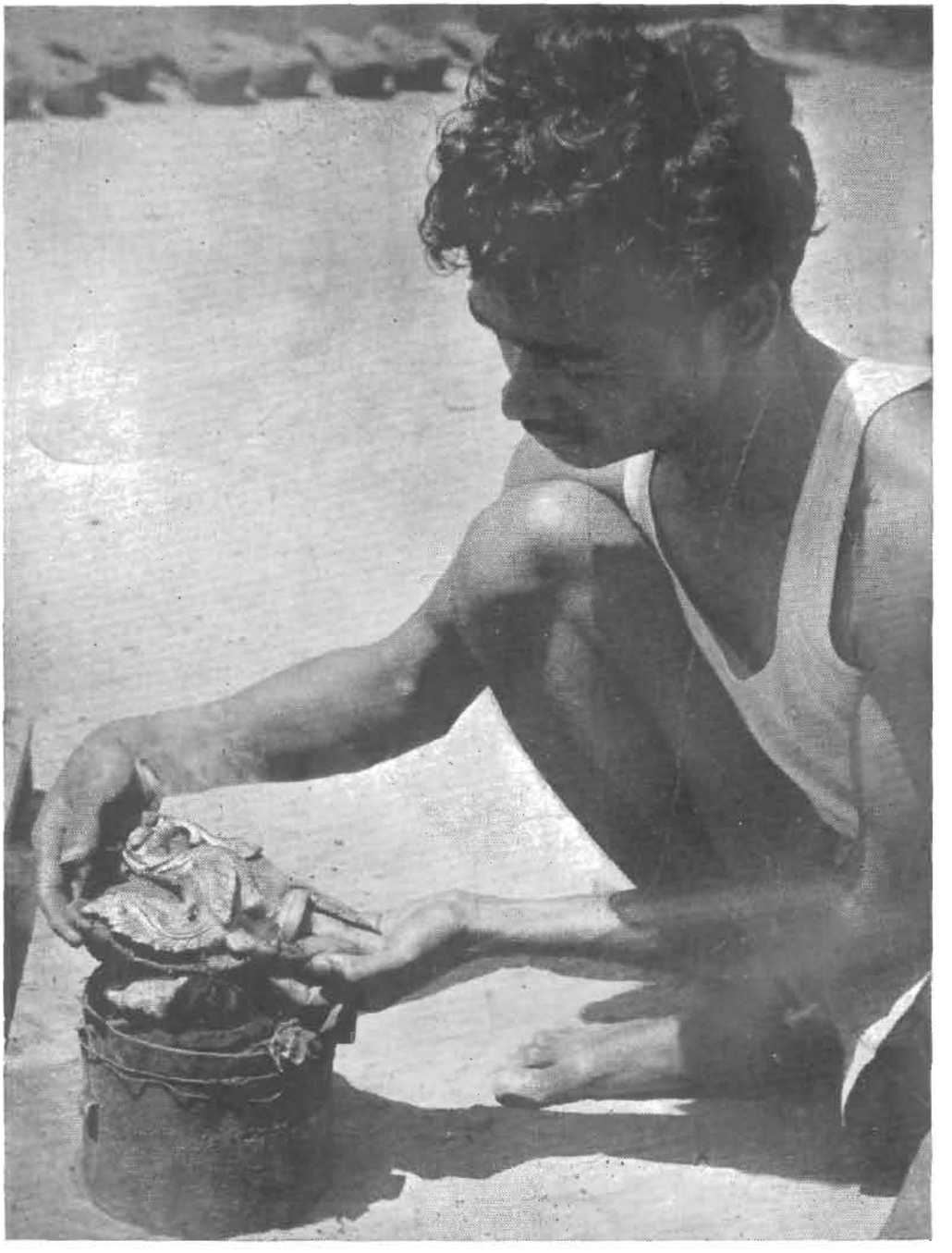
Some of the moulders are busy preparing the mud for loam moulding process at the left. The dried vandal sand is broken up with a hammer, in the centre, jute fibre is cut into small bits and at the right, the broken sand is sieved to remove its impurities.



The brass pattern mould of the Hamsa (Swan) paper weight is held in the left hand of the moulder and with his left lubricating oil is being rubbed at one side of the pattern to prevent it from sticking to the prepared mud.



One side of the Hamsa paper weight pattern which has been rubbed with the oil is being plastered with the loam sand.



After plastering one side of the pattern it is placed on a thin iron plate and baked slightly to remove its moisture from the mud.

the leaping flames at the top. Over the hole, the new hollow moulds are placed and plastered with cowdung to conserve heat and to prevent smoke from escaping. The articles to be cast are not taken up one at a time; more than ten castings are made during a single firing. Since liquid bell-metal does not flow easily, a little bit of aluminium is added. As the molten bell-metal must be poured only into heated moulds, as otherwise the latter might crack or even explode, the prepared moulds are heated in the furnace side by side with the crucible containing the scrap metal, the former being placed on the upper portion of the furnace so as to match the temperature of the molten bell-metal. In bell-metal casting, coke is used. The furnace is fired with charcoal and firewood. When the bell-metal becomes molten in the crucibles at the bottom of the furnace, the moulds which are simultaneously heated at the top of the oven are removed from the furnace with the help of tongs and placed in such a position that the open mouths of the runners face upwards. The molten bell-metal is freed of impurities which float on its surface and is poured into the heated hollow moulds. A ring-shaped twisted cloth dipped in castor oil and kerosene is rolled on a mild steel rod of 2' in length, lighted and placed round the mouth of the mould so as to keep the temperature of the molten metal steady as it has the tendency to turn cold, while it is poured into the mould. The mould is allowed to cool for a few hours, the time depending upon the size and thickness of the article. Afterwards, it is slightly tapped with a hammer, the outer mould is broken and the mud inside the cast article is removed by digging with the sharp tool. The runner is now cut with the help of a hacksaw. The articles are then heated slowly over an open fire. Once they become red hot, they are lifted with the help of tongs and dipped in cold water. For big articles immediate dipping is not necessary. Afterwards, articles are taken, chiselled, turned, engraved and polished. The long and painstaking wax moulding and casting process has come to an end. It is precisely the duration and difficulties inherent in its manufacture which has made it an impractical proposition for most artisans to practise this and so they prefer to switch over to other easier processes. However, it is apparent that some of the best articles of exquisite workmanship have been produced by this ancient lost wax (cire perdue) process of solid castings which is the pride and glory of Nachiarkoil.

LOAM MOULDING

Dragon paper weight

This method is widely practised for casting small and highly artistic objects. This is an easy process compared to those described earlier. Vandal sand is dried in the open sun, broken up and sieved. Jute fibre is cut into small bits and washed to remove gum and dust. The firbe is then thoroughly dried, vandal sand and jute fibre are taken in the proportion of 9 : 1, and mixed with the addition of some water. The brass pattern mould of the dragon paper weight is rubbed with lubricating oil so that mud does not stick to it. A handful of this jute and vandal sand mixture is then plastered over the pattern mould on one side. The outer surface is smoothened by pressing the sides and corners with the hands. After one side of the pattern mould is plastered with the mud (a mixture of jute and vandal sand), it is placed on a thin iron plate and fired slightly, care being taken to regulate the temperature in such a way that the mud does not crumble. This is done to remove any moisture in the mud. After that, the other side of the pattern is plastered over with the mud as before and this side is also fired. After a few minutes, it is slowly tapped with a small hammer and is opened into two halves where the two sides were joined with the prepared mud. The design is slowly taken out and the two hollow sides are now joined together firmly by plastering the outside with the same sand, jute and water mixture. Molten brass is poured into this hollow design. Once the casting is over, the mould is broken and the cast is removed. The runner is cut, and chipping and filing are done. If the patterns are rough, turning, engraving and polishing are then carried out.

The following Table indicates the various articles produced in Nachiarkoil according to the three different methods.

Articles which are produced by box mould process	*Wax mould process*	*Loam mould process*
Kuthuvilakku	...	...
Kooja (brass)	Kooja (bell)	...
...	...	Dragon
...	...	Lion
....	Vengalapanai	...
Milk chembu	Milk chembu	...
Vasamalai	...	...
...	...	Bell handle
Picnic carrier	Picnic carrier	...
...	Coffee filter	...
...	...	Nandi

We shall now take up the processes of fitting, drilling and grinding, burnishing and turning, engraving and polishing.

Fitting

The process of fitting is the same for the three different processes of manufacture. After casting, the articles have a tail, the remnants of the runner. This has to be removed by cutting it off with the hacksaw. In some cases they have to be clipped off with the help of the chisel. To remove all the defects such as pin points and other casting defects, the articles are slowly beaten with a small cross frame hammer, after which they have to be filed with steel files to remove all rough surfaces. Almost all the articles are threaded and turned on metal turning lathes. In smaller workshops, internal and external threading are done with the help of taps and dies, taps being used for internal threading and dies for external threading.

Drilling and Grinding

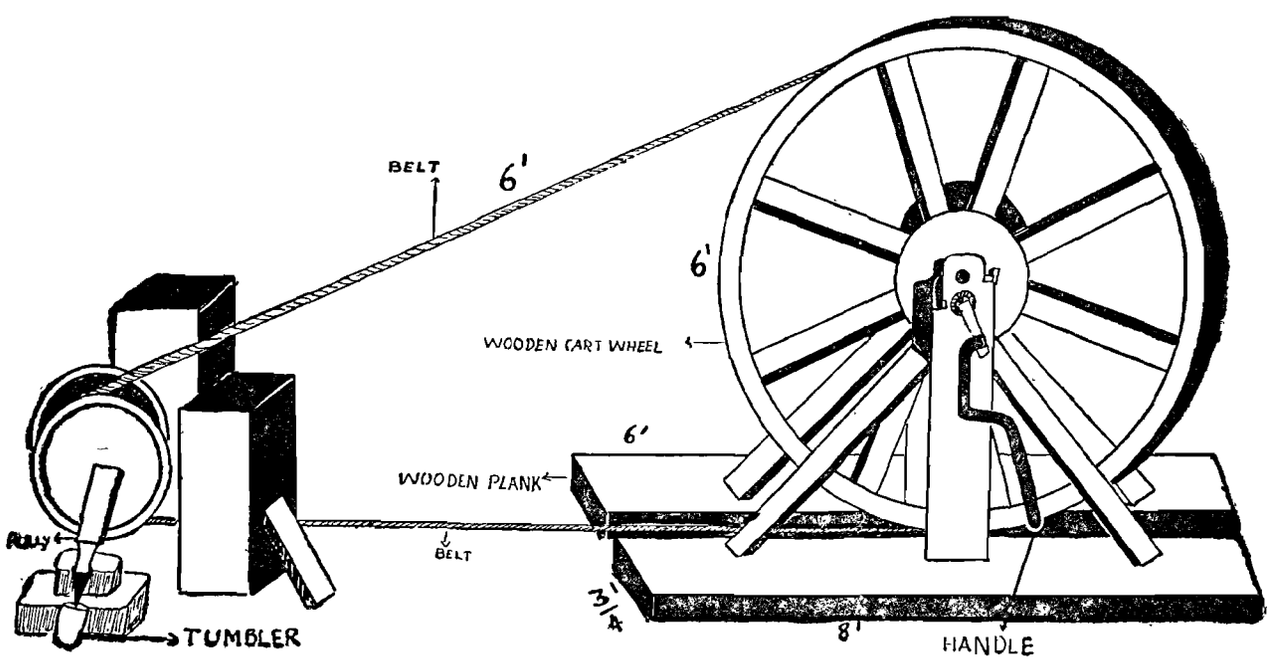
Sometimes drilling is done before burnishing and sometimes after burnishing. The articles are drilled in the centre with the help of a vertical drilling machine. After casting is over, some of the articles which have to be filed are first ground on the grinding stone.

Burnishing or turning

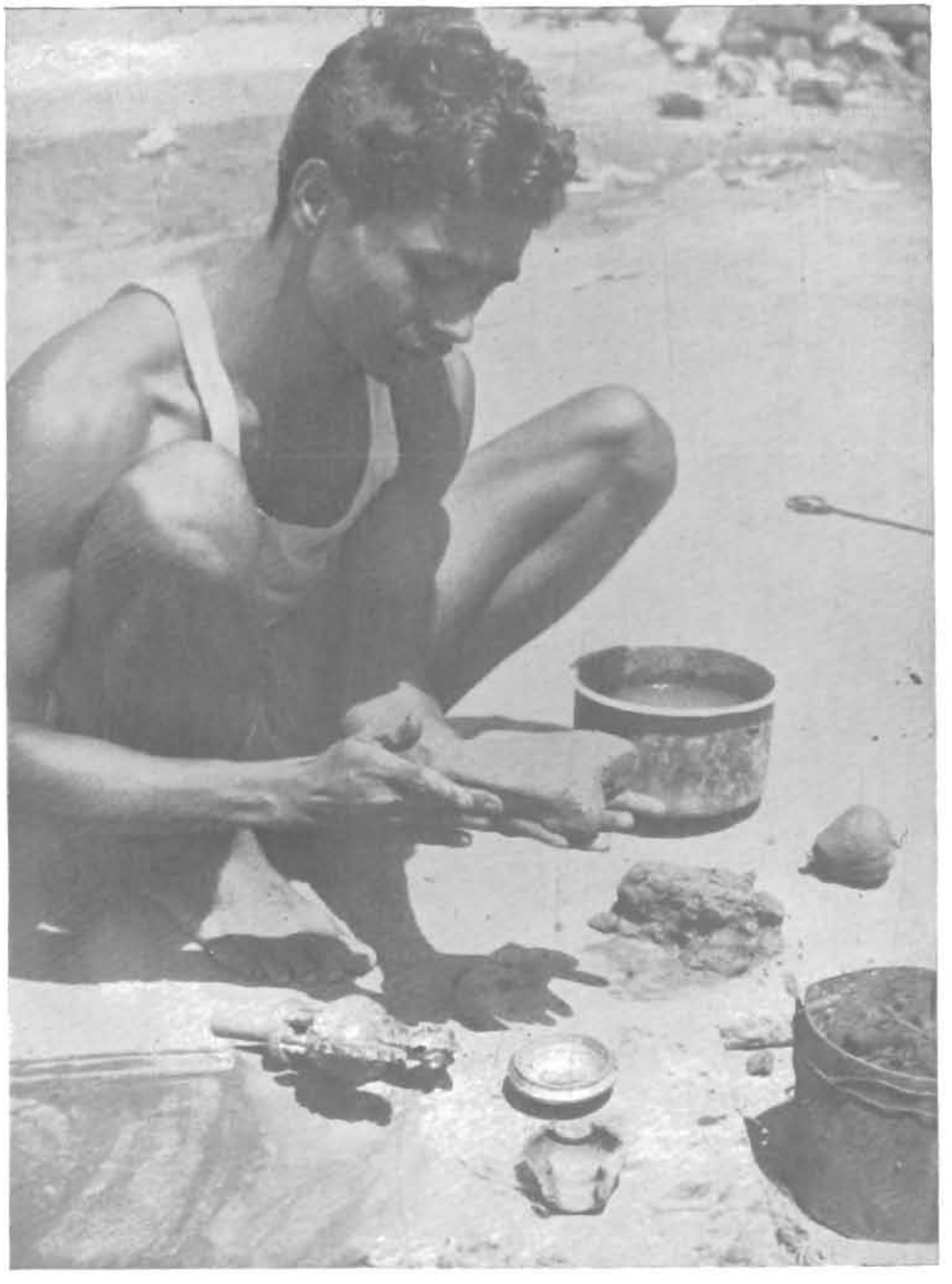
After the articles are filed, they have to be turned to smoothen the surface according to the required shape. In small workshops, articles are burnished with the help of two persons on manually operated lathes, one person rotating the handle of the wheel and the other turning the articles. The electrically operated lathes require the services of only one person. The prepared shellac is fixed to the face of the burnishing lathes. The article to be turned is slightly heated and fixed to the shellac. In the Government Departmental Unit, a more modern method is adopted. The article to be turned is gripped by the lathe with the help of self-centering chucks. The lathe is run by a motor in a clockwise and anti-clockwise direction. The article is turned and scraped with the help of different kinds of burnishing tools. The artisans employed for this purpose are master craftsmen. The artisan stands or squats opposite the article on the lathe and holding the tool in both hands applies the necessary pressure on the article at the right moment and at the required place. Different tools are required at different stages to provide the necessary shape to the article. For burnishing the inside of the vessel, the burnishing lathe rotates in an anti-clockwise direction by means of a reversible type switch, while the private artisans adopting the cart wheel turning contrivance rotate the wheel in an anti-clockwise direction when needed.

Engraving

Engraving work is done after casting is over. The articles to be engraved are the so-called 'fancy' ones, a word unfortunately used to indicate ritual, ceremonial or purely decorative objects that are small in size,



