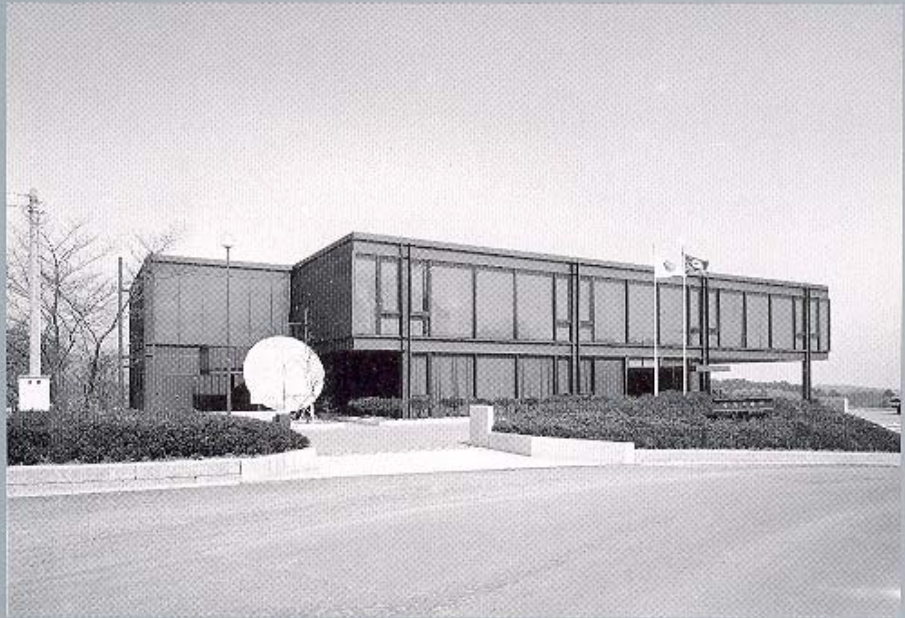


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## Elucidation of Manufacturing Technology Employed to Construct the Body of the Delhi Iron Pillar

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### Abstract

The manufacturing methodology employed to construct the main body of the Delhi iron pillar has been elucidated by critically comparing the vertical and horizontal methods of forging. Several aspects of the manufacturing methodology (hammering, heating, use of inserts, use of dies, handling and surface finishing) have been discussed. The addition of flattened iron lumps on to the side of the pillar with the pillar placed in the horizontal direction appears to be the likely method of manufacture. The use of hand-held hammers for the forging operation is also indicated. Visual evidence and support for the use of horizontal forging technique have been provided and discussed in the text. The possible method of handling the pillar during the manufacturing stage has also been hypothesized. Horizontal and vertical motion of the pillar during manufacturing must have been performed with the use of handling clamps on the pillar, while rotational motion (and also handling) of the pillar must have been aided by the use of rotating pegs inserted in the bottom and top cross sections of the pillar, and also on the sides of the pillar. In the final stage, the exposed surface has been provided the smooth finish and taper by chiseling and burnishing.

### デリーの鉄柱の建造に採用された製造技術の解明

インド、デリーの鉄柱の主体部の製作技術について理論的に考察する。製作は水平・垂直方向への鍛造によるものと考えられていた。鍛打・加熱・挿入物の使用・金型の利用・取扱と表面仕上げなど幾つかの製造技術の理論的な研究により考えて、柱の製作は表面に鉄塊を平らに併せて打ち付けて行く方法が取られていたこと、鍛接には手で打つハンマーが用いられていたこと、製作中に柱を水平・垂直に回転させるのは柱の下と先端の断面に杭を打ちこんで行なったこと、最後にタガネによって表面にテーパが付けられ、平滑にされて磨かれたなどの仮説を提唱する。

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### 1. Introduction

The iron pillar currently situated in the Qutub-ul-Islam mosque (Fig. 1) near the Qutub Minar at New Delhi has been the focus of attention of archeometallurgists and corrosion technologists for a long time due to its excellent corrosion resistance. Sanskrit inscriptions (which are clearly visible with no signs of corrosion

damage) on the pillar indicate that it was commissioned by one king *Chandra* to commemorate his victories and was originally erected as a *garudstambh* in a Vishnu temple somewhere in North India<sup>(1)</sup>. There are several historical<sup>(2)</sup>, archaeological<sup>(3)</sup> and numismatic<sup>(4)(5)</sup> evidence to point that this king was Chandragupta Vikramaditya II (375-415 A.D.), one of the important monarchs of the Gupta