of the bridge at Perpignan have been derived from an interesting account of the work published in the *Annales du Génie Civil*. The account referred to was written by M. A. de Basterot, who was one of the engineers engaged on the work, and who estimates that in the case of shafts of about 26 ft. in height, the cost, if they are constructed of brickwork, is only about half that which would be incurred if they were made of iron, the same process of sinking being, of course, supposed to be adopted in the two cases.

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**APPARATUS FOR SINKING SCREW PILES.**

**Plates XCI. and XCII.**

Plates XCI and XCII illustrate a machine which was designed in 1869 by Mr. P. Brotherhood, of the then firm of Messrs. Kittoe and Brotherhood (now Brotherhood and Hardingham), at the request of Mr. H. Lee Smith, chief engineer for the Punjab Northern Railway, for screwing down the piles to be used in constructing bridges and flood openings on that line of railway.

This machine consists of a wrought-iron under-carriage mounted on wheels of 5 ft. 6 in. gauge, and carries a vertical boiler at one end. A strong cast-iron beam in the centre carries a cylinder in which works a ram, to the top of which there is bolted a strong cross beam carrying the machinery for operating on the piles.

This consists of a horizontal steam-engine bolted to the side of the cross beam, and driving a pinion and train of spur and bevel wheels which impart motion to two large horizontal wheels carried in bearings at each end of the cross beam. A friction clutch is carried in the centre of each of those wheels, through the boss of which the shaft of the pile to be screwed is passed. The shafts are rolled with feathers or ribs on each side, which feathers, passing through corresponding recesses or key-ways formed in the boss of the friction clutch, afford the means of imparting the rotary motion from the horizontal wheels to the piles.

Steam is brought from the boiler through the centre of the ram and cylinder which carries the cross beam by means of a telescope joint, as shown in the annexed figure, this arrangement allowing the ram to be raised without interfering with the steam pipe; and a small donkey engine is provided which can pump from a tank situated between the frames, either into the boiler, or into the cylinder under the ram which carries the cross beam. When the engine is at work the cross beam is held firmly by means of cotter bolts to the frame.

The method of working is as follows: A temporary road being laid on the centre line of the proposed structure, piles are pitched by passing the shafts through