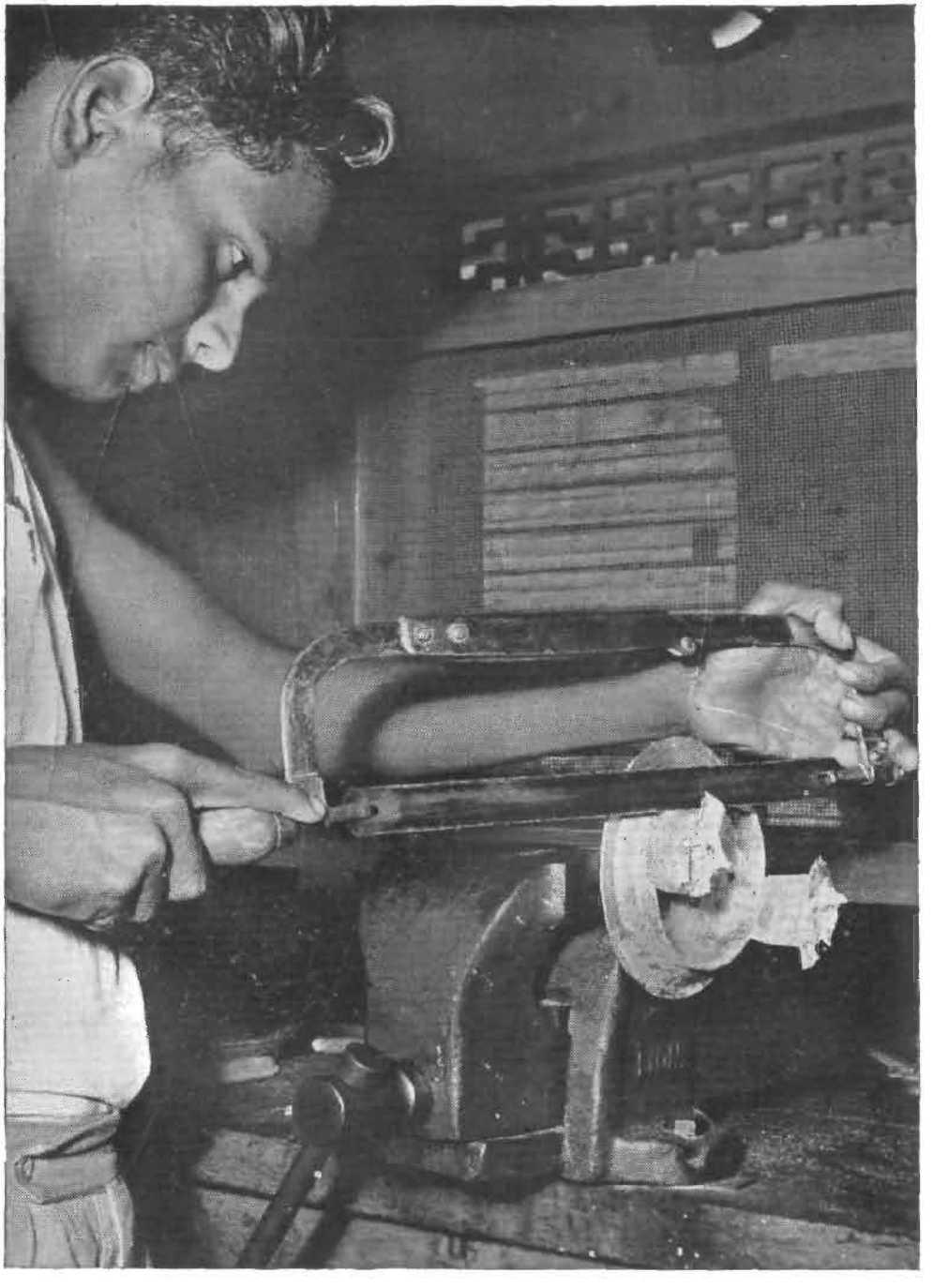
Hand-turning lathe



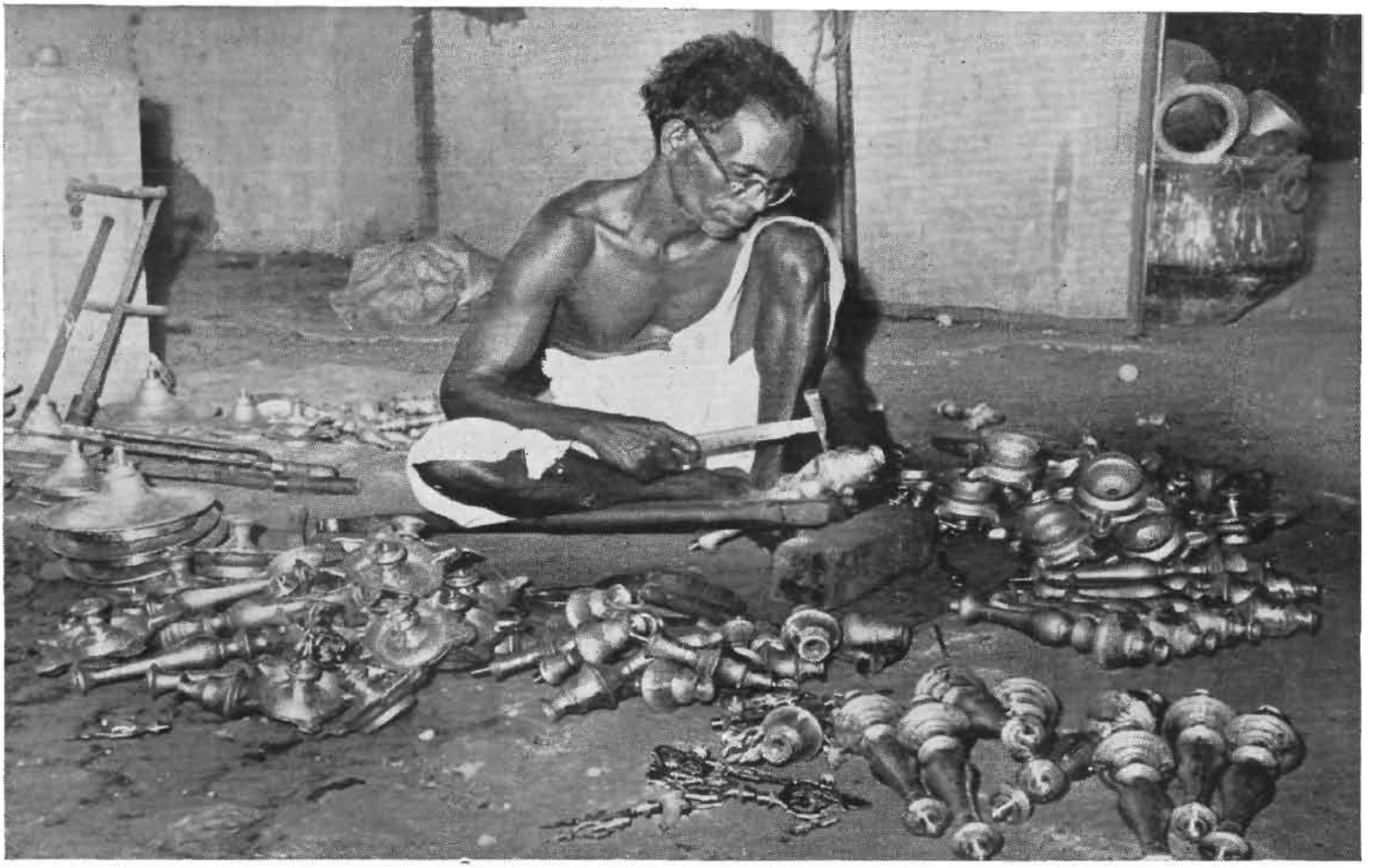
After repeating the same on the other side, the pattern is removed by opening the mould into two halfs and the moulder carefully joins the two halfs with a handful of jute and vandal sand mixture.



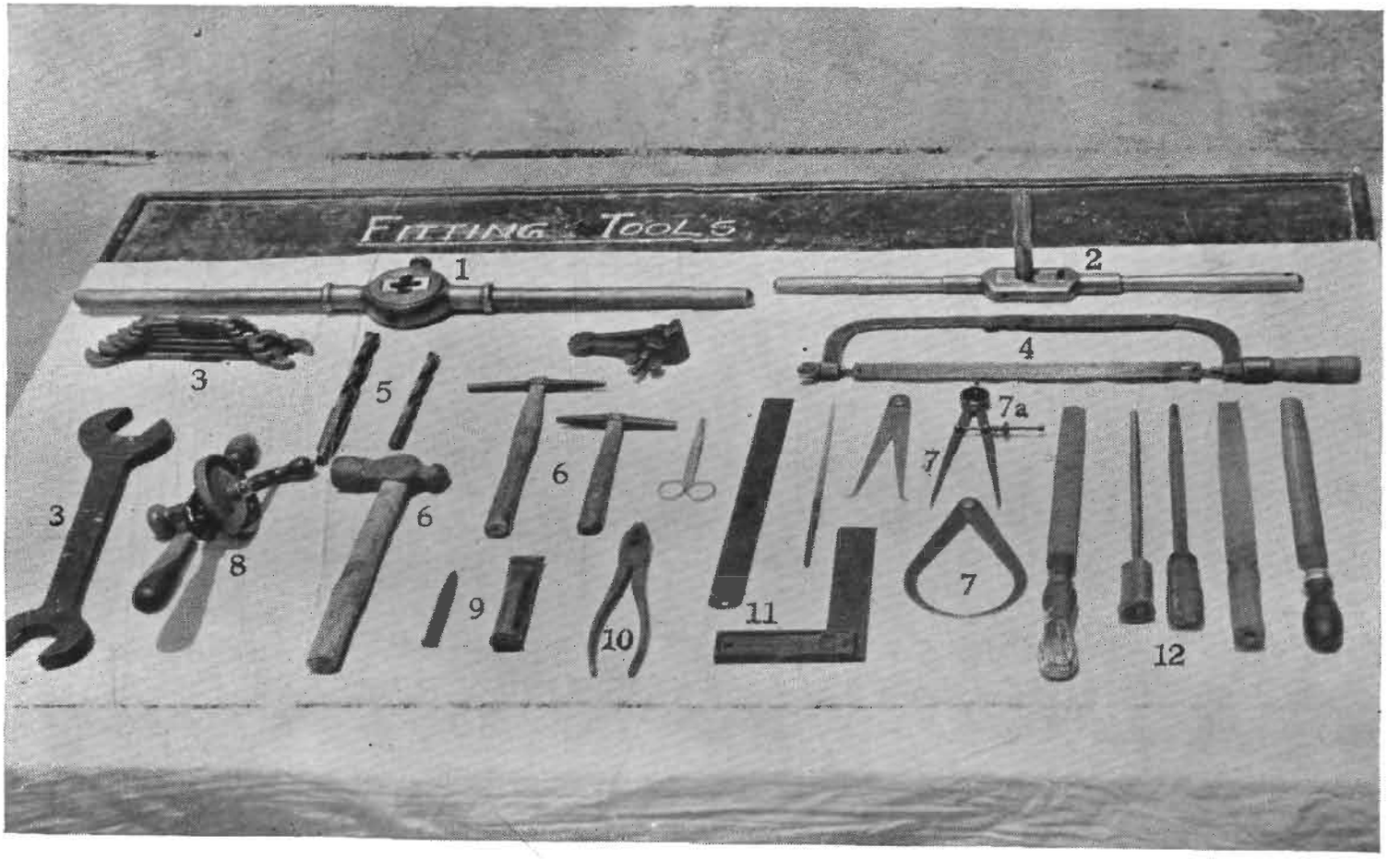
With the help of the crucible tong the crucible with the molten brass is lifted and poured into the hollow Hamsa paper weight mould.



After casting is over the articles with their runners are fixed on to a bench vice and with the help of a hacksaw the runner of a Kuthuvilakku base is cut out.

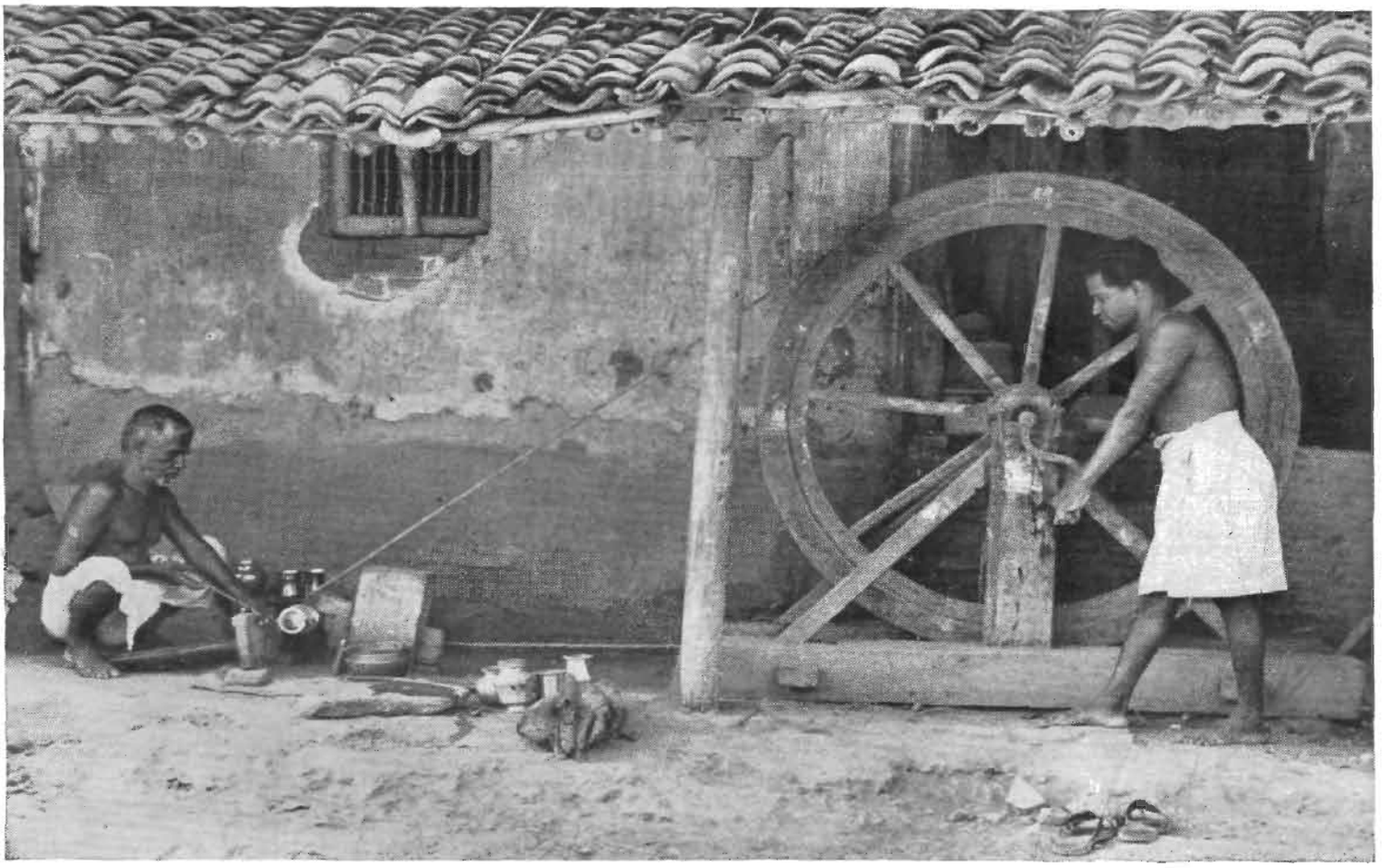


In order to remove pin holes and other blemishes that invariably appear on the brass and bell-metal articles after casting, the artisan foresightedly piles the articles together according to the defects they possess, and, by this token, the tools needed to remove them, one by one he places them on stakes and beats them slowly and carefully with small cross-frame hammers until the defects disappear.



Fitting tools which are used by all the factories at different stages.

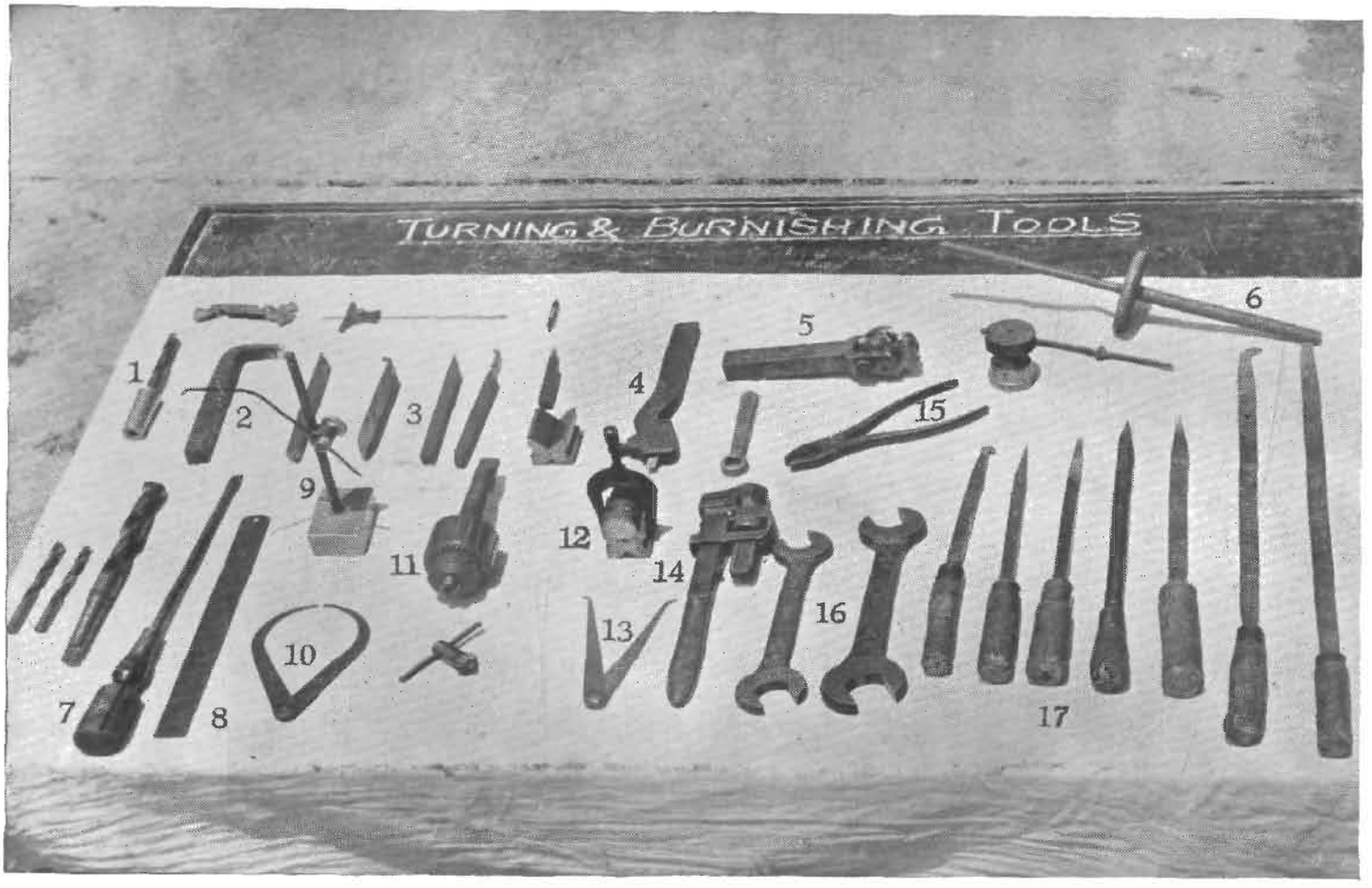
1. Die and Wrench
2. Tap and Wrench
3. Spanner set
4. Hacksaw
5. Twist Drills
6. Knicking Hammers
7. Inside and outside callipers.
7a. Spring Dividers
8. Hand drill
9. Centre punch
10. Pliers
11. Try Square
12. Files



In some of the factories two artisans are at work operating a wooden cart wheel type of turning lathe in order to burnish newly cast milk chembus and other articles, some of which are already burnished and awaiting polishing.



Indian craftsman's viable characteristic, namely, that of his ability to trim his emotional and economic sails to catch the winds of survival as this country moves from its ageold handicrafts era into its modern industrial age is exhibited here. The base for the Kuthuvilakku which has just been cast are turned (burnished) on a metal turning lathe run by electricity by an expert turner.



Turning and Burnishing tools which are commonly found in each and every factory at Nachiarkoil.

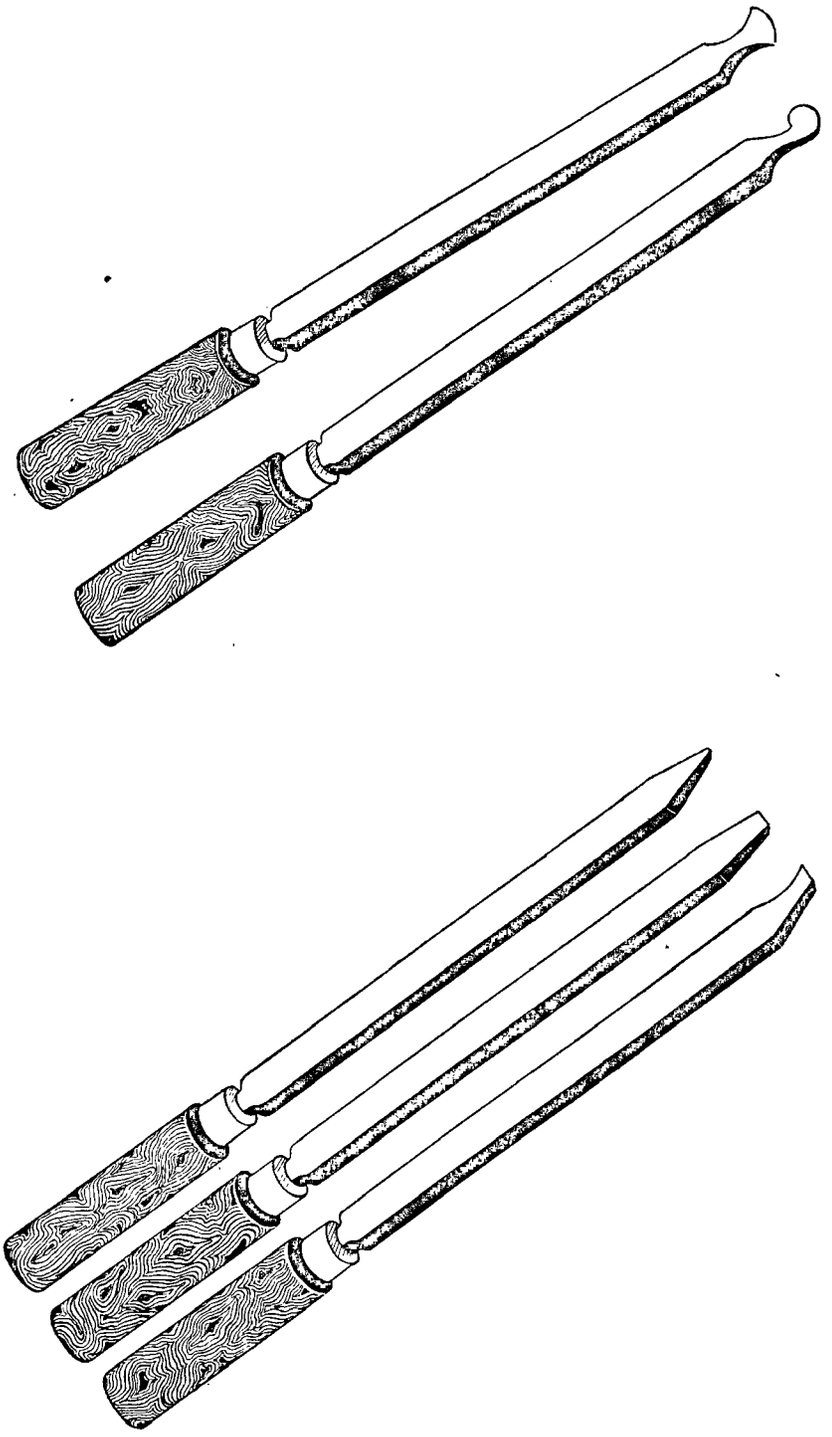
1. Drill with socket
2 & 3. Turning and Parting tools
4. Tool bit and holder
5. *Hand Vice*
6. Core Mandales
7. Screw Driver
8. Steel rule
9. Surface guage
10. *Outside Caliper*
11. Drill chuck
12. 'V'Block Clamps
13. *Inside Caliper*
14. Screw wrench
15. Pliers
16. *Double end Spanners*
17. Set of hand burnishing and turning tools.

articles such as paper weights, incense stands and figure heads to be fixed to temple bells etc. The article to be engraved is pressed on prepared heated shellac which is plastered to a wooden plank and the Sthapathi who is an adept at this art slowly and gently engraves it.

