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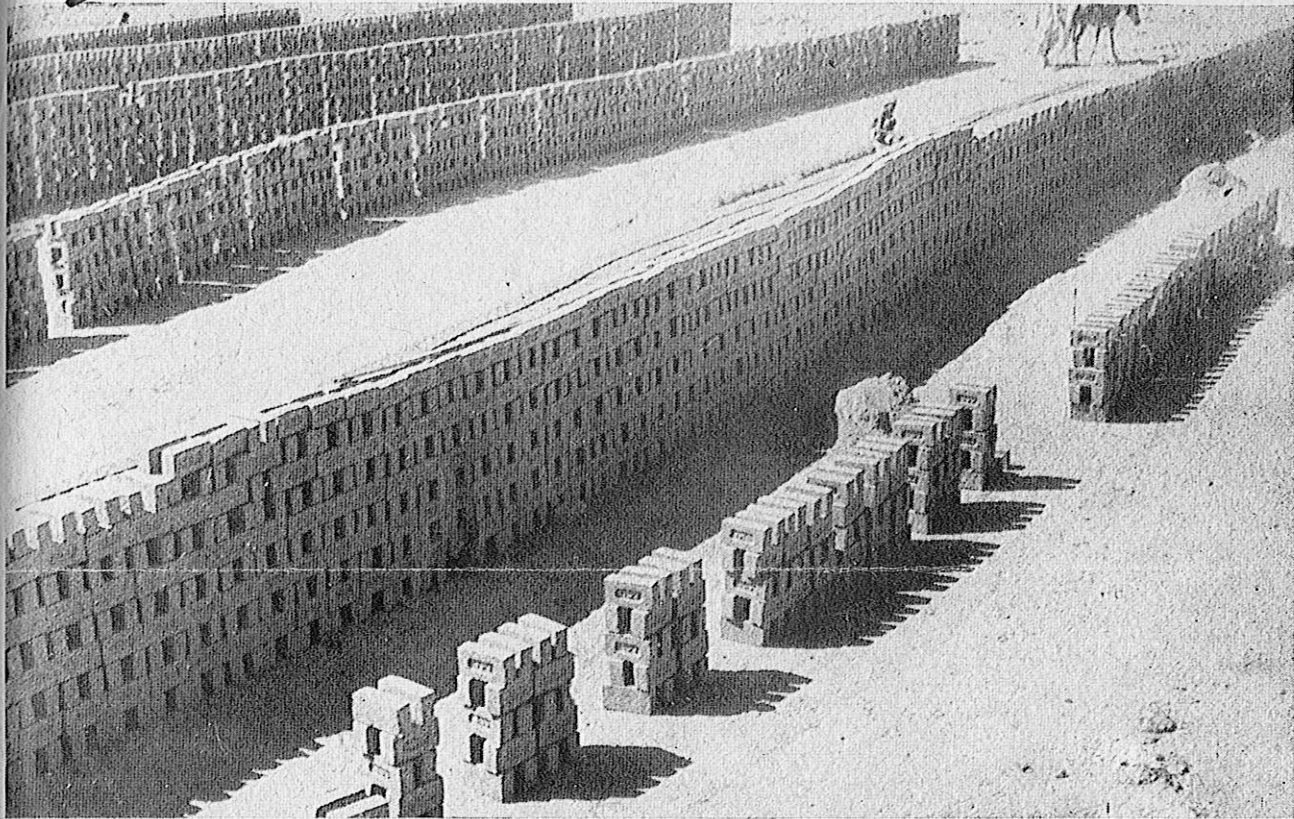


Figure 1. Moulding and drying ground.

# A Scientist Describes The Manufacture Of Bricks In India

Brick is one of the most important building materials in India and its manufacture and consumption are increasing at a fast rate. The impetus given by the successive Five-year Plans has resulted in a phenomenal growth in building activity all over the country.

This has led to a vast demand for bricks which the industry, as it stands today, is able to meet only partially.

As a consequence, brick prices have shown a steep rise over the past few years and, in some cases, there has been a deterioration in the quality of the product.

An analysis of the situation indicates that although production

has increased to about 10,000 million bricks per year, a stage has

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been reached where no substantial increase in output can be effected

within a reasonably short time unless the industry is reorganised on modern lines.

