

which such undertakings are calculated to confer upon the country. We are commanded by the Queen to assure you of the warm interest which her Majesty cannot fail to take in this Exhibition, and of her Majesty's earnest wishes that its success may amply fulfil the intentions and expectations with which it was projected, and may richly reward the zeal and energy, aided by the cordial co-operation of distinguished men of various countries, by which it has been carried into execution. We heartily join in the prayer that the International Exhibition of 1862, beyond largely conducing to present enjoyment and instruction, will be hereafter recorded as an important link in the chain of International Exhibitions, by which the nations of the world may be drawn together in the noblest rivalry, and from which they may mutually derive the greatest advantages."

The procession then passed along the north side of the nave to the Eastern dome, where the special musical performance took place. The music, specially composed for this occasion, consisted of a grand overture by Meyerbeer; a chorale by Dr. Sterndale Bennett (to words by the Poet Laureate), and a Grand March by Auber. The orchestra, consisting of 2,000 voices and 400 instrumentalists, was presided over by Mr. Costa, except during the performance of Dr. Sterndale Bennett's music, which was conducted by M. Sainton.

At the conclusion of the special music a Prayer was offered up by the Bishop of London. The Hallelujah Chorus and the National Anthem were sung. His Royal Highness the Duke of Cambridge said, "By command of the Queen I declare the Exhibition open."

This declaration having been made, it was announced to the public by a flourish of trumpets, and the firing of a salute on the site of the Exhibition of 1851. The procession then proceeded to the Picture Galleries, and the barriers were removed.

The military bands were those of the Grenadier, the Coldstream, and the Scots Fusilier Guards, conducted by Mr. Godfrey, and were stationed in the centre of the western dome.

About 25,000 persons were present.

## THE INTERNATIONAL EXHIBITION.

(Extracts continued from "The Mechanics Magazine.")

### The Western Annexe.

"We now beg to direct public attention to a pair of marine engines exhibited by Messrs. John Penn and Son, of Greenwich. These are excellent exponents of the workmanship of Messrs. Penn. They are on the direct acting principle, and are intended for a screw steam-ship. The engines are of the collective power of 600 horses, and have been manufactured for the Spanish Government. The cylinders are 78 inches in diameter, and the length of the stroke is 3 feet 6 inches. The connecting

rods are 9 feet long. Several pairs of engines of a nearly similar character have been made for the respective navies, and they have been found to work with perfect smoothness and regularity. Much of this latter is due to the system of counterpoising the crank shaft pursued by Messrs. Penn; and we may say in passing, that it would be well if more attention generally were paid by engineers and machinists to the proper balancing of running machinery. Much of the jarring and tremor, so disagreeably felt on board steamers, and so hostile to the stability of buildings, is due to the want of a proper mode of balancing those parts of the engines or machinery which are of unequal weight.

"Returning to the engines of Messrs. Penn, it may be further said that each condenser is provided with a double acting air pump 23 inches in diameter, the length of stroke being the same as that of the piston. The engines occupy a space 28 feet in breadth by 18 feet in the direction of the length of the vessel.

"Engines of the same kind of construction as these, but of 1,250 H.P., are in course of construction by the firm named. These are intended for H.M.S. Achilles, now being built in Chatham dockyard, and one of the cylinders of the Achilles' engines is exhibited in the annexe. It is a fine and clean casting, well bored out, and its weight is 18 tons. The inner diameter is 42 inches, the stroke will be 4 feet."

"Messrs. Penn also exhibit, in near neighbourhood to the cylinder, a massive wrought-iron crank shaft for the same engines, as also a connecting-rod, fitted complete with brasses. The Warrior and Black Prince were furnished with engines of which those of the Achilles will be duplicates. Before advancing further through the annexe, we may state that Messrs. Penn are at present engaged, also, in making two pairs of engines for the new iron sided ships Northumberland and Minotaur. A cylinder cover belonging to one of these is shown, as are some iron castings from the mould, and others which have passed under machine tools.

"Models of a pumping-engine and safety-balance valve, as erected and used at the Leabridge branch of the East London Water-works, are exhibited by Messrs. Harvey and Co., of Hayle, Cornwall. Having seen the originals of these we can vouch for the fidelity of the models. The Leabridge engine, which was erected by Messrs. Harvey some five or six years since, was at the time of its erection the largest in or near London. When working full-power it pumps 9,000 gallons of water per minute to a height usually of 140 feet. The water thus raised is conveyed into London by means of cast-iron pipes 36 inches in diameter. The whole of the system of pumps, reservoirs, filtering beds, sluices, &c., at Leabridge is well arranged, and everything there is on a gigantic scale.

"In 1858 Messrs. Harvey and Co. erected, for the Southwark and Vauxhall Water Company, at Battersea, a pumping-engine, the cylinder of which is 112 inches diameter, and weighs 36 tons. This engine, though the largest and most powerful ever built for such a purpose, is of the most simple construction. The steam valves are all on the equilibrium principle, and the arrangement of parts is throughout, such, that this colossus of engines, so to speak, is as completely under the control of a