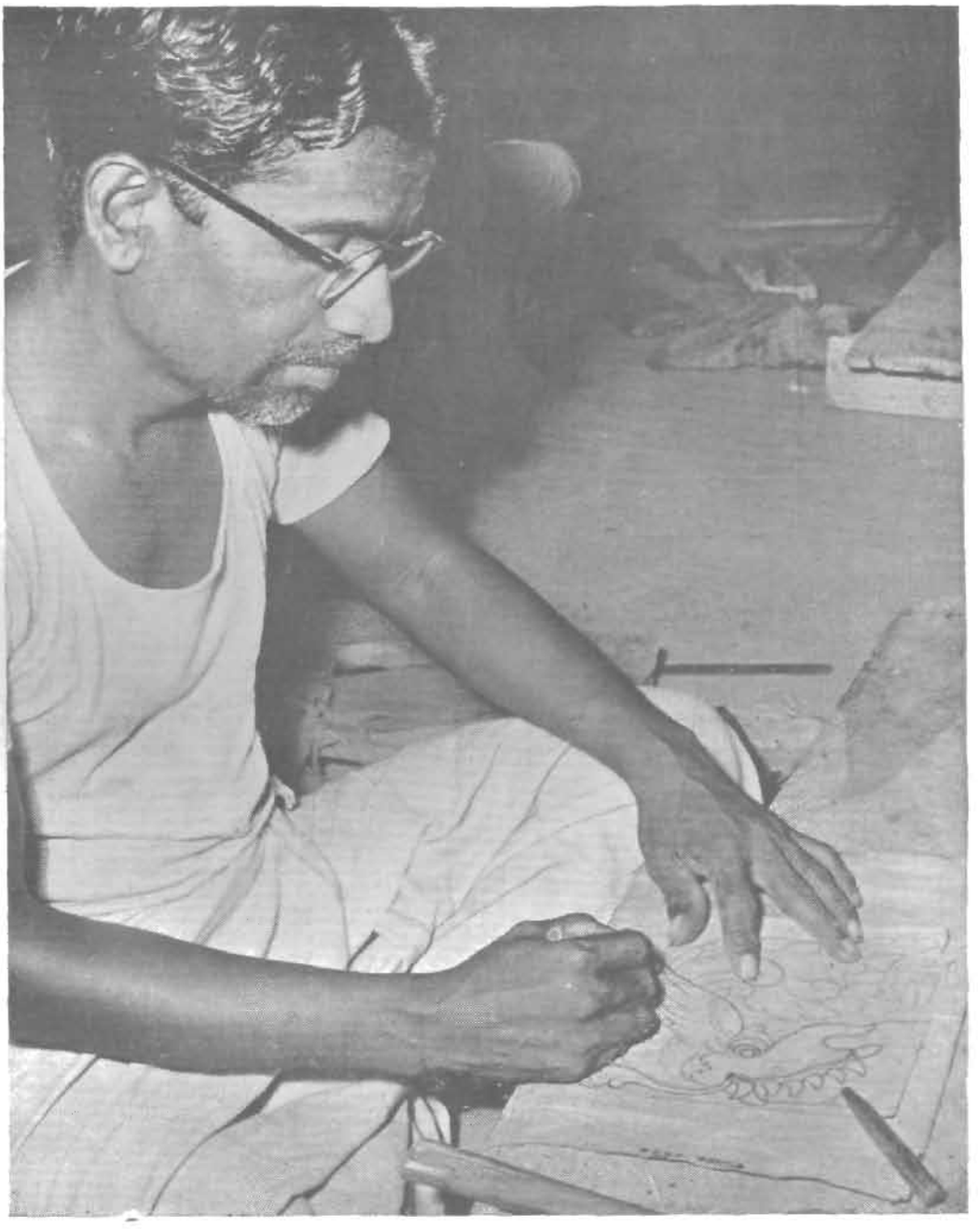
Polishing

After burnishing is over, the articles are brought for polishing. Mops are attached to the spindle of the polishing machine which rotate at a speed of about 3,000 R.P.M. Lustre soap is first applied to the mops. The articles are held firmly in both hands and thrust against the revolving buffs or mops. For polishing the inside of the vessels, small mops are used so that they can enter into the mouths of certain articles such as containers or bells and polish their interior brass or bell-metal walls.

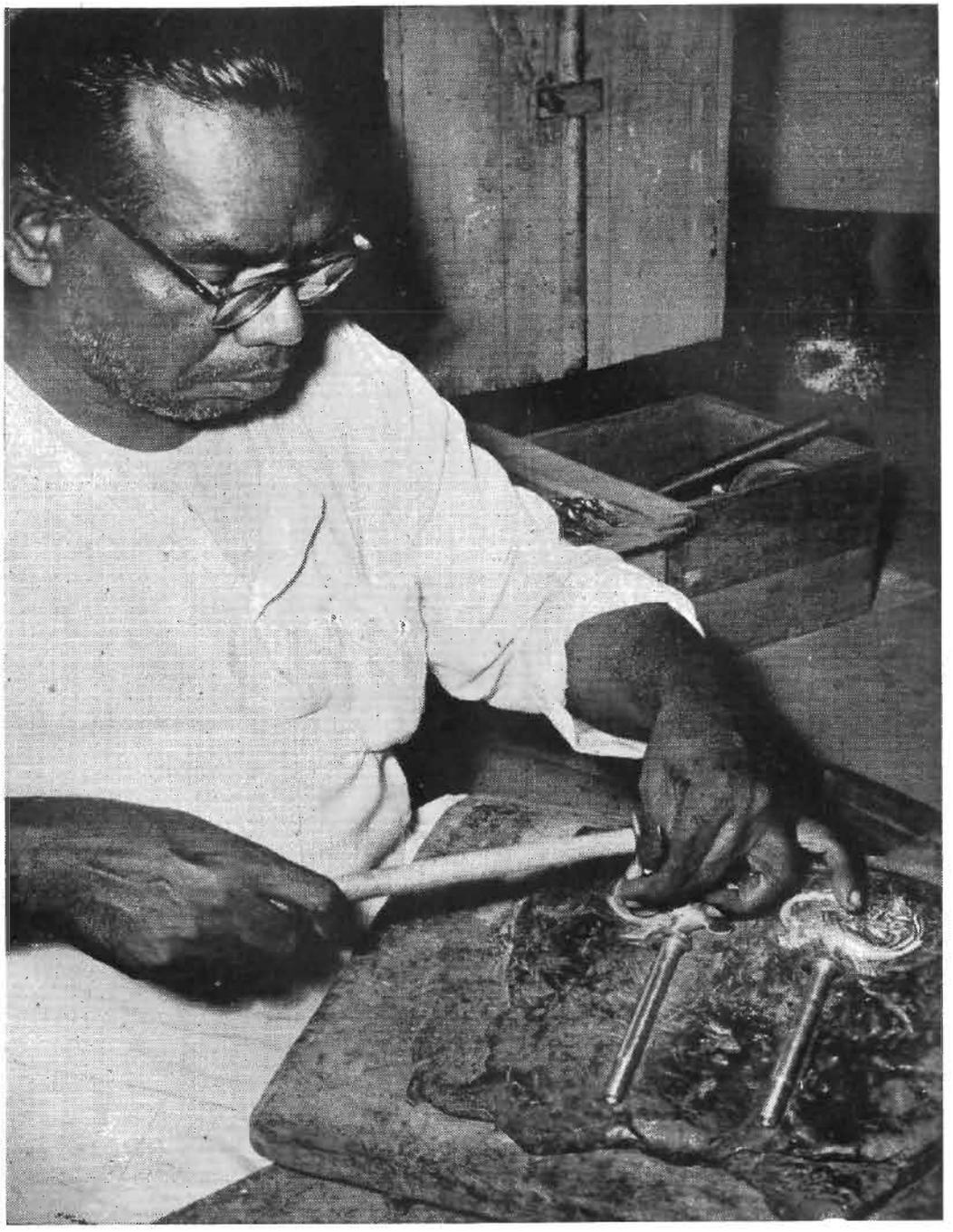
Articles with a number of edges and depressions have to be polished by adopting a different method. Ordinary glue and rough emery powder are mixed and pasted on to the felt mop and dried in the open sun. After a thorough drying, the mop is fixed to the spindle. After the initial polishing with this mop, the felt mops are replaced with cotton mops and final polishing is administered. Where there are no polishing machines, burnishing lathes are utilised for polishing. In the Government Training Centre, the floor type polisher is used. It is a motor, driven on a spindle, which extends on either side of the polishing machine. Cloth mops are mounted on either side and the articles are polished. Two people can work at a time on the spindles and the output is therefore greater.



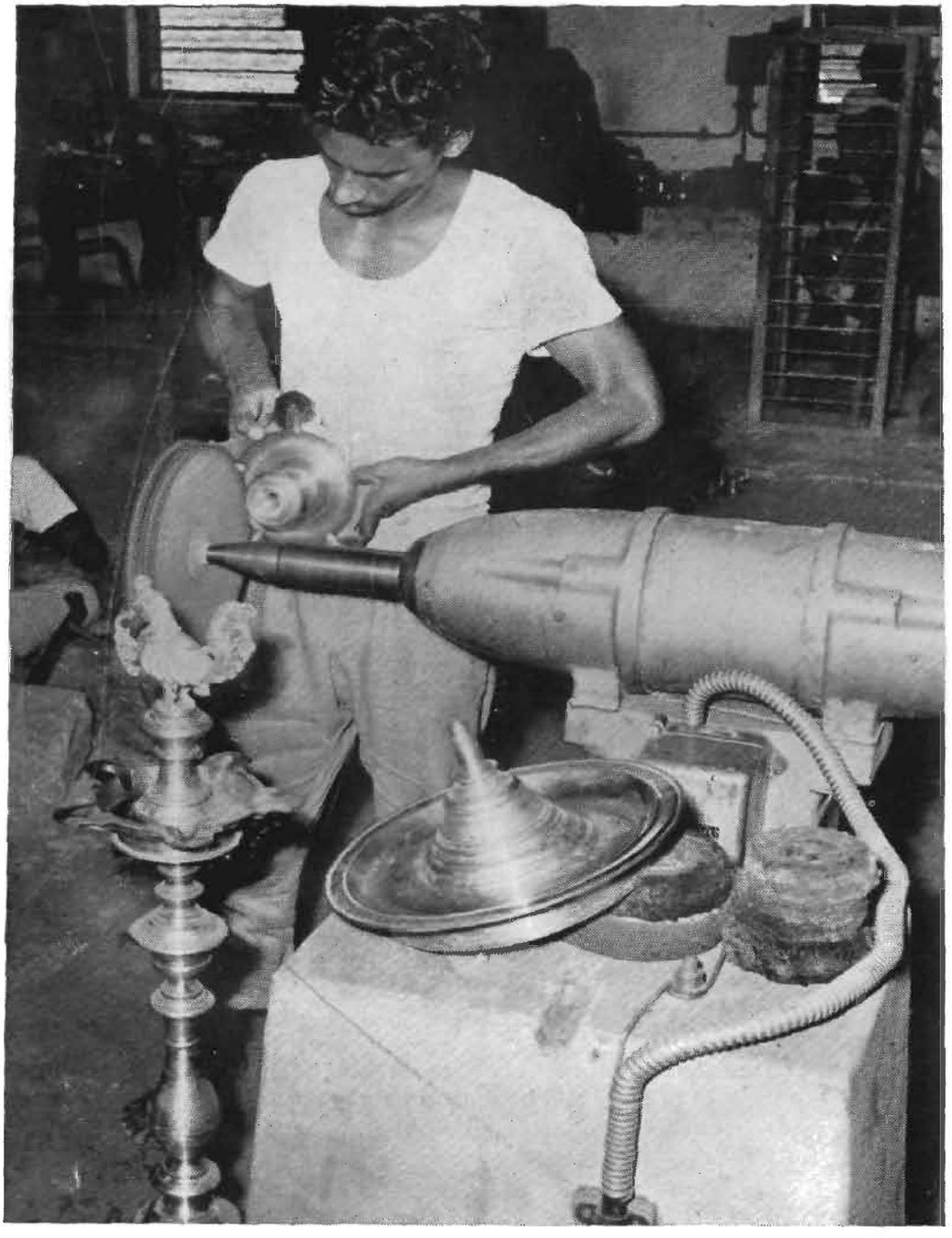
Burnishing tools of various shapes



For ornamental sheet work the floral design is copied on the brass sheet by placing a carbon paper over it and tracing it with a pencil. To make the outlines clear the Sthapathi holds a sharp steel needle and marks the outlines by applying some force on the needle.



The Sthapathi (metal-smith belonging to a caste, claiming descent from 'Vishvakarma' described in the Mahabharata as the Master executor of a thousand handicrafts) is engraving on a fancy article 'Hamsa' (Swan) which is completed and ready to be mounted on the top of a temple oil lamp (Prabai). It is fixed on a shellac plastered wooden plank. The Sthapathi is engraving surface design by means of one of the many kinds of engraving tools, with his three fingers and his thumb, whilst with his right hand he holds a small hammer that is used to top the heads of the various gravers which are producing them.



For polishing the various parts of the Kuthuvilakku (Pedestal oil lamp) a lustre soap is put on a buff which is attached to a polishing machine run by an electric motor. The parts under polishing are held firmly with both the craftsman's hands against the buff as the spindle rotates at the high speed of 3,000 R. P. M.



Sitting at the left of the entrance to his shop is Mr. Mani Odayar, a leading merchant of brass and bell-metal ware in Nachiarkoil.

CHAPTER - III

ECONOMICS OF PRODUCTION

In Nachiarkoil most of the metal craft artisans, with a few exceptions, have taken up the production of brass and bell metal wares. A number of small workshops dot the area producing in bulk quantity Kuthuvilakkus, tumblers, koojas and kerosene lamps. Bell-metal wares are made to order to a limited extent. Appendix VII-A and VII-B will provide the readers an insight into the cost of production of some of the reputed products of Nachiarkoil.

The margin of profit accruing to craftsmen and dealers depend on various factors like demand, money conditions, seasonal variations etc. Since there is no steady sale, prices of articles differ except at the Government Unit, which has a fixed price and has a steady margin of profit. Thus in private shops the same article will be sold at different rates on different dates and there are variations in prices from shop to shop. In the Government Unit, and the Co-operative Society, the sale price is fixed at 20% above the cost price. The following Table indicates the margin of profit for some of the more well known articles in regular demand.

Name of the article	Whether brass or bell metal	Cost price	Sale price	Margin of profit
		Rs. P.	Rs. P.	Rs. P.
1. Kuthuvilakku	Brass	8.00	8·50	0·50
2. Small Vasamalai	,,	54·07	80·00	25·93
3. Paper weight dragon	,,	3·35	4.00	0·65
4. Mundhiri Kooja	Bell-metal	25·00	28·00	3·00
5. Pooja bell	,,	7·54	8·40	0·86
6. Tumbler	,,	5·46	5·97	0·51
7. Milk chembu	,,	15·00	16·50	1·50

In all the 25 workshops in Nachiarkoil where brass wares are produced, the articles mentioned above are regularly produced as they are cheap and there is demand for them.

Bell-metal wares are generally produced in the Government Training-cum-Production Centre (Unit). The products of this Centre are durable and strong, the finish is superb and the articles are produced with the help of electricity and with modern appliances which are beyond the means of an ordinary artisan to possess. This unit receives orders from all over India, the majority of them coming from temples who want articles in the shape of temple bells, temple lamps and other vessels of religious significance. Recently there was an order from the Kapaleeswarar Temple at Mylapore during their Laksha Deepam festival and Rs. 16,000/-worth of articles were manufactured and delivered to this temple. At the exhibition of all articles of Religious Endowment Board in connection with the "Arupathi Moovar" festival, bell-metal and brass metal articles from Nachiarkoil were also on display and caught the eye of the rustic and the connoisseur alike.

Since most of the workshops did not maintain proper accounts for earlier years, it was not possible for us to undertake a detailed study of the production as well as sales in the various workshops during the last 5 to 10 years. Figures were available only for 1962-63 which are furnished below. These figures are exclusive of the production and sales of the Co-operative Society and the Government Unit which will be discussed elsewhere.

Year	No. of factories	Value of production	Sales
1962-63	25	Rs. 6,44,200/-	Rs. 6,44,200/-

In spite of difficulties in organising sales, it is heartening to note that articles which were produced could be sold in the open market and through various middlemen. Even though the workshop owners have separate facilities to market the finished goods, these are handed over immediately to the local merchants in Nachiarkoil as well as in Kumbakonam and Tanjore who take the responsibility to dispose of the goods. These goods in turn are distributed by the local merchants to their branch shops in other cities and are sold in bulk to wholesale dealers. We made a study of the marketing channels of one or two workshops and found that in addition to sending the wares to Kumbakonam and Thanjavur, they are also sent through merchants to Tiruchirapalli, Madras and other places. Exports are also made to Kerala and to Andhra Pradesh. However, we have no detailed information regarding the various channels of marketing since some of the owners were

reluctant to give us particulars. It was, however, noticed that the Government Unit, because of its superior position, was able to market in a much more organised manner, mainly because it had the various State Emporia and depots opened by the All India Handicrafts Board to market the goods. Hence articles produced in the Government Unit could be sent even to foreign markets as well as markets in some of the major cities in India, viz. Bombay, Calcutta and Delhi.

The Government Training-cum-Service Centre, because of its ability to execute any order entrusted to it and its desire to take on even difficult and obtruse designs has made a name for itself in the manufacture of brass and bell-metal products. Even though it was started comparatively late, i.e. in 1957, it has made tremendous progress, as the following figures would indicate. Upto the 30th November 1962, with 52 workers (both skilled and apprentices), the total production in the Government Training Centre was to the order of Rs. 60,599.85. Compared to this, the total production upto the same year in the Co-operative Society which was started in 1959 with 47 workers was only Rs. 20,462.80. The average production in any one of the workshops in Nachiarkoil producing articles in bulk is only Rs. 20,568/-. Thus it is seen that with fewer men, the Government Training Centre has been able to produce goods, not only of artistic value but in larger numbers also.

Wages

In spite of the artistic merit and the value of this handicraft, we find uniformly that the wages paid to the artisans are not commensurate with the amount of labour involved in production. The artisan in Nachiarkoil, struggling to get about Rs. 3/- per day, is in no way better off than many of his compatriots engaged in the pursuit of other crafts elsewhere. There is no co-operation between the owner and the worker in the workshop, wages not being based on mutual understanding. For this, the worker is partly to be blamed. There is no loyalty to his owner, only to his calling. Hence there is no incentive for the owner of the workshop to pay increased wages to the worker commensurate with the skill displayed because it is quite likely that even if he receives enhanced wages, the worker may shift his allegiance to some other workshop in the vicinity. The worker is generally attracted by money—naturally so. He is unwilling to work late and threatens to move to some other workshop if the owner refuses to give frequent advances. The owner, to safeguard his own interest, does not give increments or increased wages. Again, once the advance is given, the worker does not have any incentive and sometimes he may accept the advance and take up a job in some workshop. Such are the unsettled conditions in Nachiarkoil, and, therefore, it is not to be wondered that the wages are always at a low level. This is one of the reasons why unlike in other crafts co-operation has not taken a very firm hold in Nachiarkoil. People prefer to take their chances among the workshop owners who can frequently compete in the case of master craftsman, offering to raise his wages, though by a very small margin. The Co-operative Society, on the contrary, providing only a steady income according to individual performance, cannot therefore be an attraction.

Since brass metal ware is cheaper, the wages for artisans engaged in the production of brass ware is naturally lower than that for turning out bell-metal wares. In Nachiarkoil there are a number of big merchants who deal in brass and bell-metal wares. They have their own factories as well as shops where the finished goods can be sold. These factories are not large enough to employ many artisans ; so the work is also distributed among smaller factories. The merchants purchase the raw materials and calculate the amount required for the production of various types of articles. The exact amounts are doled out to the owners of smaller factories with a list of articles required in each variety and size. The owners of small factories, after receiving the raw material and the lists employ their own workmen in the workshops, manufacture the products and hand over to the big merchants the required goods without receiving any wages. The difference between the cost of raw materials and the price fixed for the finished goods as between the big merchant and owner of the small workshop is the net profits accruing to the small owner. The big merchants then fix the price with a margin of profit over and above what they have paid to the small owner and sell the articles. In addition, the owner of the small workshop manages to salvage some of the metal from the castings he has made on behalf of the big merchants. This metal he utilises to produce articles of his own, according to his own tastes and preferences and sells it to local dealers. Thus there is a two-way margin of profit for the small owner. This is necessary because he has to pay wages to the workers he employs in his workshop. The following Table indicates the wages for some of the products, if a particular artisan works for eight hours a day.