The economic situation in the country precludes mechanisation of this industry on a large scale. However, it is generally conceded that around the larger centres of consumption there is ample scope for setting up mechanised plants and modern kilns, and schemes are al-

ready under way for building several large brick factories in different parts of the country.

Encouragement is also being given for starting brick factories on a co-operative basis in some of the States. In South India, the roofing-tile industry, which, by comparison, is run on vastly more modern lines, is also in a position to undertake mechanised production of bricks.

However, it is generally realised that for several years to come, the present-day method, briefly described below, will continue to be followed in the greater part of the country.

### Raw Materials

Clays used in brick making in India may be divided broadly into two classes, viz. (i) the alluvial deposits of northern and eastern India; and (ii) the black cotton and red soils of the western and peninsular regions.

Making and burning methods vary substantially with the character of the clay. The process described here is essentially the one followed in the alluvial region where nearly 75 per cent. of the country's bricks are made.

### Preparation, Moulding and Drying

The alluvial soil, being soft, is easily won by hand-digging implements. The top soil, to a thickness of about 6in., containing plant roots, etc., is removed and a wide profile is opened up.

The usual depth to which the clay deposit is worked is about 8 to 10ft. The extracted clay is mixed with water at the pit head and left to soak overnight.

It is then pugged by trampling it over with feet, or in animal-driven vertical pug-mills.

The prepared clay is then manually transported to the moulder.

Bricks are commonly moulded by hand. The moulding ground is usually prepared near the clay pit



Figure 2. Pattern of setting of bricks in a Bull's Trench Kiln.

by levelling the area and covering it with fine sand.

The mould is a wooden box with a removable base which carries the frog. It is generally dusted with fine sand before filling with clay, although in some areas slop moulding is also followed.

The clay is first rolled into a clot and then thrown into the mould. The surplus clay is cut off by a wire-bow and the formed brick is released by inverting the mould on the ground and removing first

the base board and then the mould box.

### Leather Hard

The brick thus moulded is allowed to lie flat on its base until it is leather hard and is then placed on a hack for further drying, which may take from 7 to 10 days, depending on weather conditions.

An idea of the moulding and drying grounds may be obtained from Figure 1. Generally a moulder

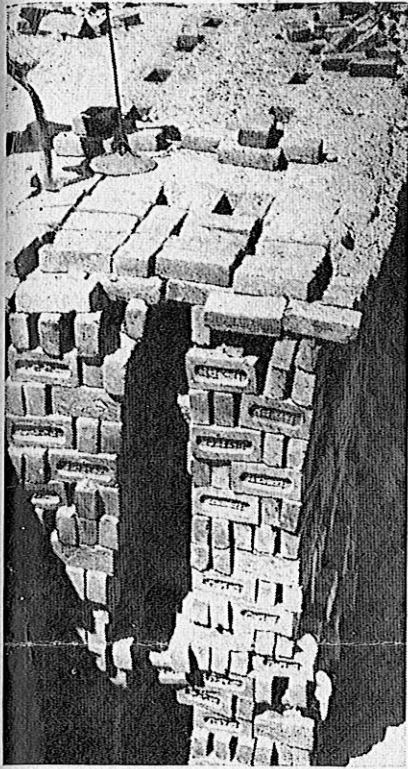


Figure 3. Pattern of setting indicating position of feed-holes and furnaces.

with a helper boy makes around 1000 bricks per day of 8 hours.

Moulding and drying being done entirely in the open, bricks are made only during the dry season extending from November to June.

The dry bricks are transported to the kiln by mule teams.

### The Kiln and Burning

The Bull's trench kiln still remains the only form of continuous kiln used in India for firing common bricks. The kiln consists of two parallel trenches connected at the end in semi-circles.

Each trench is generally about 25ft. wide and 8ft. deep and is sunk below the ground level to half its depth.

The effective burning length is about 450 to 500ft. Such a kiln has an output of 500,000 to 600,000 bricks per circuit, which takes about 40 days to complete.

Bituminous slack is the usual fuel used, the consumption varying

between 4 and 5cwt., per 1000 bricks.

An idea of the pattern of setting can be obtained from Figures 2 and 3. It will be observed that bricks are arranged in columns leaving  $\frac{1}{2}$ in. space between the bricks and about 4in. between the columns to provide passage for the circulation of the hot gases and cooling air.

A row of 23 or 24 columns constitutes a blade, and a space of 10in. is left between successive blades to provide space for the combustion of the fuel.

