sible to keep the shafts dry by any amount of pumping power which could practically be brought to bear upon them, and another plan, based upon the peculiar character of the river, was therefore tried. The River Tét is, at Perpignan, about 400 ft. wide, and its bed has a very steep slope. Like other streams taking their rise in the Pyrenees, it is liable, at certain seasons, to great floods, which augment its volume to an enormous extent, and frequently do considerable damage to its banks and the property situated on them. During these floods the water level rises 16 ft. or 20 ft., the rate of the flow increasing to as much as 26 ft. per second, and one of their effects is to frequently alter the course taken by the stream when not flooded, the low-water current being found changed after a flood from the right bank to the left, or vice versa. Having regard to the circumstances of the case, the plan which it was determined to adopt to remove the water from the shafts was that of cutting in the centre of the bed of the river a canal or drain about 5900 ft. in length, extending from the site of the bridge down the stream, the sides and upper end of this canal being protected from the river by strong banks, so that it formed a central work on each side of which the stream could flow. From the rapid fall of the bed of the river it was considered that the canal could be made of sufficient depth at its upper end to drain the substrata to such an extent as to lower the water level in the shafts about 13 ft., and thus enable the sinking to be completed. Owing to the danger from the freshets already mentioned, it was of course important to carry on the work, of which we are giving an account, without any unnecessary delay, in order that it might as far as possible be performed between the occurrence of the spring floods, and those which take place in the months of October and November. With this end in view, fifteen hundred excavators were set to work when the bed of the river was dry, and the construction of the canal was carried on as rapidly as possible, the foundations also being simultaneously proceeded with. The sides of the canal were, as we have said, guarded by strong banks, whilst the head or upper end was protected by a kind of triangular cutwater formed by piles backed by bags of earth; and as a further precaution there was formed higher up the course of the stream an earthen breakwater, this being placed transversely to the course of the current, and being 98 ft. in length, leaving a passage on each side through which any flood might pass.

As the construction of the canal progressed the level of the water fell in the shafts, and the excavations were being carried on actively, when a sudden stoppage was put to the work by the occurrence of a flood caused by a severe storm of rain. This flood, which took place in the middle of summer, was not of any extraordinary extent, and was of but short duration; yet it was sufficient to overflow the protections at the head of the canal, and within ten minutes of the time of the water surmounting these, the whole of the canal and its accessory works, which had been constructed at a cost of 70,000 francs (2800L), were entirely destroyed. After this catastrophe all idea of carrying out the plan of draining by a canal was abandoned; and M. Lair, the conductor of the works, suggested the employment of compressed air to enable the sinking of the cylinders to be proceeded with. This proposal was at first received with some hesitation by the engineers, as it was considered doubtful whether the system could be successfully adopted in shafts constructed of brickwork; but eventually it was resolved to adopt it, and we shall now proceed to describe the means by which it was carried out.

Referring to Plate XC, it will be seen by Figs. 2 and 3 that the shafts, after being carried up about 13 ft. above the ground level, were each fitted at the upper end with a wrought-iron cap, F. This cap, which was made of plates ½ in. thick (for a pressure never exceeding one atmosphere) was slightly convex, and was securely bolted to a ring of iron, G, this ring being, in its turn, fastened to the brackets, H, held by the eight straps, I. These straps were each made of iron 2 in. by ½ in., and they were bent to fit the brickwork, being carried down both inside and outside the shaft, and fixed by the bolts, J. A layer of cement, K, was placed on the top of the shaft, both within and without the ring, G, in order to prevent the escape of air. The rim of the cap, F, was formed by a ring of flat iron, L, of the same width as the table of the iron ring to which it was bolted, a ring of india-rubber being interposed to make the joint tight.

On one side of the cap was fixed the elliptical tube, or chamber, M; this chamber, which was made of iron of the same thickness as the cap, being 3 ft. 3½ in. high by 3 ft. 2½ in. on its longer and 2 ft. 7½ in. on its shorter diameter. The upper and lower ends of the chamber were pierced each with an elliptical opening, N, these openings being placed one directly over the other, and being each 1 ft. 3½ in. by 12 in. These openings, which served for the passage of men and materials to and from the shaft, could be readily closed at pleasure by the covers, O P, which were simple iron plates fitted with rings of india-rubber to make a tight joint, and held in their places when closed by the pressure of the air within the chamber and shaft respectively. The arrangements for admitting air from the shaft to the chamber, M, or allowing it to escape from that chamber into the atmosphere, consisted merely of holes, Q, each ½ in. in diameter, and fitted with a simple valve formed of a small india-rubber disc connected by a rod.