	Kuthuvilakku Brass	Koojas Bell-Metal	Tumblers Brass
	Rs. P.	Rs. P.	Rs. P.
Moulder	1.50 to 2.00	3.50	1.25
Caster	1.25	2.50	1.00

	Kuthuvilakku Brass	Koojas Bell-Metal	Tumblers Brass
	Rs. P.	Rs. P.	Rs. P.
Blower	1.00	1.25	1.00
Cart wheel roller	2.00	2.25	2.00
Fitter	2.50	3.00	2.00
Turner	3.00	3.00	3.00
Polisher	2.25	2.50	2.00

From this, it is apparent that the artisan fashioning brass and bell-metal wares earns on an average a sum of Rs. 2/- to Rs. 2.50 per day. Another uncertain factor in his earnings is that there is no guarantee that he will be engaged on all the thirty days. On an average, it is not possible for him to work for more than twenty days in a month. For the raw material the big merchants have to depend on the street hawkers who sell the old vessels. Unless big merchants supply metal scrap to owners of workshops, work in the factory or workshop cannot go and therefore, indirectly the artisans depend on the hawkers who have to supply raw materials for their livelihood. When the raw materials are scarce, artisans get no work. If the price of raw material is very high, merchants naturally have to raise the price of finished goods with the result there may be some slackness in demand and some of the artisans will be thrown out of work. Master craftsman may perhaps be able to earn a rupee more than their brethren. The highly paid craftsman is the turner who gets Rs. 3/- per day. Others get between Rs. 2/- and Rs. 2.50 per day. The blower gets the lowest earnings, about Rs. 1.25 per day. We append below the average monthly income of some of the artisans pursuing different avocations in Nachiarkoil.

Worker	Monthly average income
Bell-metal worker	Rs. 60/-
Brass-metal worker	Rs. 50/-
Blacksmith	Rs. 90/-
Carpenter	Rs. 70/-
Tailor	Rs. 75/-
Goldsmith	Rs. 100/-

Thus it is seen that brass and bell-metal workers have low incomes compared to others pursuing different avocations. Such is the fate of artisans specialising in some of the foremost and famous handicrafts of South India,

Brass and Bell-metal artisans, for pursuing this craft have only to break the old brass and bell-metal vessels into bits and place it into crucibles for melting. To have a small workshop, every artisan must atleast possess Rs. 1,000/- to purchase burnishing and other tools, the minimum amount of machinery and to erect a thatched shed. There are about 160 artisans in the area and only 25 workshops, i. e. an average of six artisans per workshop.

The uncertain economic conditions of the artisans are reflected in their standard of living. Majority of them live in one-roomed thatched houses built of mud with mud flooring. However, they are free from starvation, as Nachiarkoil nestles in the rice bowl of Thanjavur district. They atleast get one square meal a day, but most of their children are not sent to school. Their dress is simple and their diet Spartan. The majority of artisans, about 90% habitually chew betel nut and as much as 5% of their wages are spent on purchasing pansupari (betel nut). If they are not placed at the mercy of street hawkers who sell old vessels, they say they will be able to get a steady income of Rs. 75/- to Rs. 90/- per month. According to them, the old vessels which are melted to provide the necessary liquid metal for casting loses its sheen and glamour when melted again and again. They are of the opinion that the Government Unit set up at Nachiarkoil competes with them successfully in producing attractive designs through the utilisation of modern appliances and, therefore, the products turned out in the workshops are unable to compete successfully with the products manufactured in the Government Unit. They are, however, resigned to the fact that it is not possible to provide Rs. 1,000/- for each artisan to set up a workshop. This also raises the larger question of marketing the sudden glut of products which will be the inevitable concomitant of setting up nearly 160 workshops in the area.

Mechanisation of crafts

Some 40 years back, the entire industry was confined to the Pather community as a purely domestic industry. Nobody had thought of mechanising the different processes as it was a manual operation at every stage. But slowly, in the last 20 years, mechanisation has come to replace the old methods of production. This has naturally thrown a few people out of work because where two or three were formerly required for a particular operation, only one is now required. But this has not created any difficulties as such of those artisans who have been thrown out of work consequent on mechanisation are owners of small worksheds and they have taken to the production of brass articles by the box moulding processes. Further, the castings are to be done manually and cannot be mechanised. It is only the final processes of turning, drilling, grinding, burnishing and polishing which can be mechanised. Therefore, in this process, a certain amount of

rationalisation in industry, rather than retrenchment and unemployment, has taken place. Moreover, the fine finish consequent on mechanisation has made the products of Nachiarkoil more renowned and famous thus leading to an increase in demand about which no one can complain. There is also no increase in price. Even for articles which are drilled, burnished and polished by hand, there is a steady demand in many rural areas and though the elite and the discerning buyers prefer articles which possess lustre where polishing, turning etc. is done by machines, many of the rural people still go in for articles which are manually turned out simply because there are certain shops where these articles are produced and they happen to frequent these shops. But many of the factories and workshops which formerly did not possess machinery have now installed electric motors to burnish articles. Mention should be made of the efforts taken by Sri L. S. Neelakantan, Instructor, light metal casting, of the office of the Director of Industries and Commerce, Madras. It was he who pleaded for the expansion of the facility afforded by Government to supply tools at 50% subsidised cost to blacksmiths and carpenters under the Community Development Scheme to the brass and bell-metal workers of Nachiarkoil. The proposal was accepted and the electric motor was supplied at half cost through the Block Development Officer of Tiruvamarudur block under whose jurisdiction the village of Nachiarkoil lies. There are now 38 motors in the 25 workshops in Nachiarkoil. In some workshops metal turning lathes are handled by a turner for turning as well as for polishing. In the Government Unit as well as in two workshops, for blowing the furnace the electric fan blower is now in use.

Training of Artisans

In order to safeguard our national heritage and the creative expression of our people which is emphasised through the pursuit of old and traditional handicrafts, the All India Handicrafts Board and the Government have been bestowing their attention on improving the quality and quantity of the artisan's output, not only by giving them the necessary training for bettering the crafts techniques, but also by introducing modern as well as old designs which are fast dying out. To break the monopoly of one particular caste which at some stage may face extinction if the furture generations do not take kindly to the craft, the Government and the All India Handloom Board encourage other castes to learn the techniques of production. The following are the measures undertaken by the various agencies to impart the necessary training to brass and bell-metal artisans in Nachiarkoil.

Under the Second Five Year Plan, the Director of Industries and Commerce, Madras had formulated a scheme for the establishment of a service-cum-training centre for the development of brass ware and bell-metal industry. According to the Plan, 15 artisans are to be trained every year in improved methods and new lines of manufacture. During the period of training, each trainee is to be paid a stipend of Rs. 30/-. To initiate the training the following amounts were sanctioned by the State Government as well as by the Central Government.

Recurring Grant (State Government)	...	Rs. 68,000/-
Non-recurring Grant ,,	...	Rs. 14,450/-
Loan (Government of India)	...	Rs. 12,000/-
Grant (Government of India)	...	Rs. 71,000/-

Training commenced from 17—2—1957. Till now three batches have completed training. The duration of the training is for two years. At the time of this survey the third batch had completed the training and fresh applications have been called for the fourth batch. As the applications failed to satisfy the minimum qualifications required, only 10 were selected out of a sanctioned strength of 15. It was stated that the poor response from the surrounding areas of Nachiarkoil was mainly due to inefficient publicity and propaganda. In this Centre, the technical staff consist of a Superintendent, a Technical Assistant, a Moulder, a Skilled Assistant, a Turner-cum-Fitter, Turner, Semi-skilled worker and three administrative staff.

For the first two years since the inception of this scheme, the Unit concentrated on and produced brass and bell-metal articles of everyday use, i.e. household utensils like koojas, tumblers, lotas, spittoons, kerosene lamp stands, flower vases and ordinary kuthuvilakkus which were concurrently produced by the local artisans and establishments.

Fortunately the Unit had the benefit of supervision and guidance from an able Instructor in light metal casting, Sri L.S.Neelakantan, attached to the Director of Industries and Commerce, Madras. He has specialised in the art and now brought to bear all his talents to introduce traditional motifs and manufacture temple requisites. He visited all the temples in the State and studied many traditional designs of lamps, pooja articles etc., based on sastraic principles and in turn introduced the same in the Government Unit of Nachiarkoil. He also secured an order for the manufacture of traditional lamps from Sri Kapaleeswarar temple at Madras. The execution of the order in record time and to the satisfaction of all, and the wide publicity given to it by the dailies has provided a new fillip to this industry and

has brought in its wake a stream of orders from a number of temples,

Forty-five trainees in the three batches along with the technical staff of the Centre did wonderful work during these six years. Of the ex-trainees, some have been absorbed in the Unit, noteworthy among them being Mr. Manian, the skilled Assistant and Mr. Alagiriswami the Turner who are adepts in their respective spheres. When the Kapaleeswarar Temple placed a rush-order for Rs. 16,300/- worth of ornamental articles, these two, along with the Superintendent and trainees, laboured hard, day and night to execute the orders in time.

As indicated earlier, upto 1962, during the course of five years, 3,278 articles have been produced to the value of Rs. 60,599.85. The Unit has earned a net profit of Rs. 1,496.67. The margin of profit is very low, but this being a Government Unit, the figures of total profit will not indicate the true worth of the articles produced or the Centre's value in promoting this craft in the area. The majority of the trainees graduating from the Centre secured employment not only at Nachiarkoil, but in the other areas of Tanjore and Kumbakonam towns and the villages surrounding this town. Very few of them migrated out of Tanjore district. As a standing testimony to the fact that the Centre encourages members of other castes to learn the rudiments of this art and become expert craftsmen, the following community-wise Table is appended below.

Name of the community	Number trained
Achari	2
Pillai	11
Naidu	...
Padayachi	9
Pather	13
Mudaliar	1
Odayar	1
Naiyer	1
Christian	1
Vaithiar	1
Thevar	1
Chettiar	2
Kaller	1
Raja	1

In this Training Centre, a number of superb articles emerge such as small and large vasamalais, flower vases, picnic carriers, modern coffee filters, peacock-shaped punching bell, Pradosha deepam (lamp), Prabha Deepam (lamp), branching lamps, temple bells, and camphor stands etc.

Co-operative Society

The story of the Nachiarkoil bell-metal and brass ware workers' Co-operative Society is, sad to relate, not a happy one. In many other crafts, co-operation has taken a firm hold, notably in the field of pottery, mat weaving, silk weaving etc. But in brass and bell-metal ware this is not the case. The industry is in the hands of big merchants who control production and marketing. There are several workshops producing more than Rs. 5,000/- worth of goods per year. But the owners of workshops are not the owners of the goods. This may sound paradoxical unless one has read what we have stated earlier about the relationship between the big merchants who obtain the raw material and the owners of workshops who manufacture these goods. Since conditions were unsettled and the artisans were too much at the mercy of the big merchants, the Government of Madras came forward to help with funds and a Co-operative Society was started in the beginning of 1959. From the beginning, the Society, was doomed to failure, because of the very nature of this industry and the tempting baits offered by the owners of workshops and big merchants at Nachiarkoil. Therefore, the present condition of the society is indeed one which cannot be said to be satisfactory.

The Nachiarkoil Bell-metal Workers Cooperative Cottage Industries Society was started on 20-2-1959 with the avowed intention of providing employment to the artisans and to absorb the trainees at the bell-metal training centre. At the present moment there are about 38 members on rolls with a share capital of Rs. 20,000 made up of 2000 share of Rs. 10/- each. Though the foundation of the Society was laid on 28-2-1959, production started only from 2nd September 1960. This was due to the fact that the Society had no building of its own in which to house the workshop; hence it had to construct the workshop from the meagre funds provided by the Government - a sorry state of affairs indeed!

The site adjacent to the temple belonging to Sri Srinivasa Perumal Devasthanam was obtained and a big workshop was constructed where 30 workers could work with ease. The following Table indicates the financial assistance received from the Government to be utilised for the installation of machinery and construction of the building.

Loan	Amount Rs.	Purpose
	7,500	Working capital loan.
	26,000	Loan for working capital, machinery, and equipment.
	5,000	Working capital loan.
Subsidiary	20,000	From Thiruvidaimardur Block for machinery and building.
Machinery	8,000	
Building	12,000	
	2,500	Reserve Fund subsidiary.
	1,000	,,

Nature of machinery installed

Name of machine	No.	Horse Power
1. Fan Blower	1	0.33
2. Burnishing lathe	3	3 (1 h.p. each)
3. Grinder	1	1.50
4. Drilling Machine	1	1.00
5. Polisher	1	3.00

Total value of machinery	... Rs.	8,404.73
Value of building	... Rs.	31,852.20
Value of equipment	... Rs.	4,756.53

Even though the Government came forward with funds to help the Society on its way due to lack of co-operation, the Society was completely neglected. Two reasons for its failure were firstly, the inducement of higher wages offered by the other owners of workshops and secondly the advances given from time to time to tide over difficult periods by private owners for which no provision exists in the byelaws of the Co-operative Society. During our survey, we found there were only two members working in the Society along with 8 non-members, to attend to the difficult items of work during the slack period. They blithely assured us that they would naturally enrol themselves as members of the Society, a promise which we did not believe they would keep. Even those people who are trained in the Training Centre prefer to go out, set up their own workshop or work for wages in other workshops, rather than be members of the Co-operative Society. Since pressure cannot be exerted to make people enrol themselves as members of the Co-operative Society, the Government is helpless in the matter. The Society makes both ends meet by producing in small quantities, koojas, tumblers, Vasamalais etc. There are also a few non-members who are encouraged by allowing them to bring their goods to the Society for polishing their articles at the polishing machine set up in the premises. The following Table indicates the community-wise distribution of artisans working in the Co-operative Society.

Community	No. of workers
Pather	3
Vellalar (Saiva)	3
Vellalar (Solia)	2
Naidu	1
Bakther	1
	10

The following are the figures of production and sales of the Co-operative Society.

Year	Value of production	Sales
1958-59	...	...
1959-60	...	...
1960-61	4,031.51	112.96
1961-62	8,924.42	7,710.77
1962-63	7,506.87	7,702.18

It is seen that for one year after its inception, the Society produced nothing and sold nothing. And in the other years, the production is not comparable to that turned out in other workshops and in the Government Training Centre and the sales were really poor. The only bright spot noticed is in the year 1962-63. However, a lot of articles remain unsold in the Co-operative Society and unless something is done to market these goods, the Society is likely to be in doldrums without any hope of enrolling new members.

Marketing

Marketing, except for the Government Training Centre is still controlled by the big merchants. In Nachiarkoil these people purchase the raw materials and they regulate the production of the articles by supplying old broken vessels at controlled rates to owners of workshops whenever there is demand for the finished products. There are, however, one or two merchants in Nachiarkoil who manage to get a steady supply of raw material at controlled rates and therefore are in a much better position to fix the price of the finished goods at competitive rates compared to their less fortunate brethren who have to buy raw materials at high price and thus have to fix the price of

the finished goods also at rates higher than normal rates. In order to compete successfully with these merchants, the other less fortunate merchants have to bring down their market rates, which certainly affects the margin of profit. In the local shops, the merchants sell their goods and a majority of them also export to South East Asian countries, particularly to Ceylon where there is a good demand for 'Kuthuvilakkus'. The articles are also sent to Kumbakonam, Tanjore, Tiruchirapalli, Madurai and Madras. There are also merchants who sell goods to their own agents for cash or credit. During important festivals, these brass and bell-metal articles find their way into the markets in cities and towns. One such centre is Kumbakonam and another is Tanjore. During the rainy season between September and October, the market is dull. The busy season starts from January and lasts till August. During Deepavali and Pongal, the products are in good demand and the merchants are not able to fulfil the rush orders and sometimes they run short of raw materials. This is the time the street hawkers have a field day, when they are able to raise the price of their raw materials. In the case of the Government Training Centre, marketing is organised through the All India Handicrafts Board and various State Emporia. Direct orders placed by temples are also executed, but the sales are effected only through the Emporia.

Case studies

In order to make the study more authentic, we have prepared two case studies for purposes of comparison and contrast; one of a leading merchant engaged in the production and sale of brass and bell-metal wares and the other of a master artisan and owner of workshop who receives raw materials and in turn engages the workers and returns the finished products to big merchants. These case studies will, it is hoped, help the reader in understanding the discussion relating to economics of production which has been set down in the earlier paragraphs.

1. Sri K. N. Mani Odayar

Sri K. N. Mani Odayar is a leading merchant of Nachiarkoil engaged in selling brass and bell-metal wares. He is a native of the village and his forefathers were agriculturists. His father was running a big rice mill. After the old man's death, his four sons, including Sri Mani Odayar, quarrelled amongst one another as to the division of the property and Sri Mani Odayar by a strange quirk of fortune was shrewd enough to realise that brass and bell-metal ware in Nachiarkoil had a bright future. Out of the proceeds of the division of property, he started his own business by opening a small factory for brass and bell-metal ware in East Bazaar Road. There being no electric motors, lathes were manually operated by six artisans. Fortunately for him, he had some business connections in Ceylon and he was in a position to explore the foreign market by sending Kuthuvilakkus to Ceylon, where this particular type of article was in great demand. Slowly and steadily, he built up the business until he became one of the leading merchants of Nachiarkoil. Between 1950-52, his sales figures touched the high water mark of Rs. 50,000/- per year. In 1953, there was a temporary halt of exports to Ceylon as the Indian Government prohibited merchants from exporting copper, brass, and bronze articles to foreign markets. This made him explore and stabilise internal markets for his products. By his tact and sauvity, he was able to market his produce in Kumbakonam, Tanjore and Madras. The workers under him love him, as he is kind hearted. In addition to regular wages, advances of money are also given to artisans when they are in need of it. At present there are 30 artisans working under him and many others come to him for employment. It is his proud boast that if he can get a steady supply of raw material, from time to time, at controlled rates, he can expand his factory and if the Government permit him to do so, he will engage all the artisans in Nachiarkoil. The ban on export to Ceylon was lifted and in 1954, he obtained a fresh licence to once again supply to the foreign market. In that year, when he could not export to the foreign market and had to explore the possibility of marketing locally, he assured himself of a steady local demand. Between 1955-62, his production also increased to Rs. 2 lakhs. Then came a slight disaster. In August 1962, his foreign market collapsed as the Ceylon Government banned the import of Indian goods. However, the demand for Kuthuvilakku being regular locally, he started manufacturing kerosene lamps and other household wares in his factory for which there arose a steady demand. In 1958, his workshop was converted into a big factory and is located just on the outskirts of Nachiarkoil in Tirunaraiyur village. On order, all varieties of wares, traditional and modern are manufactured at reasonable rates. The following are the figures of production and sales since 1957.

Year	Production	Sales
	Rs. P.	Rs. P.
1957-58	1,86,614.31	2,01,426.67
1958-59	2,41,648.58	2,69,981.07
1959-60	3,00,412.19	3,28,874.50
1960-61	2,55,189.77	2,79,379.11
1961-62	2,69,080.14	2,98,582.79

2. P. Subramania Pather :

P. Subramania Pather, a native of Nachiarkoil is a master artisan-cum-owner of a medium-sized workshop. He underwent training in the Government Training Centre in 1957-59. He was one of the first to be trained at this Centre. Before getting training in this Centre, he was working under his brother who was running a small workshop. In 1960 fresh from the Training Centre and encouraged by his friends, he set up his own Workshop. Within a short time, articles like tumblers, cups, etc. began flowing out of his workshop wherein he had only a manually operated wheel. He did not possess at the beginning any machinery. However, in the year 1962, with the money which he had steadily accumulated, thanks to his craftsmanship and the respect he commands in the village, he was able to get two motors of 1 h.p. each, which he promptly installed. Such is the demand for his products that even with the help of two motors he is not able to meet the orders. Therefore, he has to utilise the services of two manually operated wheels. He manufactures only tumblers and cups according to the box moulding process. Kuthuvilakkus and other household articles are not manufactured in his workshop. Since he is not a merchant, his income mainly depends on the orders he receives from the big merchants, but such is his fame that he has a regular indent placed on his services. He receives the order along with the raw materials given to him by the merchants and in turn he engages the workers on piece rate wages. Manufactured goods of different shapes and sizes are handed over to the merchants from whom he receives the order. The following Table indicates the production and sales in his workshop.

