

hope of a solid reward, and here lay the real justification of the patent laws. They were at liberty to feel some satisfaction at the fact that they did in some cases give a solid reward to men who deserved encouragement, and no one could dispute that the laws, if existing at all, ought to be so framed as to give the greatest chance of a reward to the meritorious.

It was important to every engineer to consider whether the existing laws could be amended, and if so in what manner, and the question was specially interesting now, as there was a rumour that the present Government intended to legislate on the subject. Having stated that in his opinion the existing regulation, by which provisional protection might be had for a moderate sum, was quite free from the objection to making the patent itself too cheap, while it enabled inventors to draw up accurate and complete specifications, the Professor went on to say that the following were the chief reforms in the actual laws which were popularly suggested:—1. That patent cases should be tried by some special tribunal. 2. That patents should only be granted after the Crown had in some manner tested the novelty and importance of the invention. 3. That patents should not remain valid unless worked within a certain time. 4. That the rewards for successful inventions should be paid by Government instead of being earned in trade. 5. That the scientific witnesses should be appointed by the tribunal trying the patent case, and not chosen by the two parties to the suit. None of these suggestions, he continued, cut very deeply into the existing laws, but aimed rather at better modes of ascertaining whether a patent was valid or not. They pointed to the following defects in the present method of ascertaining this validity:—1. That the Court sometimes really could not understand the patent, the issues or the witnesses. 2. That patents were often granted for so-called inventions which had been previously patented or disclosed; 3. That patents were often used as mere traps to catch those who really introduced an improvement; 4. That the rewards or profits from patents seemed often to bear a very false relation to their real value; and 5. that scientific witnesses became partisans. All these were real defects, but some of them had roots so deep in the nature of things, that no change of law would much disturb them.

After discussing at some length the proposed reforms and the defects aimed at, the Professor summed up his opinions as follows.—The patent laws should be maintained and need not be greatly modified, that any tribunal or referees appointed to consider the novelty or utility of an application for a patent should only have power to give an opinion, and should not be allowed to decide whether the patent was novel or useful; that patents need not be made cheaper; that the nominal position of the scientific witness should be made to agree with his real position, and that the reward of the inventor should depend on nothing but the commercial success of the patent.

#### THE WOOLWICH 35-TON STEAM HAMMER.

The erection of the 35-ton Nasmyth's steam hammer itself which although performed under the supervision of a representative from Messrs. Nasmyth, Wilson and Co., was nevertheless actually conducted by foremen and artificers of the Royal Gun Factories in the Arsenal at Woolwich, exhibited many points of interest in the contrivances by which it was effected. It was an undertaking of some magnitude, as the entire height of the hammer was over 45ft., and it was necessary to raise the various portions, several of which weighed 31 tons each, to a still greater elevation in order to get them into position. A gigantic pair of shear legs was constructed by Mr. Mehew for this purpose (see page 260.) It consisted of two carefully selected fir-poles 74ft. long, having the bottom ends rounded and working in sockets in two large wooden "shoes." The shoes could be shifted about to any required position, but were retained at a normal distance apart of 20ft. Near their summits two stout cross-pieces of timber were made last on either sides of the poles, supported by means of wrought iron bands drawn tight with bolts and nuts, and pins running through the poles beneath. The bands and pins admitted of a certain amount of lateral play between the poles and crosshead. The poles were lashed under the crosshead. A large block and tackling which had been expressly constructed for lifting portions of the foundations for

the 10-ton steam hammer in the gun factories were suspended from the crosshead. Two snatch blocks were then secured at each corner of the crosshead above, and two others at the bases of the poles. A strong rope being rove through one of the lower snatch-blocks, it passed through the upper corresponding one, thence through the large block and down to another attached to the portion of the hammer required to be lifted, afterwards ascending again through the large block and passing down the second leg of the sheers. Both ends of the rope were made fast to crab winches, round which they were coiled. Thus when the cross strain of lifting up the weights came upon the sheers it was counteracted by the tension of the ropes down each leg, that necessarily tending to steady the legs. There was, of course, a tendency to pull the feet of the sheer legs with their shoes out of position, but this was easily overcome by attaching the legs at the bottom to portions of the foundations already fixed in the ground. A baulk of timber placed between these effectually prevented all shifting of the legs. Four guy ropes or stays were attached to the poles and crosshead at their point of junction to steady the sheers. One of these was secured to a pile of baulks in the adjacent timber field, whilst the remaining three were attached to various parts of the surrounding buildings. But the strain upon these was very trifling, for the angle which the sheer-legs made with the perpendicular was so slight that when the weight came on them it acted almost in the direction of their length. Hence a means was arrived at for manipulating the huge limbs of the steam hammer, and depositing them in any required position, of the simplest possible character. By loosening and tightening the side guys a lateral movement was obtained, the crosshead admitting of this; and by performing a similar operation with the two back guys, a forward or a backward movement was secured. There were, of course, steadying guy ropes to prevent the castings swaying about. Our engraving shows the plan adopted, as applied to the lifting of a standard weighing upwards of 10 tons. The crab winches were kept in position by being loaded with pig iron, and by being chained to contiguous parts of the building.

The furnaces for the new hammer are of the ordinary reverberatory character, but of quite unprecedented size, in order to contain the enormous forgings which are required to be raised to the welding heat in them. Only one is actually finished and in working order; the second is in course of rapid completion. They possess at the same time certain peculiarities of construction which will be described in due course. They are each built upon a block of concrete 4ft. thick, laid in an excavation dug out for it, and having large slabs of cast iron placed upon the top, so as to distribute the pressure evenly throughout the whole mass. Upon these slabs a series of cast iron standards is erected for the floor of the furnace to rest on, four rows of standards being beneath the hearth, where, of course, the greatest weight, that of the "heat," comes. The hearth has four strong cast iron girders around it, forming a square frame above the standards; and the bottom of the hearth consists of thick cast iron slabs. It is sunk about 1ft. so as to admit of a deep bed of fettling being formed within it upon the iron slabs. Girders also run along the sides of the furnace floor for the wall-plates and brick side linings to be built on. These girders rest upon the standards before alluded to. The end walls are built upon large cast iron cross-beams, which are perforated transversely with holes and grooved longitudinally to prevent their twisting and buckling with the heat. The two side walls of the furnace, and one end wall—that over the fireplace—are constructed externally of light plates of cast iron—see page 260—with flanges at the edges to connect them, and ribbed on the outside for strength.

PERTH, Dec 19.—The engineers of the Huron and Quebec Railway are making rapid progress in the survey of the line from Perth, via Franktown and Richmond, to the city of Ottawa. It will be an air line for over thirty miles, the greatest cutting being not over five feet. Mr. Fowler, Managing Director, accompanied by Mr. Strong, engineer, carefully examined the line to-day. Nothing will prevent the work being commenced at Perth, east and west, during January or February, and completed to the Kingston and Pembroke Railway in time for the next Provincial Fair at Ottawa. A survey has been made from Perth to the Kingston and Pembroke Railway, in the township of Oro.