holes left in the finished length of concrete, these holes being afterwards filled up. The depth of the cylinder was 3 ft. 6 in., and the concrete was put in in lengths of 3 ft. 3 in. The apparatus is provided with openings through the platform, so that excavating can be continued below while the upper lengths are being lined. The levelling of the apparatus was rather troublesome, but at the Saint-Etienne Colliery of the Société de l'Industrie Minérale this was made easier by an arrangement which permitted the men on the platform to adjust its level themselves.

Concrete linings of this type are strong and fairly watertight, while they are said to cost on the average only about half as much as a brickwork lining. As an example of what may be done with concrete, which by some is not considered a very promising material, it may be mentioned that at the Charbonnage de Bonne Espérance a shaft was sunk in watery strata with a descending cylinder of concrete, shod with cast iron, and, contrary to the expectations of the engineers, this cylinder showed no signs of failure or cracking. This shaft was timbered temporarily, and finished with a monolithic lining of concrete.

Armoured concrete does not appear to have been used for any important shafts, but a number of small square shafts of diameters from 6 ft. to 14 ft., and depths ranging from 22 ft. to 31 ft., were sunk for the foundations of the Berne Municipal Theatre, and lined in this manner. A diagrammatic plan and section of the lining of these shafts is shown in Fig. 6, in which the armouring is represented by broken lines, and consisted, as will be seen, of horizontal round iron wires, 12 mm.

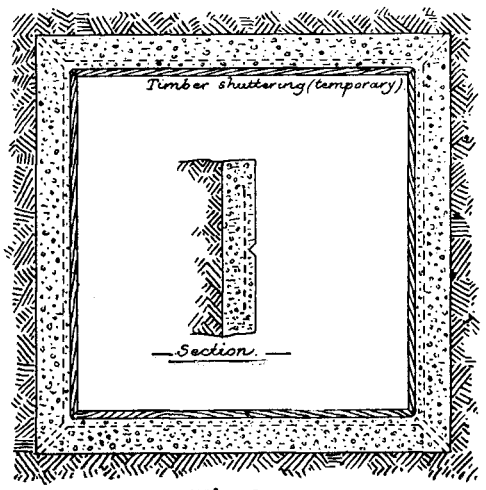

Fig 6.

Armoured Concrete Shaft-lining.

diameter, spaced a small distance apart. The concrete was put in in lengths of 90 cm. (35 in.), and adjacent lengths were tied together by vertical wires 35 cm. (14 in.) long, and hooked at their ends. While the concrete of one length was setting the next length below was excavated. The thickness of this lining was only 15 cm. (6 in.), and it was so light that the friction of the earth against its sides was sufficient to support it while the lower lengths were being excavated. It may perhaps be remarked here that from its extended and successful application on the Continent as a material of construction for a large variety of purposes, armoured or reinforced concrete would seem to merit greater attention than it has hitherto received at the hands of English engineers.

In the appendix which follows will be found—(*a*) the annual reports of the Inspectors of Mines, Wardens, Managers of Government water-races, and that of the Engineer for Water-conservation; (*b*) the questions used at the last examinations of candidates for certificates of competency as mine-managers and battery-superintendents; (*c*) a list of persons to whom certificates as mine-managers, battery-superintendents, and dredgemasters have been issued; and (*d*) the usual statistical returns.

I have, &c.,

JOHN HAYES,

Inspecting Engineer.

The Hon. the Minister of Mines, Wellington.