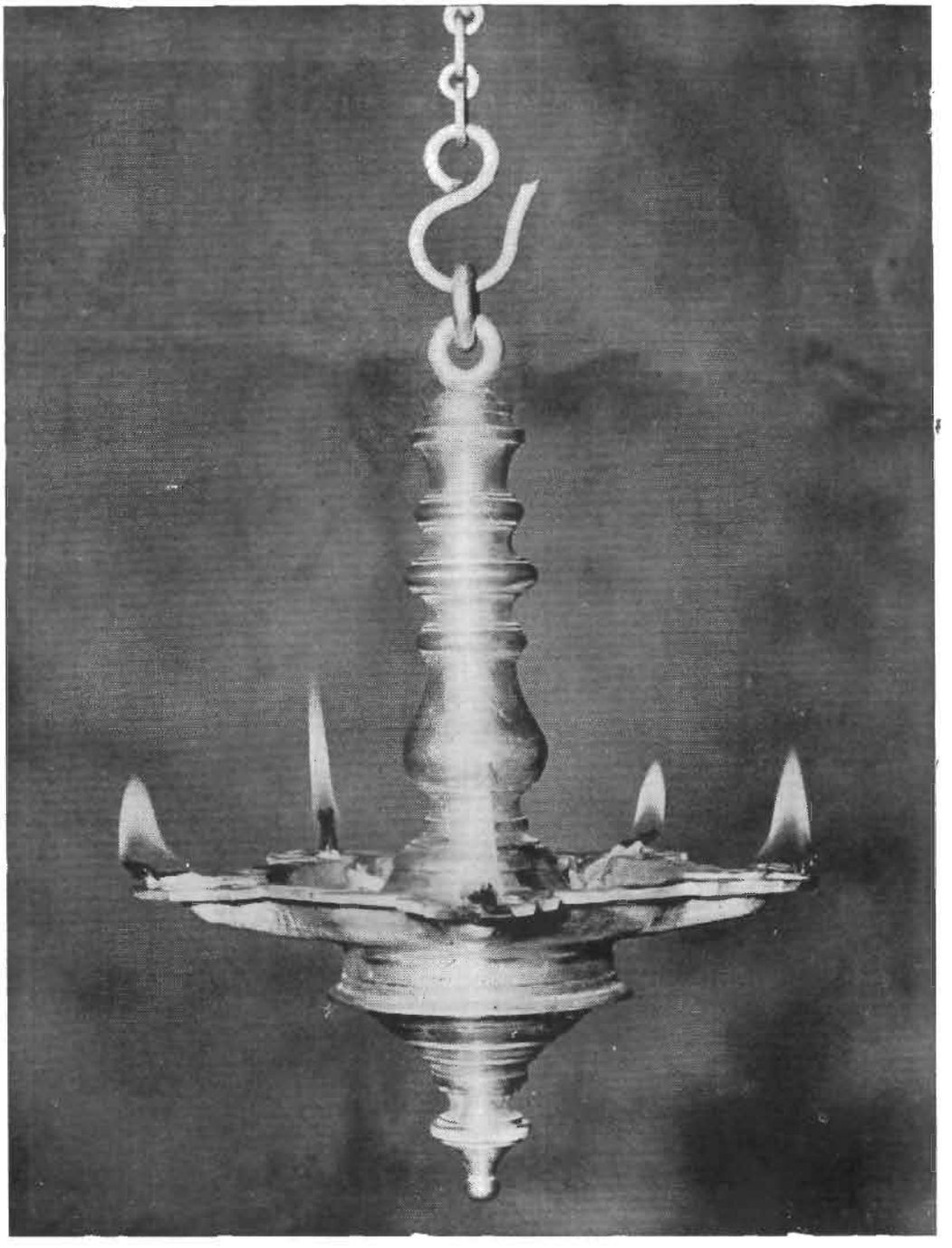
Year	Production	Sales
1960 – 61	Rs. 8,800/-	Rs. 8,800/-
1961 – 62	Rs. 10,000/-	Rs. 10,000/-

Conclusion

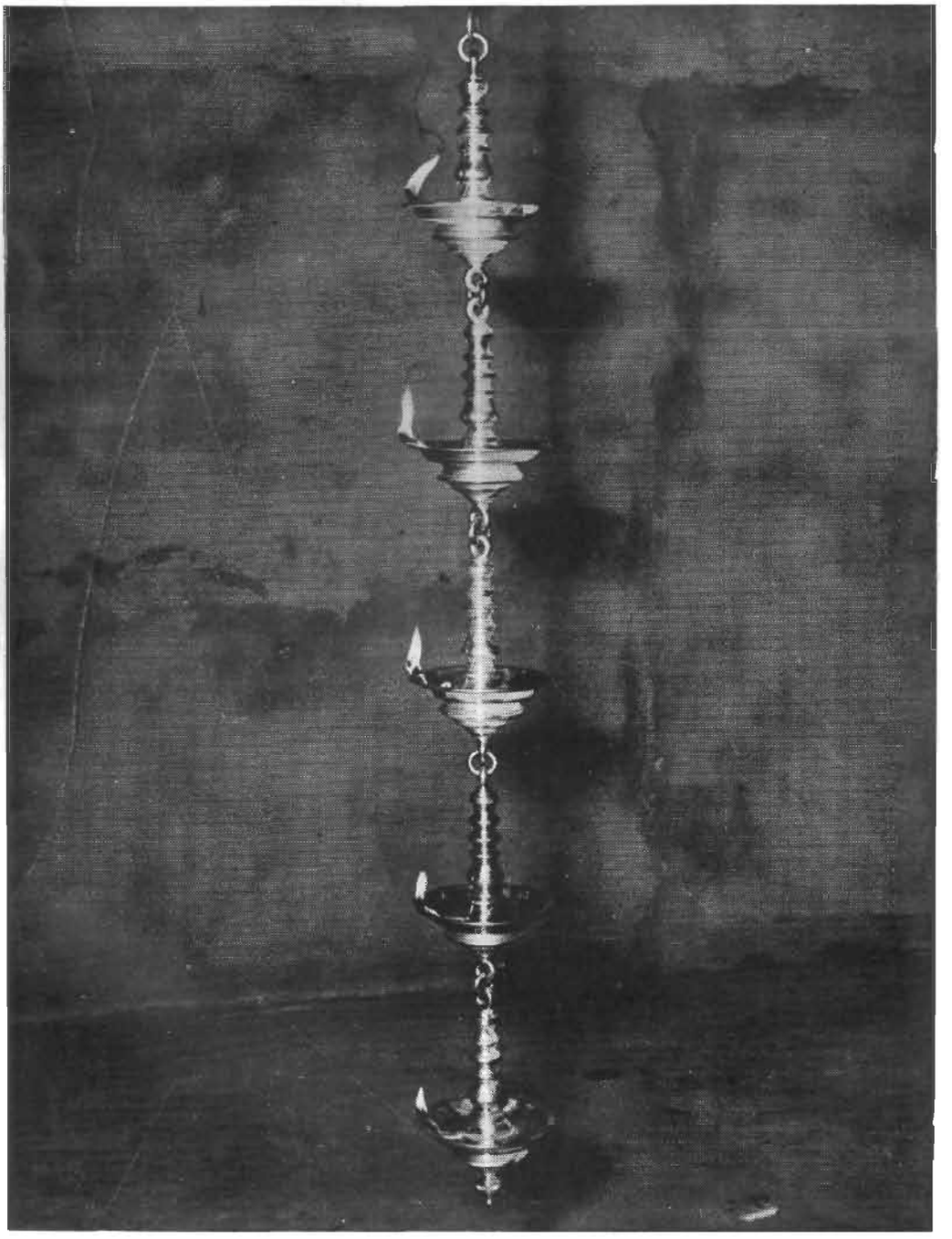
The brass ware and bell-metal industry in Nachiarkoil have bright prospects as long as there are people who realise the worth and utility of these articles which synthesize the traditional and the modern. " The All India Handicrafts Board through its emporia and private manufactures is encouraging the manufacture of these articles which while retaining distinctive Indian characteristic forms provide the proper accent to modern Western and Indian interior decoration. Classical Indian designs vie for popularity with streamlined foreign designs, pitchers and fruit dishes. The tourist trade and Govenment patronage has given terrific fillip to the metal ware industry which is as flourishing as it has ever been in the history of the country and is one of the earners of much needed foreign exchange. The tools used in the manufacture of these articles are simple and few in number. With continued Government patronage and organised facilities for marketing, it is certain that this industry will continue to remain as flourishing as ever " (J. B. Bushan. "Indian Metal Ware").



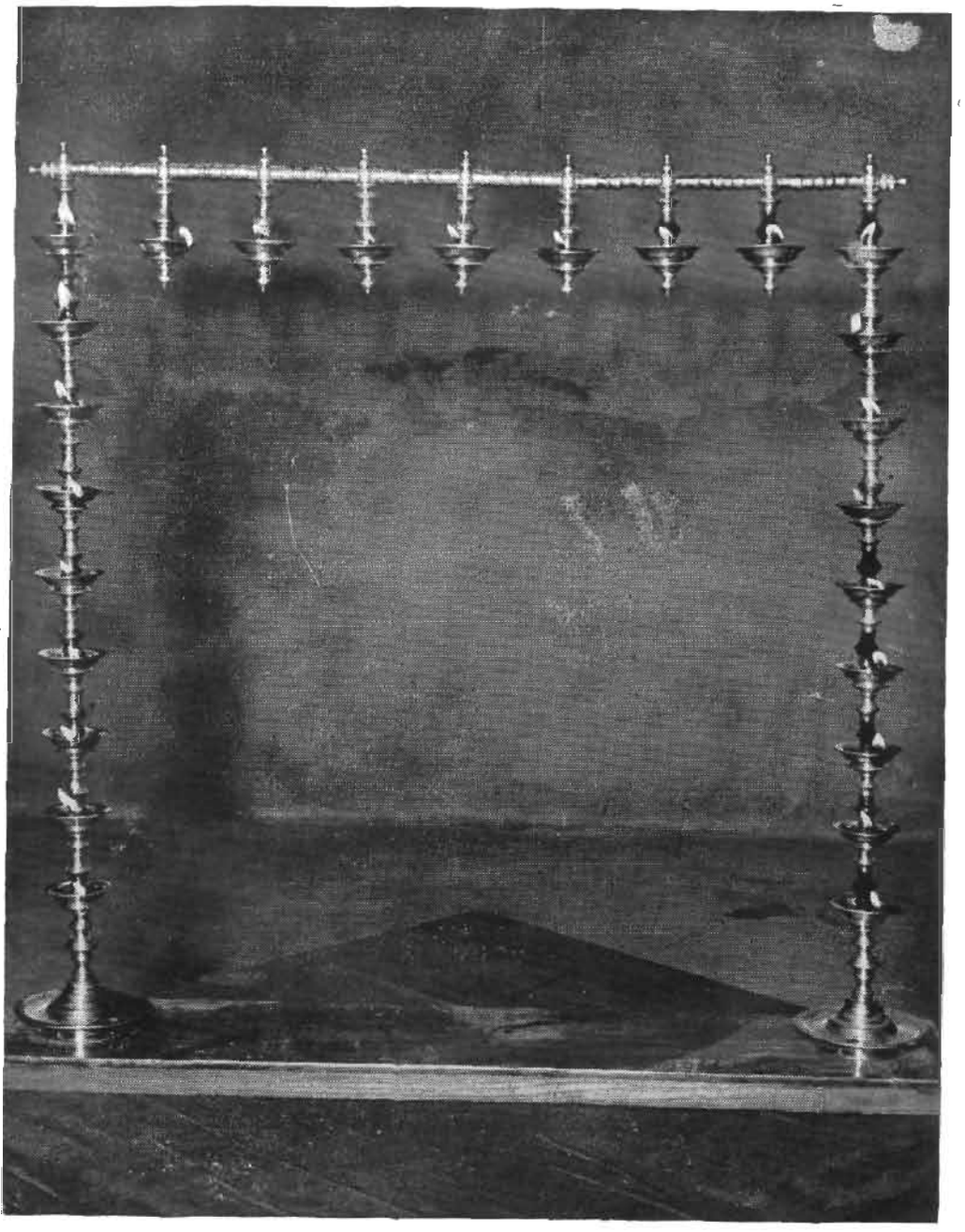
Thundamani Vilakku with Peacock Prabai



Hanging Lamp Deepam



Panchakshara Deepam



Big Vasamalai



1. Mayura Deepam

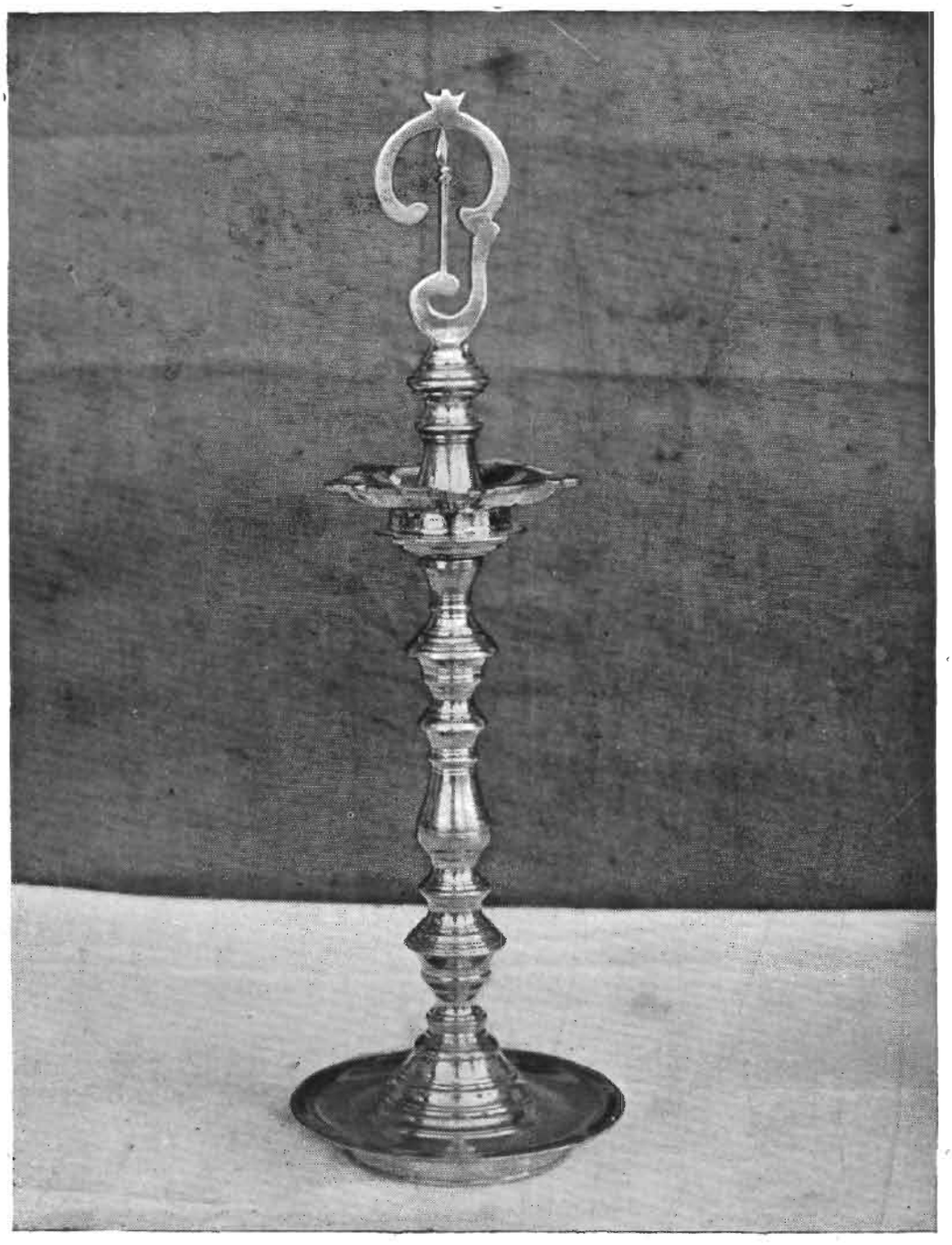
2. Naga Deepam



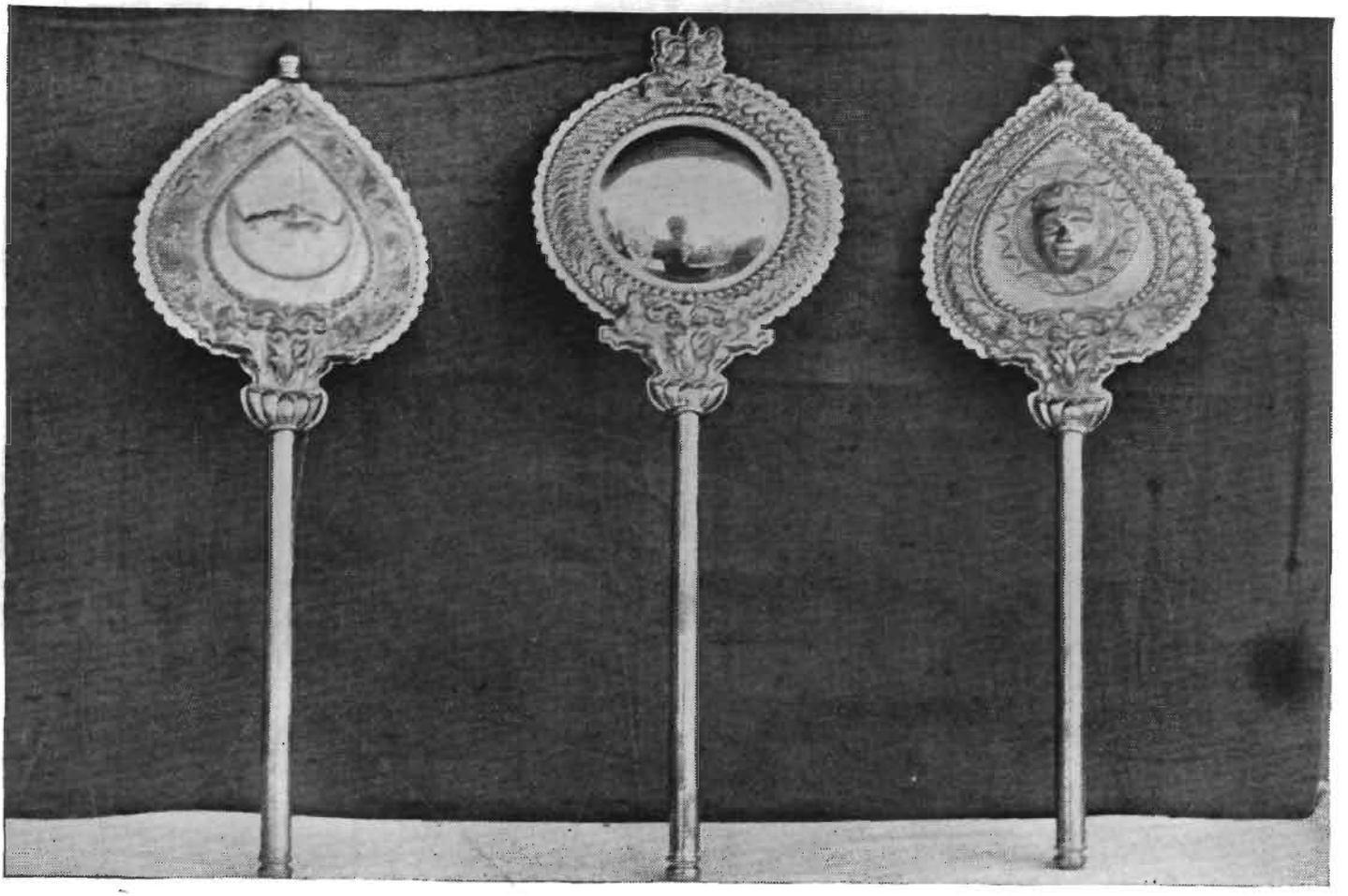
Mayura Deepam



Yali Branching Lamp with a Kudam (Vessel) placed below to catch the overflowing oil