This space is spanned by bricks at certain heights to provide step-wise platforms which help in preventing the whole of the fuel charged through a feed-hole from dropping on the kiln floor and forming a large heap.

The fuel thus burning at different heights ensures even heating over the entire cross-section of the setting. The top of the setting is closed with a layer of bricks on their flat and the whole is covered with a 6in. layer of ash and earth.

The feed-holes are covered by cast-iron caps. Draught is pro-

vided by a pair of lightweight sheet iron chimneys each about 30ft. high (Figure 4).

### Dampers Fixed

The chimneys are positioned over open feed-holes and are shifted periodically as the fire travels forward. At a certain distance behind the chimneys, sheet iron dampers are fixed across the setting to seal the air passages and to separate the loading and the firing sections.

When starting the fire, a temporary cross-wall with furnaces at the foot of it is constructed at a distance of 10in. from the first row of bricks.

At the bottom of the furnaces, bricks are arranged to form grates over which coal is burnt. Initial firing can also be started with wood, coal being charged only when the bricks are sufficiently hot.

Firing in the temporary furnaces is continued till the first row of bricks is brought up to red heat and there is good bottom heat in the furnaces beyond the first row. Top feeding of fuel is then begun,  $\frac{3}{4}$  to 1lb. of coal being charged per feed-hole every 15 minutes, and this

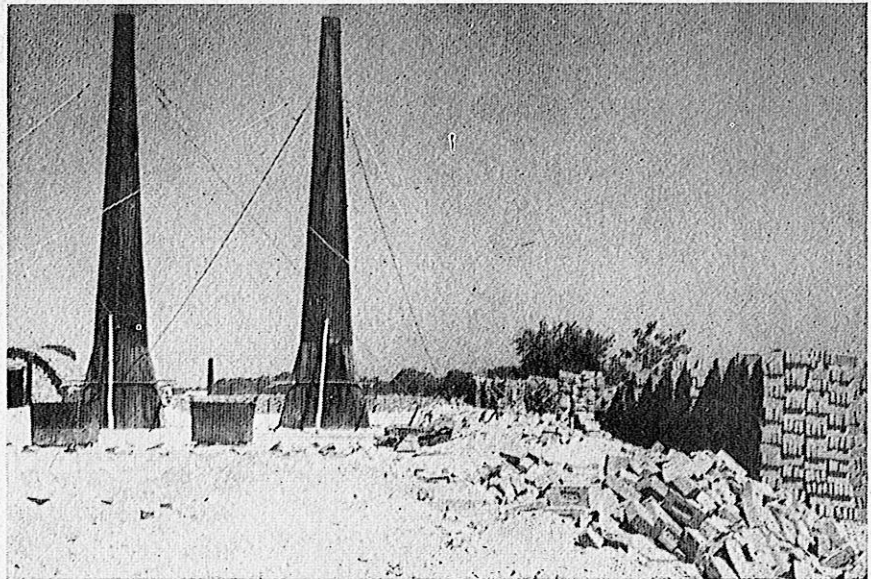


Figure 4. Top view of the kiln indicating position of chimneys.

is gradually raised to  $1\frac{1}{4}$  to  $1\frac{1}{2}$ lb. when sufficient bottom heat has been attained.

### **Regular Cleaning**

The fuel bed in the furnaces is cleaned at regular intervals by introducing long pokers through the feed-holes, thus preventing accumulation of unburnt coal on the floor.

There being no adjustable dampers to regulate the draught, the distance maintained between the firing zone and the chimneys is of importance.

In the initial stages a distance of 15 to 20ft. is maintained. When the kiln is brought up to full firing order and a strong draught is established, the chimneys are shifted further along the kiln to maintain a distance of from 30 to 50ft. between the chimneys and the fire.

The end of the firing along a row is judged by visually estimating the temperature (approx.  $1000^{\circ}\text{C}$ ) of the setting as seen through a feed-hole.

A measure of the "burn" is also gauged by the amount of subsidence of the "roof" of the setting due to the shrinkage of the bricks.

Firing is usually started in the straight portion of the trench and when the fire has travelled round the semi-circular end, drawing of bricks from the cool end is commenced.

Setting, firing, and drawing of bricks are then continued in more or less the same order as is done in the simple Hoffmann kiln.

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