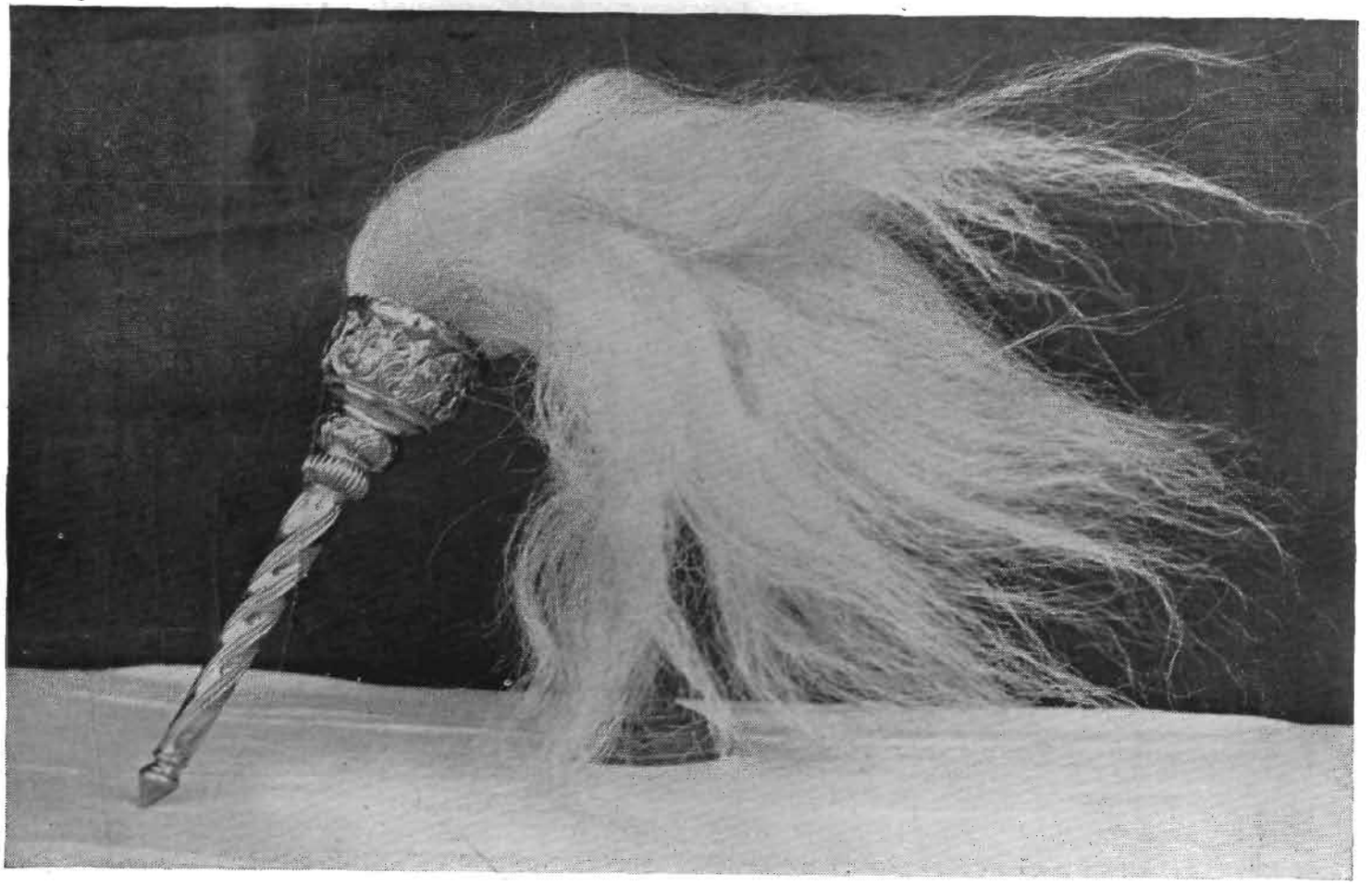
Om Deepam



1. Chandra Padam
2. Mirror
3. Suriya Padam



1. Gindy
2. Hand Pooja Bell
3. Dhara pattram with Kamadhenu face



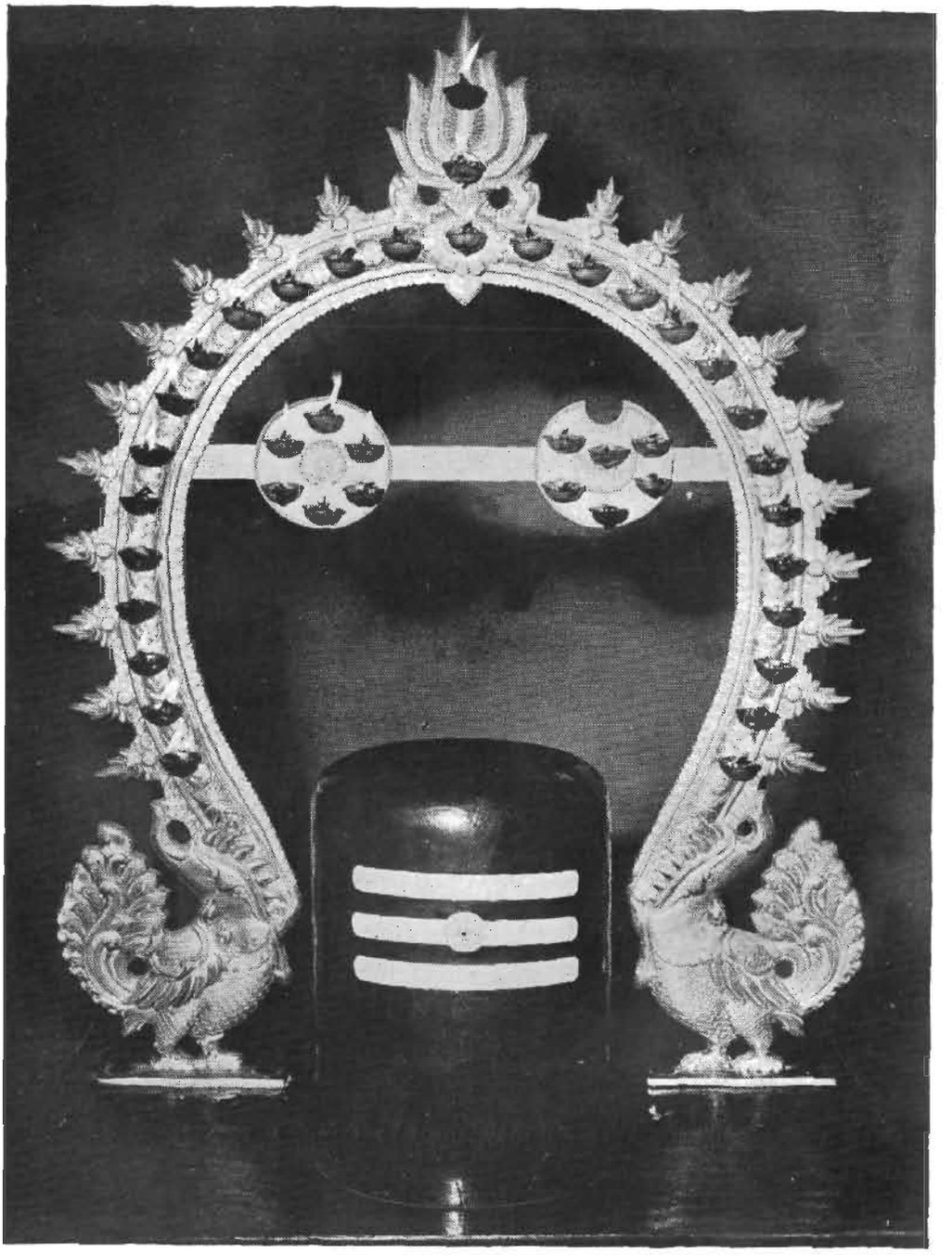
Chamaram



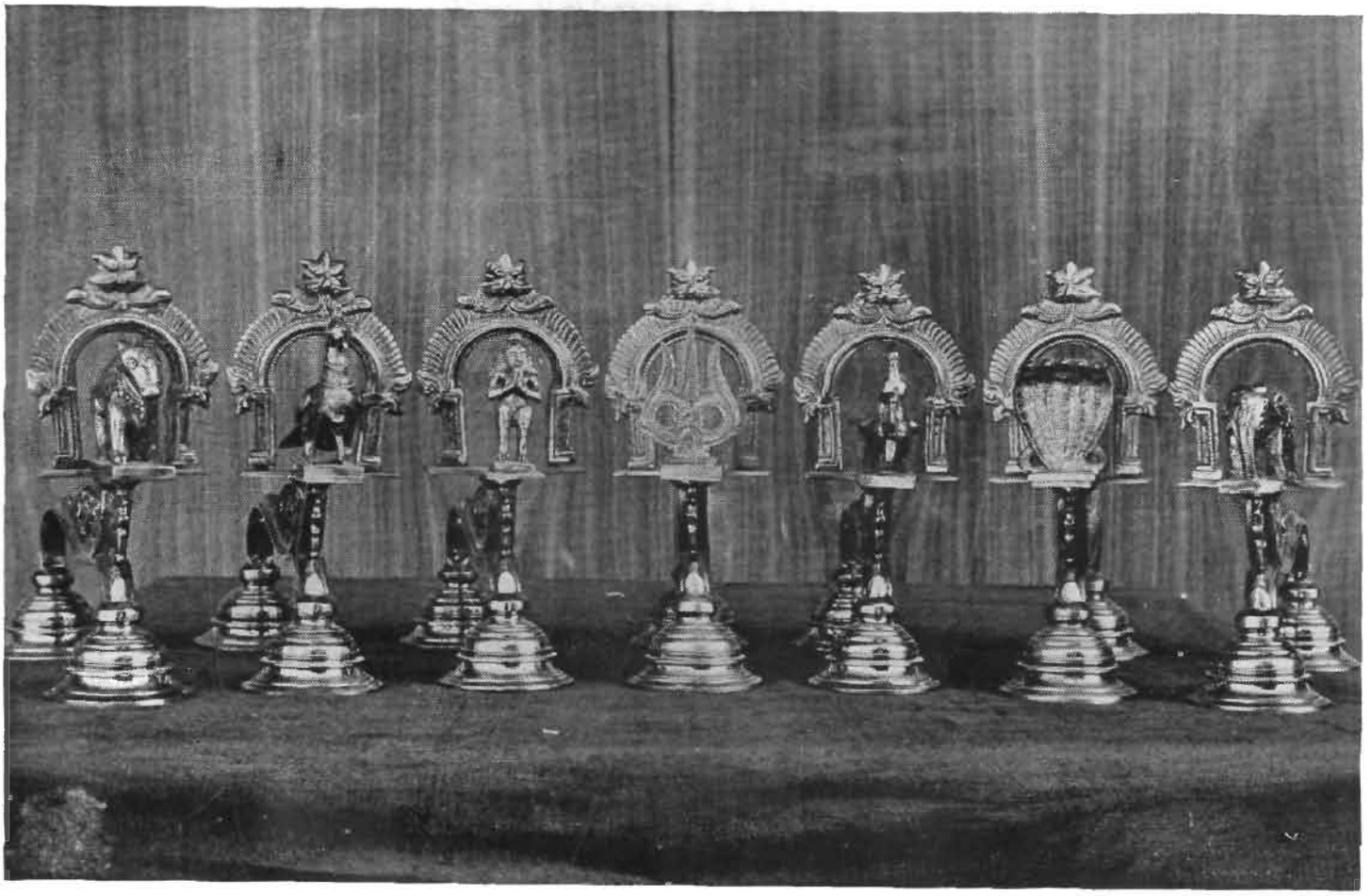
Arigia Patharam



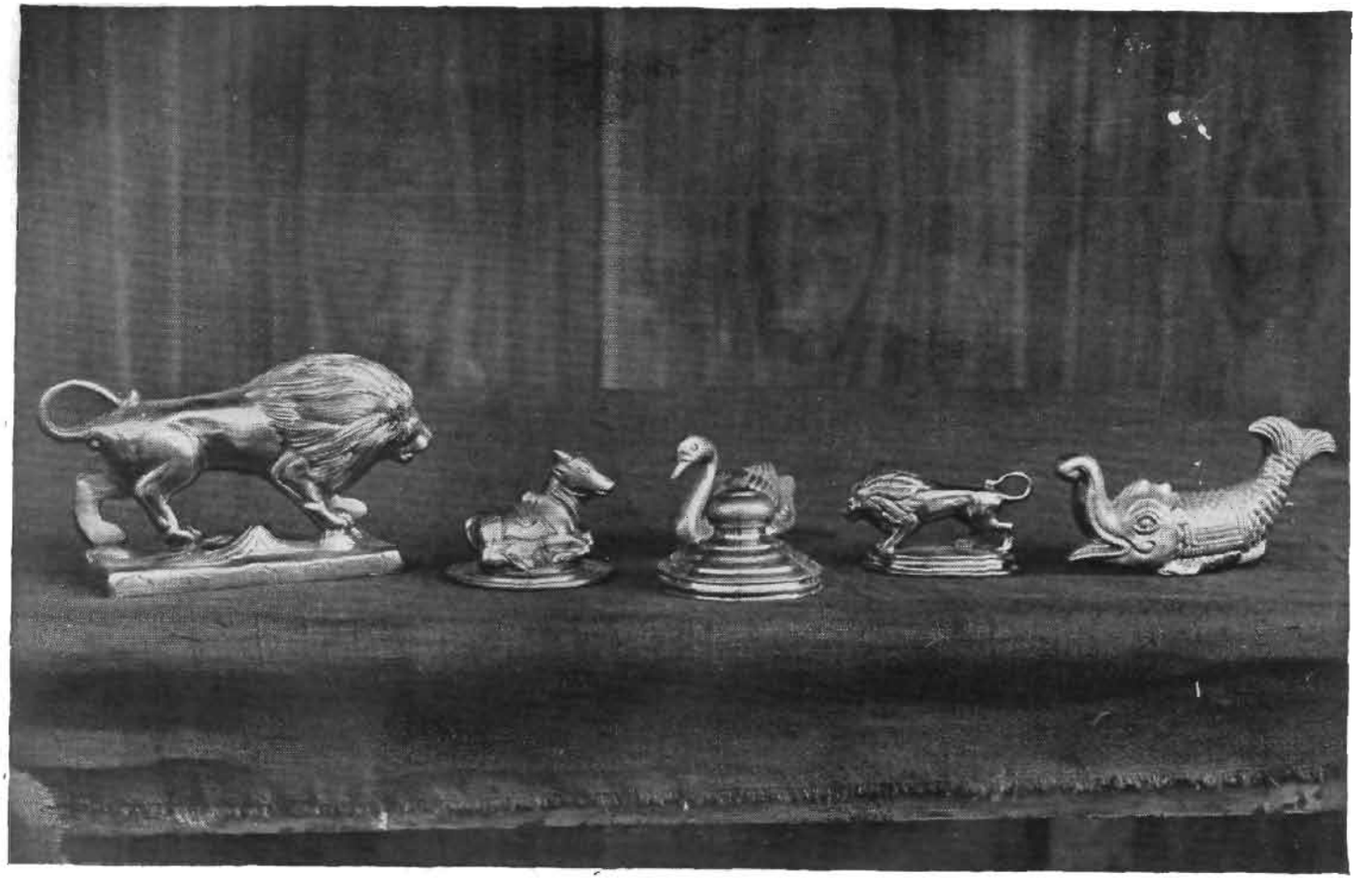
Traditional lamps in Temples



Prabha Deepam



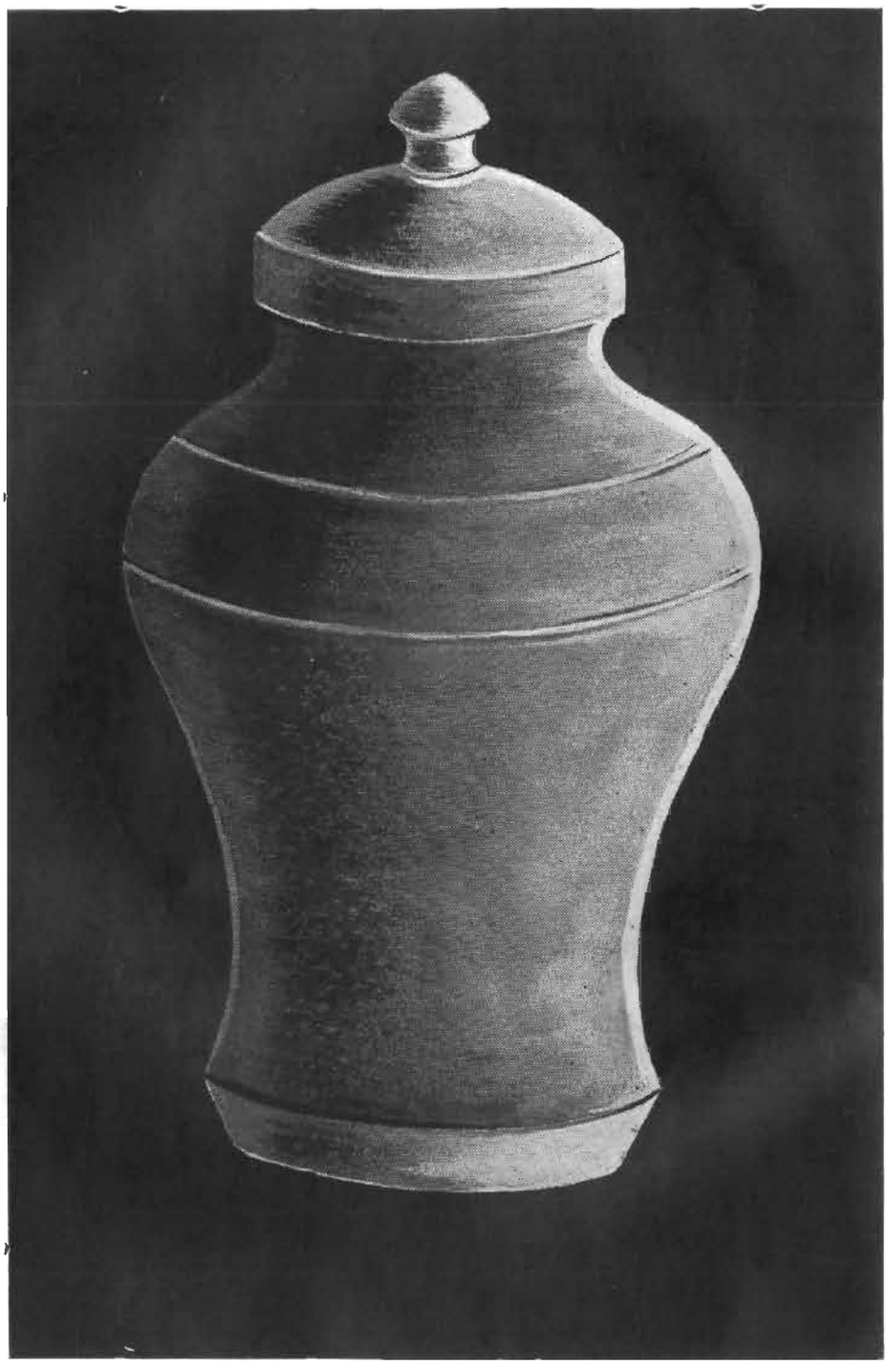
Rishaba Deepam, Mayura Deepam, Purushamirugha Deepam, Thirusulam Deepam,
Hamsa Deepam, Naga Deepam, Gaja Deepam



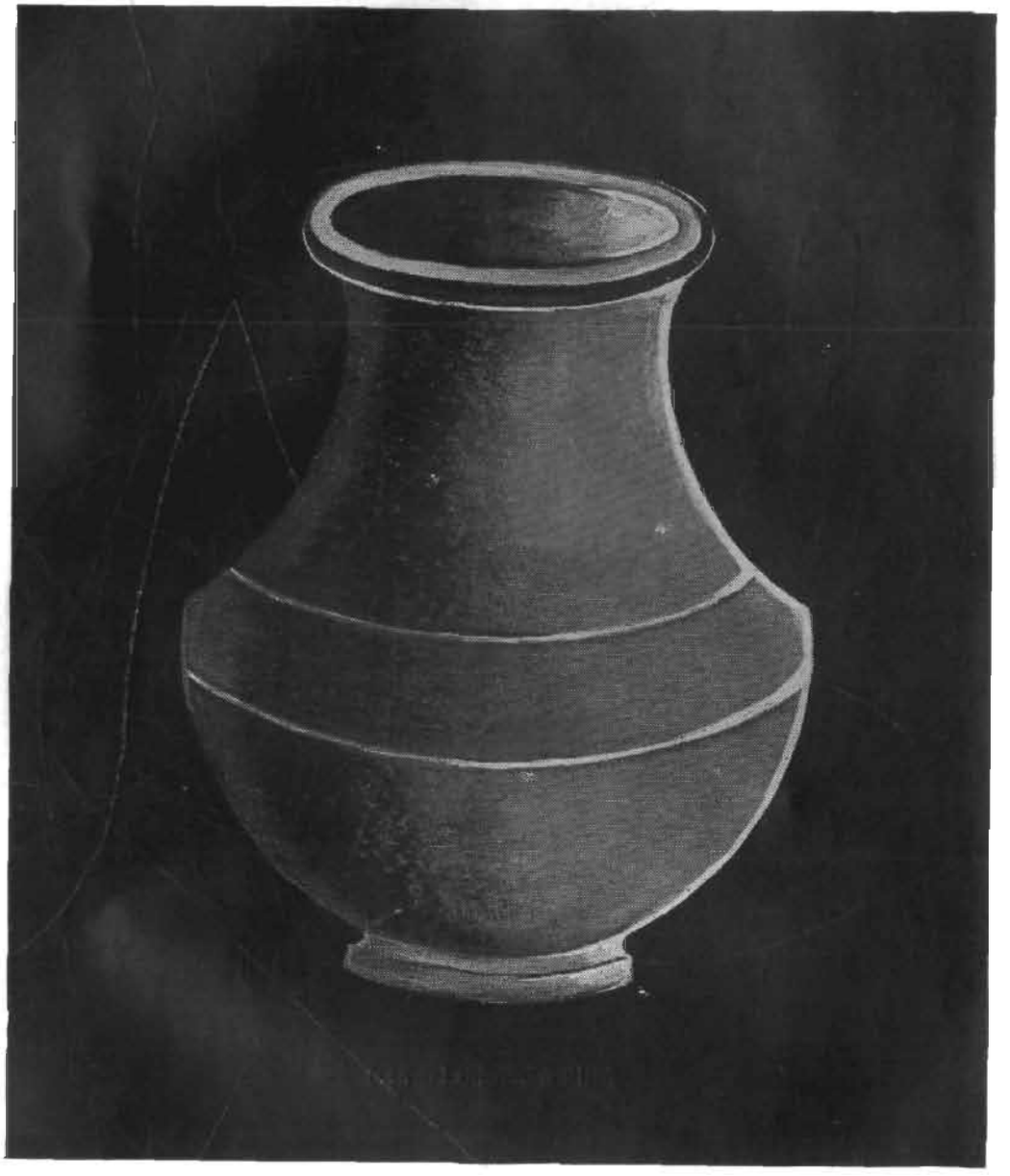
Paper weights of different designs
(By Loam Moulding Process)



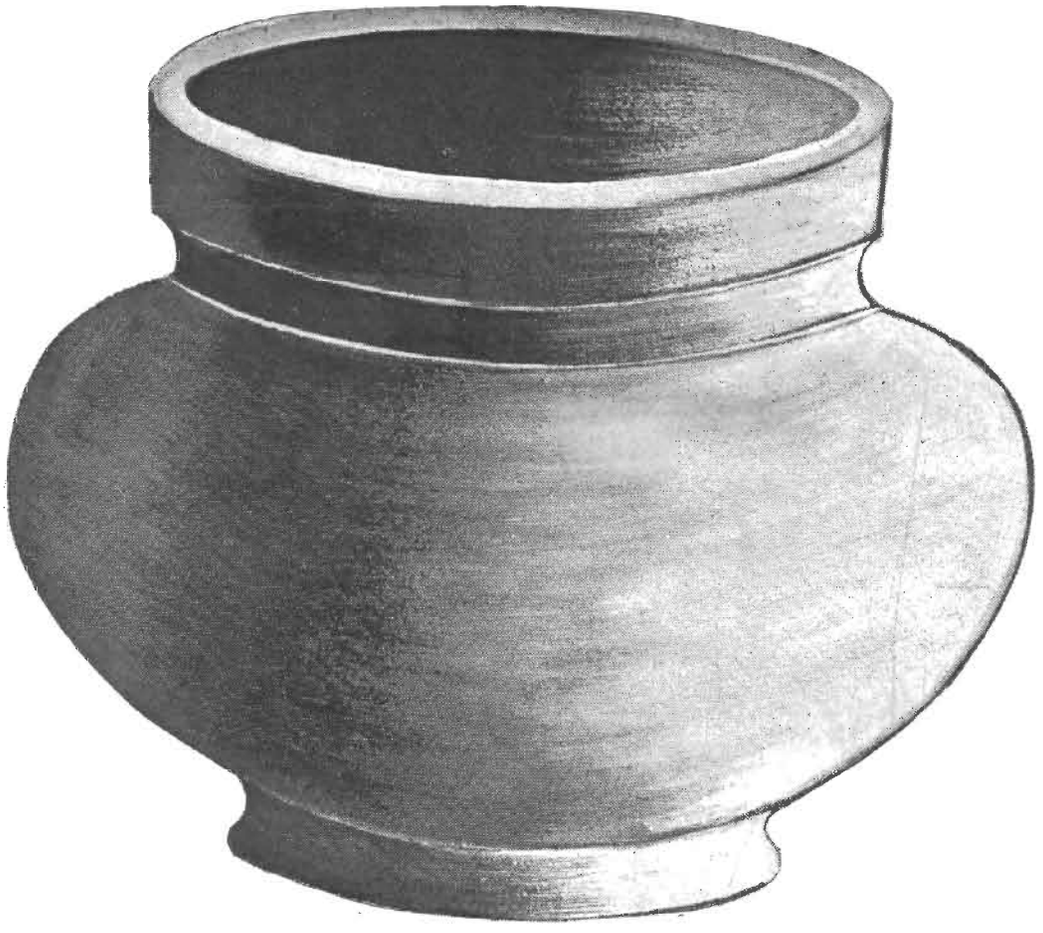
Vengala Panai (Bell-Metal)



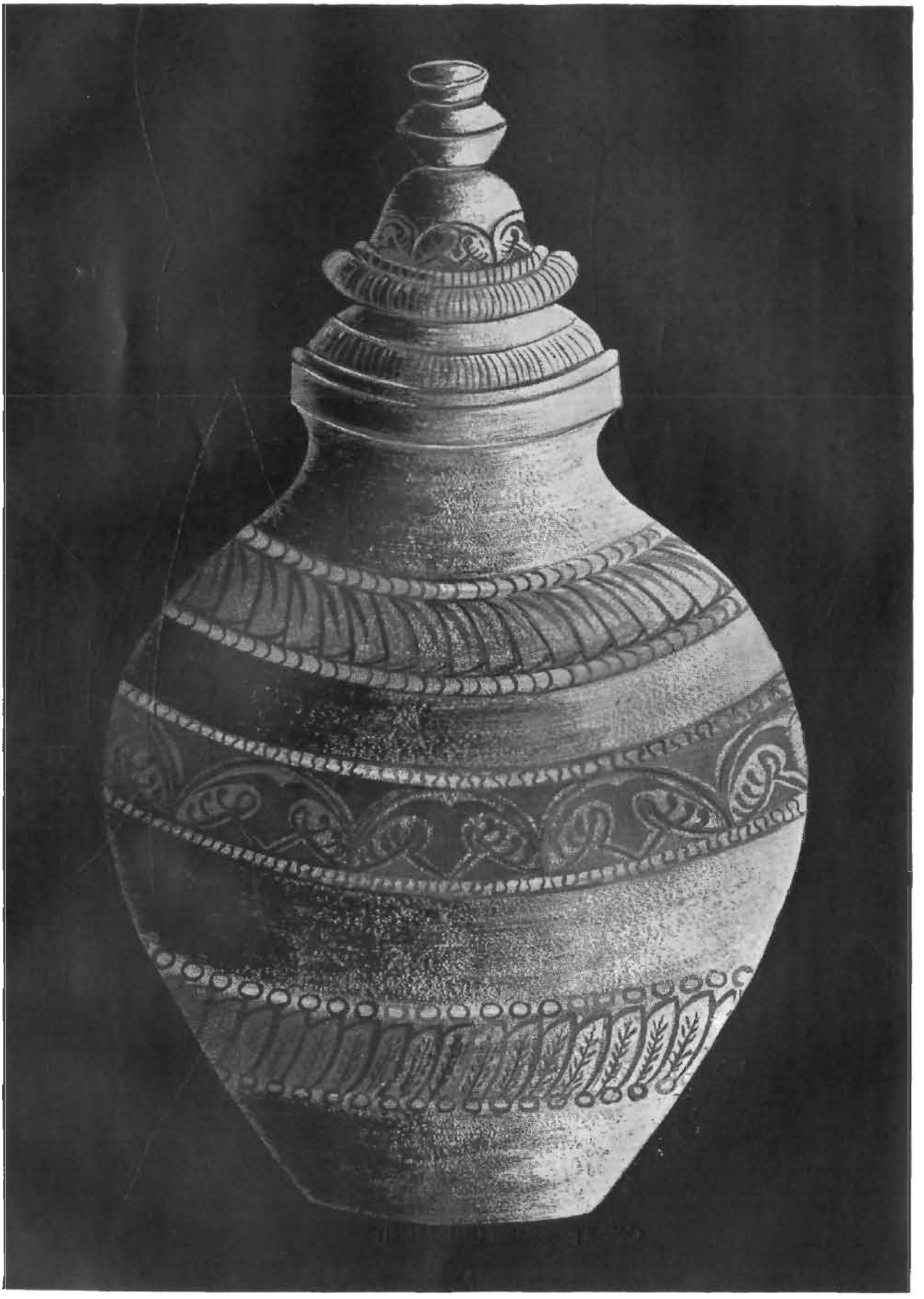
Milk Chembu covered with a lid (Bell-Metal)



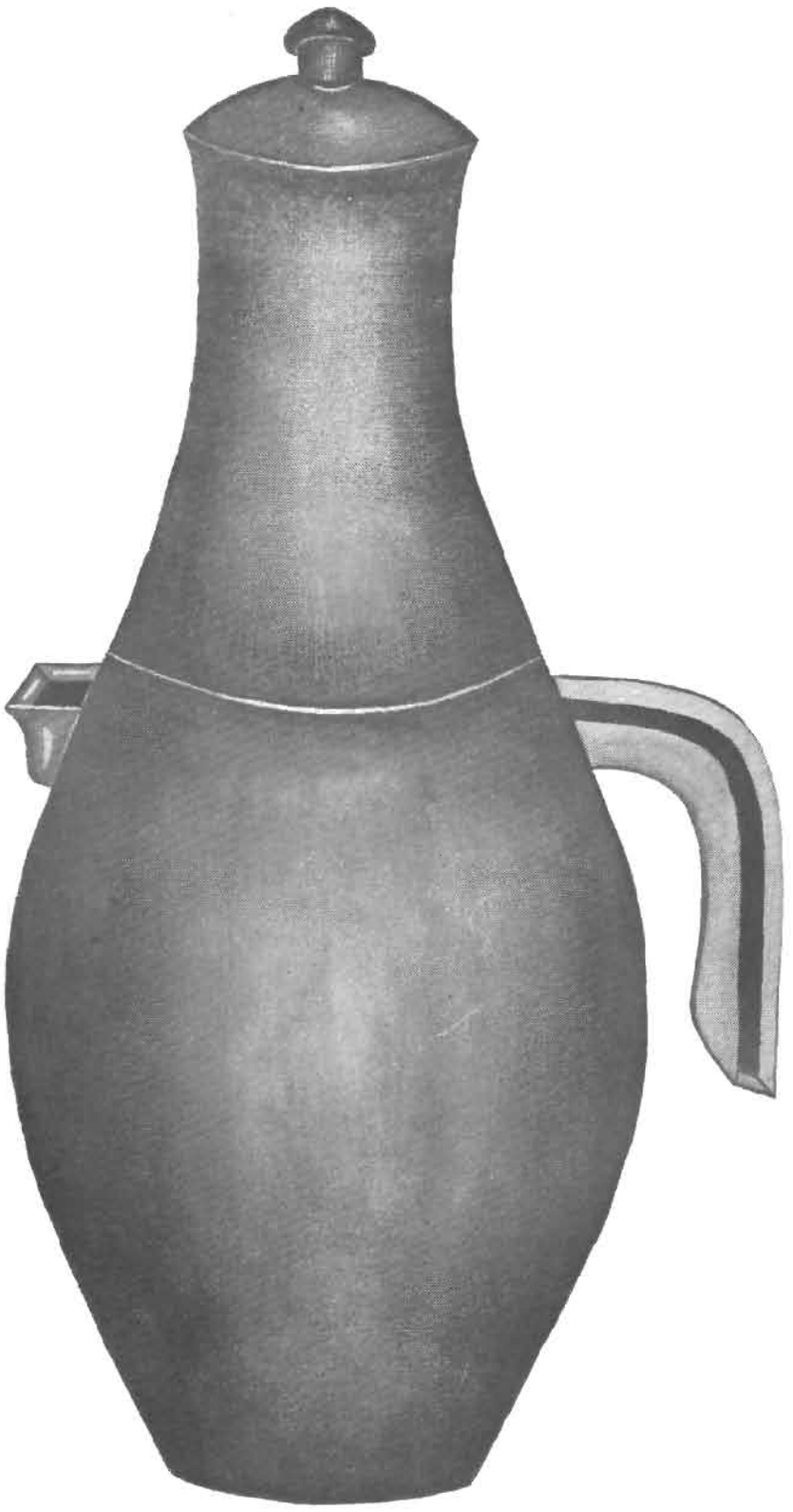
Milk Chembu (Bell-Metal)



Milk Chembu (Brass)



Kumba Deepam (Bell-Metal)



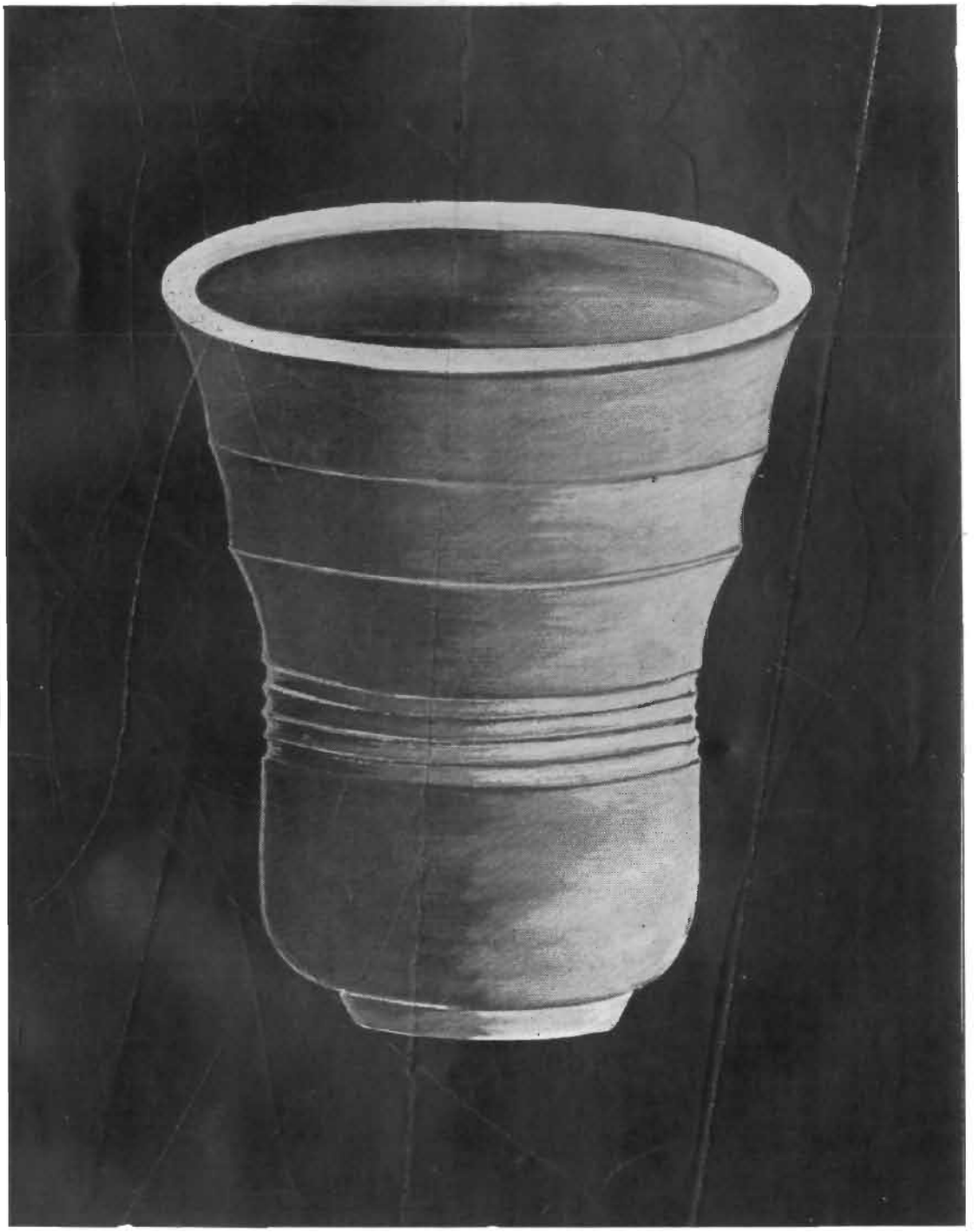
Coffee percolator (Bell-Metal)



Gindy (Bell-Metal) used in temples



Tumbler (Bell-Metal



Tumbler (Brass)



Coffee Kooja of Mundri Design

APPENDIX I

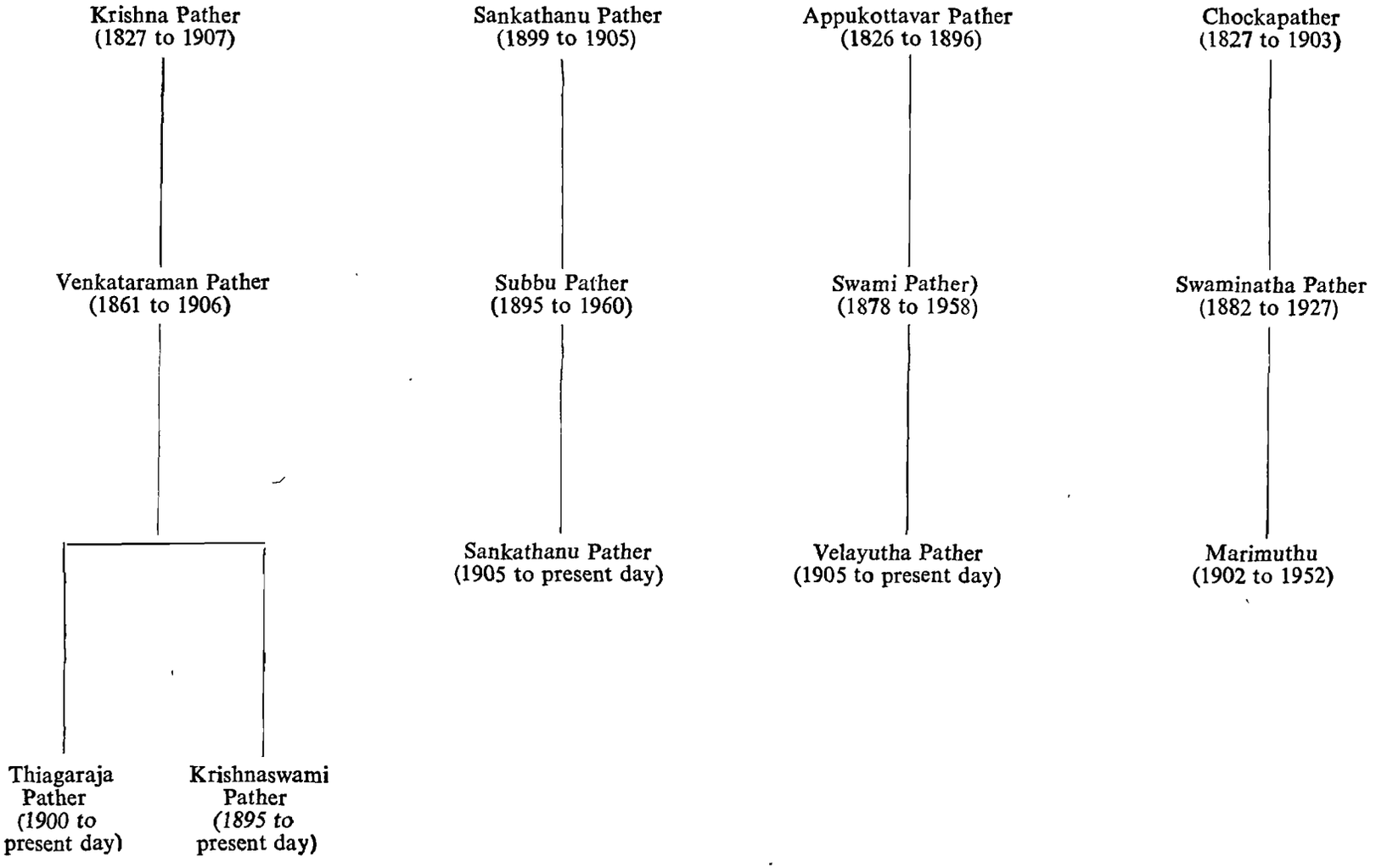
Annual Production of Brass and Bell-Metal Wares

The approximate annual value of production in these districts where this craft is practised is as follows :—

Name of the District	*Name of the Taluk*	*Name of the place*	*Value of production*
			Rs.
1. North Arcot	Wandiwash	Melvankaranai	500
		Melnandiambadi	5,400
	Walajapet	Arcot Town	20,000
2. Madurai	Madurai	Poiakaraipatti Kallupatti Block	10,000
	Tirumangalam	Silamalaipatti	6,000
3, Tiruchirapalli	Lalgudi	Manakkal	21,000
		Sirudaiyur	84,000
4. Thanjavur	Sirkali	Maharajapuram	500
	Kumbakonam	Nachiarkoil	10,17,000
		Innambur	3,000
5. Ramanathapuram	Tiruppattur	Tiruppanavayal	...
		Pallathur	60,480
	Sivaganga	Nattarasankottai	3,600
6. Tirunelveli	Tenkasi	Alangulam Block, Keelaveeranam, Ayyakulam, Nettur, Alangulam	20,000
		Tenkasi village, Sundarapandya-puram	5,000
7. Kanyakumari	Agastheeswaram	Nagercoil	1,00,000

APPENDIX II

Migration of Pathers from Nagercoil to Nachiarkoil in 1857



APPENDIX III

Main and Subsidiary Materials

Main Materials

Name of the materials	Use of the material	From where it is imported	Cost of the materials	How it is made
1	2	3	4	5
			Rs.P.	
1. Copper	For mixing alloys like bell-metal, brass and bronze	S. T. C.* and Servicing Corporation, Administrative Office, Industrial Estate, Guindy, Madras.	1 K. 4.45	Copper is taken from ores and purified in furnaces in factories.
2. Tin	It is mixed with copper for producing bell-metal and also for tin soldering	do	1 K. 12.88	Tin ,,
3. Zinc	It is mixed with copper for producing brass	do	1 K. 1.30	Zinc ,,
4. Aluminium	A small quantity is included for easy flow of molten brass ,for box moulding	do	1 K. 4.93	Aluminium ,,
5. Lead	For bell-metal it is mixed with copper and tin and also for joining purposes	do	1 K. 2.04	Lead ,,
6. Thera (old vessels)	Old vessels are cast and melted to be poured into the new moulds	Locally and in all the Southern States	1 K. 3.68	It is made by mixing various alloys and pouring the molten metal in the moulds
Subsidiary Materials				
1. Coke	To heat the furnace in order to help copper, zinc, aluminium and other metals to melt	Tiruchirapalli	1 K. 0.12	It is extracted from underground and Tar is removed from it
2. Charcoal	do	Locally and Amanakanthondy Tiruchy Dt.	1 lb. 0.10	Trees are cut, set fire to and then covered with sand; after some years they are taken out.

* State Trading Corporation.

APPENDIX - III (Contd.)

Subsidiary Materials

Name of the material	Use of the material	From where it is imported	Cost of the material		How it is made
1	2	3	4		5
				Rs.P.	
3. Cowdung cake	It is used to heat the wax mould as well as to extract the wax	Locally	1 cake	0.03	It is prepared by adding straw and paddy husk
4. Firewood	To burn the furnace	Locally	1 Md.	0.87	By cutting the trees
5. Hydrochloric Acid	It is used for cleaning the metal before soldering	Kumbakonam Chemical shops	1 ounce	0.06	
6. Bees wax	Moulding purposes, for preparing wax with dammer and castor oil for wax mould process	Locally	1 Viss	1.80	By melting natural bee-hives
7. Mud	For moulding and preparing cores, Karus and loam moulding	Locally	1 cart load	1.00	Collected from natural sources
8. Dammer	Mixing with bees wax and castor oil for wax moulding purpose	Locally	1 K.	1.56	A resin derived from one of the coniferous trees
9. Castor oil	Mixing with bees wax for wax process	Locally	1 Seer	0.62	Extracted from Castor seed
10. Old cloth	To wrap the iron and the inner core	Locally	1 lb.	0.16	Manufactured in the Mills with Cotton
11. Salamoniac	It is a flex for soft soldering	Locally	280 gms	0.50	It is prepared in chemical factories
12. Bricks	For building the furnace with fire clay and preparing the parting sand	Kumbakonam	1 Brick	0.10	Prepared mud is baked in the kilns
13. Lubricating oil	For lubricating the bearings	Locally	1 Litre	2.24	A by-product of petroleum
14. Polishing soap	To polish the finished articles by way of rubbing over the buff which is run at a high speed	Madras	1 lb.	2.50	It is manufactured in factories
15. Fire clay	It is used for constructing the furnace	Tiruchy	1 K.	0.25	It is manufactured in factories
16. Shellac	For holding the article in place while turning or burnishing	Tiruchy	1 lb.	1.50	It is made by mixing bees-wax and white dammar in equal proportions along with lac and liquor ammonia.

APPENDIX—IV

Tools

	Name of the tool	Name of the tool maker	Name of the place where it is manufactured	Length, Breadth and height of the tool	Cost of the tool	Use of the tool
	1	2	3	4	5	6
1.	Spade	Blacksmith & Carpenter	Local	11″ x 9″ x 1/8″ Handle 24″	Rs. 3·75	Used for mixing sands
2.	Shovel	,,	,,	,,	Rs. 20·00	,,
3.	Mallet	Carpenter	,,	1 foot 2″ dia.	Rs. 1·00	To beat the mud to make it soft.
4.	Mortar & pestle	Foundry	Factories	9″ x 5″ dia.	Rs. 11·00	,,
5.	Sieves	Tinsmith, sheet metal worker	Local	12″ dia	Rs. 1·12	To sieve the sand for refining.
6.	Iron pan	Blacksmith	Local	12″ dia	Rs. 3·00	To carry the sands
7.	Grinding stone	Stone mason	Local	18″ x 12″ x 4″	Rs. 8·00	To grind the rough sand to make it finer.
8.	Broom-stick	In own homes	Local	3 feet	Re. 0·25	To sweep the sand and metal dust.
9.	Water sprinklet	Tinsmith	Local	12″ x 9″	Rs. 7·50	To spray water over the sand.
10.	Water container	Brass workers	Local	12″ x 12″	Rs. 14·00	To preserve water for moulding purposes.
11.	Moulding wooden box	Carpenter	Local	Of various sizes	Rs. 4·00 to 8·00	To mould the articles by filling the boxes with various sands.
12.	Rammer	Carpenter	Local	(Mallet pattern) 1 foot	Rs. 1·80	To ram the sand during box moulding.
13.	Leveller	Metal worker	Local	18″ x 1″ x 1/8″	Re. 0·75	To level the sand over the surface of the moulding boxes.

APPENDIX IV (Contd.)

	Name of the tool	Name of the tool maker	Name of the place where it is manufactured	Length, Breadth and height of the tool	Cost of the tool	Use of the tool
	1	2	3	4	5	6
14.	Runner	Carpenter	Local	Different patterns	Re. 0·03	To connect the mouth and cavity for the molten metal to flow in.
15.	Runner cleaner	Blacksmith	Local	6″ x ½″ x 1/8″	Re. 0·50	To strengthen the runner way and to avoid the mud from becoming loose.
16.	Leveller	Blacksmith and Carpenter	Local	3″ x 1″	Re. 0·75	To level the surface of the moulding box.
17.	Cleaner	Blacksmith	Local	9″ x ½″	Re. 0·31	To clean the interior parts of the mould in the moulding box.
18.	Charcoal hearth	Blacksmith	Local	6″	Rs. 1·03	To heat the wax turning tool & also to melt the wax.
19.	Wax melting pot	Potter	Local	15″	Re. 0·75	To melt the wax (bees wax, dammer, and castor oil)
20.	Wax pouring vessel	Metal worker	Local	18″	Rs. 14·00	To pour the melted wax in the vessel.
21.	Spatula	Blacksmith	Local	4″	Rs. 3·00	To remove the impurities which flow on the surface of the molten metal.
22.	Iron ladles	Blacksmith	Local		Rs. 1·75	To take the molten metal and to pour it over the moulds.
23.	Filter cloth		Local			For filtering the melted wax.
24.	Wax turning rod	Blacksmith	Local	3 feet	Rs. 1·50	The rod is used to mix the wax during melting.
25.	Core mandle	Blacksmith & Carpenter		Of various sizes	Rs. 2·50	To turn the rough mould and also to coat the mould with the wax.

APPENDIX IV (Contd.)

Name of the tool	Name of the tool maker	Name of the place where it is manufactured	Length, Breadth and height of the tool	Cost of the tool	Use of the tool
1	2	3	4	5	6
26. Core turning tool	Blacksmith & Carpenter	Local	Of various	Re. 0·50	To smoothen the surface of the mould.
27. Wax turning tool	Blacksmith	Local	12″	Rs. 2·00	For turning the wax to the required shape.
28. Hand tongs	,,	Local	12″ to 18″	Rs. 2·50	To lift the heated articles.
29. Crucible tongs	,,	Local	18″ to 5 feet	Rs. 6·00	To take the heated crucibles and to pour the metal into the moulds.
30. Crucible lifting tongs	Blacksmith	Local	18″ to 5 feet	Rs. 15·00	To lift the big sized crucibles from the furnace.
31. Poker	,,	Local	6 feet	Rs. 3·00	To pound the coke in the furnace.
32. Burnishing tools	,,	Local	Of various sizes	Rs. 2·50	To burnish the ornamental brass and bell-metal articles by turning on the lathe.
33. Chisels	Blacksmith & Carpenter	Local	Of various sizes and shape	Rs. 1 to 3·00	Used for chipping the extra metal from the surface of the article.
34. Hammers	,,	Local & Company	,,	Re. 0·50 to Rs. 4·00	For beating over the chisels and punches and to remove the pin points etc.
35. Files	Company	,, Local	Of various sizes and shape	Re. 0·36 to Rs. 10·00	For removing the extra metal sticking to articles and to make the surface smooth.
36. Hacksaw frame and blade	,,	,,	12″	Rs. 13·00	To cut the metal.
37. Scrappers	Blacksmith	Local	6″ to 12″	Rs. 2·00	To remove the extra metal from the surface.
			4″ to 6″	Re. 0·50 to Rs. 1.50	,, ,,

APPENDIX IV (Contd.)

	Name of the tool	Name of the tool maker	Name of the place where it is manufactured	Length, Breadth and height of the tool	Cost of the tool	Use of the tool
	1	2	3	4	5	6
38.	Punches	Blacksmith	Local		Rs. 1·50	To make holes in the centre.
39.	Drills	Firms	Company	1/16″ to 1 foot	Rs. 190·00	Used for drilling holes.
40.	Taps and die	Firms	,,	¼″ to 1 foot	Rs. 800·00	To make internal and external threads
41.	Steel scale	Company	,,	12″	Rs. 2·75	To measure the finished articles.
42.	Outside caliper	,,	,,	6″	Rs. 4·00	To measure the outside diameter of the cylindrical articles.
43.	Inside caliper	,,	,,	6″	Rs. 4·00	To measure the inside diameter of the holes.
44.	Jenny caliper	,,	,,	6″	Rs. 7·50	To draw parallel lines and to find the centre of a round surface.
45.	Divider	,,	,,	6″	Rs. 8·00	To divide equal parts and to draw circles.
46.	Scriber	,,	,,	6″	Rs. 2·00	To draw lines adjoining straight edges.
47.	Surface plates	,,	,,	12″ x 12″	Rs. 100·00	To mark parallel lines and to test the surface.
48.	V. Blocks with clamps	,,	,,	2″ 1½″ x 1½″	Rs. 48·00	Used for marking cylindrical articles.
49.	Surface Gauge	,,	,,	9″	Rs. 50·00	To draw parallel lines and to test the surface plate.
50.	Screw pitch Gauge	,,	,,	Of various sizes	Rs. 10·75	To count the threads.
51.	Depth Gauge	,,	,,	,,	Rs. 18·00	To measure the depth of the bores.

APPENDIX IV (Contd.)

Name of the tool	Name of the tool maker	Name of the place where it is manufactured	Length, Breadth and height of the tool	Cost of the tool	Use of the tool
1	2	3	4	5	6
52. Iron plane	Company	Company	9″	Rs. 45·00	For giving the wooden planks a smooth surface.
53. Primer chisels	,,	Factories	¼″ to 1½″	Rs. 18·00	To remove the extra wood from the planks.
54. Handsaw	,,	,,	12″ to 18″	Rs. 5·75	To cut the wood and planks.
55. Marking Gauge	,,	,,	Of various sizes		To draw parallel lines.
56. Trisquare	,,	,,	6″ to 12″	Rs. 11·50	To draw perpendicular lines and to test right angles.
57. Oil stone	,,	Carborandum Universal company	6″ to x 2″ x 1″	Rs. 7·00	To sharpen the chisels.
58. Marking pin	Blacksmith	Local	6″	Re. 0·50	To mark the lines.
59. Marking chisel	Company	Factories	1/8″ to 3¼″		To make rectangular holes in wood.
60. Two feet four fold scale.	,,	,,	24″	Rs. 5·00	To measure the planks.
61. Turning tools	Blacksmith	Local	Of various sizes	Each Rs. 6·00	Used for inner and outer turning and also for threading inner and outer surface.
62. Knurling tool	Company	Factories	,,	Rs. 45·00	To cut knurls and to afford good grip for use on the metal turning lathe.
63. Engraving tools	Blacksmith	Local	Of various sizes and shapes	Rs. 0·50 to Rs. 2·00	Used for engraving and ornamental work.

APPENDIX IV (Contd.)

Name of the tool	Name of the tool maker	Name of the place where it is manufactured	Length, Breadth and height of the tool	Cost of the tool	Use of the tool
1	2	3	4	5	6
64. Crucibles	Company	Factories Nos. 1 to 100	Of various sizes	Rs. 2·00 to Rs. 20·00	For melting the metal in the furnance.
65. Bench vice	Company	Factories	,,	Rs. 2·00 to Rs. 35·00	To grip the metals for chipping, filing threading and cutting etc.
66. Hand vice	,,	,,	36″	Rs. 2·00 to Rs. 4·00	To grip small articles for filing.
67. Hand drilling machine	,,	Firm	1/16″ to ¼″	Rs. 15·00	For drilling small holes by hand.
68. Snips	,,	,,	6″ to 12″	Rs. 12·50	To cut the sheets to the required size.
69. Soldering iron	,,	,,	12″	Rs. 3·00	It is used for joining two pieces of metals by soldering.
70. Round nose plier	,,	,,	6″	Rs. 2·75	Used for removing the runner during the time of box moulding.
71. Stakes	,,	,,	Assorted sizes	Rs. 5·00	Used for removing the pin points and bends.

APPENDIX V

Designs

Name of the craft	Name of the village	Old traditional designs	Modern designs	Who gives the design	Foreign or Native
1	2	3	4	5	6
Brass and Bell-metal Industry	Nachiarkoil	Vengala Panai Kuthuvilakku with Annai Prabai Mayura Deepam Naga Deepam Rishaba Deepam Hamsa Deepam Suriyapadam Chandrapadam Mundhiri Kooja Branching camphor plates with Yali branches Peacock bunching bell Thundamani Vilakku with Peacock prabai Vasamalais	Picnic Carrier Rice bowl with ornamental flowers Bathi stand with flower design Tiffin and Coffee kooja Paper weight Dragon	Self or temple authorities	Native

APPENDIX VI

Tools, Machinery and its Parts

Name of the machinery	From where imported	Cost of the machinery	Measurement of the machinery	No. of horse power	Use of the machinery
1	2	3	4	5	6
		Rs.Ps.			
1. Fan Blower	Madras	780.0		0·33 H.P.	To supply air to the furnace for melting the metals.
2. Metal turning lathe	Company	3,520.0	4½′	1·00 ,,	Used for surfacing, boring, screw cutting, and turning etc.
3. Grinder	Company	1,040.0	,,	1·50 ,,	To sharpen the tools and to grind the extra metal.
4. Drilling Machine	,,	1,200.0	,,	1·00 ,,	To drill holes of various sizes.
5. Burnishing lathe	,,	850.0	4′	½ ,,	Used for turning the curved ornamental and cylindrical articles by way of using special types of tools employing hand pressure.
6. Polisher	,,	1,800.0	,,	3 ,,	Used for polishing the finished articles by way of rotating at high speed with cloth mop.
7. Oil fired furnace	,,	2,000.0	,,	2 ,,	It is a medium sized economical furnace used for melting the metal quickly.

APPENDIX VII—A

Cost of Production of Brass Metal Ware (in rupees)

Name of the articles	Size	Brass (Kilo)	Value	Firewood and Charcoal	Return metal	Casting and moulding	Fitting Drilling and casting	Turning	Polishing	Final Polishing	Iron rod, plank, paint and screws	Electricity charge & Machinery depreciation	Cost price	Selling price	Profit	No. of workers	Hours
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Kuthuvilakku	11″	2.577	11.73	0.63	5.86	0.35	0.25	0.40	0.25	...	...	0.25	8.00	8.50	0.50	1	6
2. Small Vasamalai	26 x 23	7.711	32.06	4.50	14.09	4.00	3.00	10.00	1.00	2.00	2.60	9.00	54.07	80.00	25.93	2	56
3. Paper weight Dragon	3″	500 (grams)	1.70	0.35	0.62	0.37	0.75	0.37	0.19	0.12	...	0.12	3.35	4.00	0.65	1	3¼

APPENDIX VII—B

Cost of Production of Bell-Metal Wares (in rupees)

Name of articles	Seers	Bell-metal (Kilo)	Value	Brass (Kilo)	Value	Charcoals & other consumers	Wax	Cowdung cake	Old cloth and oil	Return metal	Wages for all processes	Electricity charge & machinery depreciation	Cost price	Selling price	Profit	No. of workers	Hours
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Mundhiri Kooja	$5\frac{5}{8}$	2.772	18.12	2.27	0.78	1.50	1.50	0.25	...	8.50	9.85	1.50	25.00	28.00	3.00	1	24
2. Pooja Bell	$2\frac{1}{4}$	500 (grams)	4.32	300 (grams)	1.25	0.65	0.25	0.06	0.06	1.00	1.25	7.70	7.54	8.40	0.86	1	2.30
3. Tumbler	1	560 (grams)	4.86	...	...	0.50	0.75	0.12	...	2.00	0.87	0.50	5.46	5.97	0.50	1	2
4. Milk Chembu	4	1.418	8.97	...	...	0.75	0.87	0.19	...	2.78	6.00	1.00	15.00	16.50	1.50	1	24

APPENDIX VIII

Name of the Factory Owners, Number of workers and Year of Establishment

Sl. No.	Name of the Factory Owners	Total No. of workers	Motors of various H. P.* used	Year of establishment	Total value of production per year (in rupees)
1	2	3	4	5	6
					Rs.
1.	K. N. Mani Odayar	19	1 H. P. 4 Motors	1959	1,60,000
2.	K. N. Mani Odayar	3	1 H. P. 1 „	1962	600
3.	Ambika Vilas	7	5 H. P. 1 „	1942	50,000
4.	Swaminatha Pather S.	6	1 H. P. 4 „	1958	3,000
5.	N. Md. Ibrahim	8	1 H. P. 1 „		15,000
6.	Subramania Pather P.	6	1 H. P. 2 „	1955	10,000
7.	Ramachandra Pather S.	9	1 H. P. 1 „	1942	15,000
8.	Vydhialinga Pather K.	3	½ H. P. 1 „	1960	2,000
9.	Ranganathan Achari N.	2	1 H. P. 1 „	1962	2,000
10.	Manikka Pather S.	4	1 H. P. 2 „	1960	3,500
11.	Ramalinga Pather N.	4	1 H. P. 2 „	1959	6,000
12.	Subhia Pather	7	1 H. P. 4 „	1954	1,50,000
13.	Chidambara Pather	8	1 H. P. 2 „	1954	12,000
14.	Govindaswami Thevar N.	6	1 H. P. 1 „ ¾ H. P. 1 „ ½ H. P. 1 „	1956	4,000
15.	Swaminatha Pillai	1	Cart Wheel	1947	600
16.	Subramaniam N.	8	1 H. P. 1 Motor	1954	13,000
17.	Govindaswami Pather S.	3	Hand driven cart wheel	1962	1,000
18.	Chakrapani	2	„	1962	1,000
19.	Chokalinga Pather A.K.S.	3	5 H. P. 1 Motor	1939	30,000
20.	Govindarajulu Chettiar N.K.R.	10	3 H. P. 1 „ 1 H. P. 2 „	1939	50,000
21.	Muthayyan	3	Hand driven cart wheel	1956	2,500
22.	Thangavelu Pillai	4	2 H. P. 1 Motor	1959	7,000
23.	Govindaswami Pather K. C.	3	½ H. P. 1 „	1959	10,000
24.	Rajamanikkam	10	2 H. P. 1 „	1957	46,000
25.	S. Ramakrishna Pather	11	5 H. P. 1 „	1956	50,000
				Total	6,44,200

* Horse Power

APPENDIX IX

Skilled artisans in brass and bell-metal industry

1. Chinnaswami M.
2. Arunachala Pather P.
3. Chitambara Pather P.
4. Ramachandra Pather S.
5. Govindaswamy Pather S.
6. Swami Natha Pather S.
7. Iyyaver Pather
8. Money S.
9. Ramiah Pather
10. Tangavelu Pillai
11. Krishmoorthy
12. Nadara Pather
13. Gopalaswamy Pather
14. Jayarama Pather N.
15. Ramalinga Pather N.
16. Subramania Pather N.
17. Ramakrishna Pather S.
18. Tangavelu Pather M.

APPENDIX X

Average value of Assets of a family (brass metal)

House	Rs. 400/-
Dry land	...
Wet land	Rs. 5,000/- three familes
Machinery	Rs. 1,000/-
Cart	Rs. 200/-
Furniture	Rs. 10/-
Jewels	Rs. 50/-
Share Deposits	Rs. 10/-

Average monthly income of some of the artisans of the villages

Hand loom weaving	...
Blacksmith	Rs. 100/-
Carpenter	Rs. 70/-
Goldsmith	Rs. 100/-
Tailor	Rs. 60/-
Pottery	...
Dhobi	Rs. 50/-
Bell-Metal	Rs. 60/-
Brass-Metal	Rs. 50/-

APPENDIX X Contd.

Average income of a family per year

Brass and Bell-metal wares	Rs. 2,000/-(Workshop owner)
Priest-hood	Rs. 500/-
Agriculture	Rs. 2,000/-
House	Rs. 3,000/-
Merchants	Rs. 4,000/-

Average expenditure of a family per year

Food	Rs. 1,000/-
Marriage	Rs. 500/-
Festival	Rs. 100/-
Clothes	Rs. 100/-
Medicine	Rs. 25/-
Death	Rs. 100/-
Repair	Rs. 100/-
Rent	Rs. 60/-
Fuel	Rs. 30/-
Education	Rs. 100/-
Luxury	Rs. 500/-