

gilt vane. Its materials are brick, red and yellow sandstone, and white marble. The stone dressings and carving are beautifully executed, from the designs and models of the architect. The capitals surmounting the main corner pillars measures four feet three inches wide and four feet six inches deep; they are carved out of solid blocks of white sandstone, and each cap weighs over two tons. The dials are sufficiently elevated to be distinctly visible from the stations of the East Indian and Punjab railways, and from other parts of the city. The building was completed in about eighteen months, at a cost, including clock and bells, of about 30,000 rupees (£3000), the whole of which sum was furnished by the Municipal Commissioners. The tower was designed and built under the superintendence of Mr. Edward Martin, Executive Engineer Rajpootana (State) Railway; the clock and bells were supplied by Mr. Benson, of Ludgate-hill, London.

### SCIENTIFIC ITEMS.

EMERY grinding stones were until recently made by mixing the emery with gum and shellac. It was found, however, that the shellac softened at high speeds, and the grinding stone, becoming greasy, ceased to polish. This difficulty is remedied by using, instead of shellac, soluble glass; this is done in certain German manufactories, the grinding stones of which are not corroded. They may turn at a velocity of 1000 to 2000 revolutions per minute without losing their form.

THE following statement shows the total number of miles of railway open and working in the British Empire to the most recent dates attainable, but mostly to the 31st December, 1875:—United Kingdom, 16,658 miles. British possessions—Australia—New South Wales, 437 miles; Queensland, 263; South Australia, 258, including railways worked by horse traction; Victoria, 618; British Guiana, 21; Cape of Good Hope, 149; Ceylon, 91½; Dominion of Canada, 4443; India, 6461; Jamaica, 25½; Mauritius, 66; Natal, 5½; New Zealand, 542; Tasmania, 167. Total in British possessions, 13,547½ miles; total in British Empire, 30,205½ miles.

WITHIN the last few days a fearful railway calamity was averted by the efficient action of the Westinghouse automatic brake. A train from London to the North was running at a high velocity in the dark, when the engine ran over a fog signal. The driver pulled up as quickly as possible, and stopped just nine yards in the rear of the last van of a broken down goods train, which the guard had not had time to sufficiently protect. The space traversed after the application of the brakes was very small, but the precise distance was not measured. The bearing of this circumstance on the Abbots Ripton accident will be readily perceived.

ACCORDING to the San Francisco *Chronicle*, another terrible instrument of war has been invented, by a resident of that city. The new gun, patented by Leonard and De Vry, and christened "Peace Conservator," was exhibited at the Pacific Ironworks. The prompt action of the instrument, delivering seventy shots in four seconds, and ten hundred and fifty shots in one minute, through a thick oak barricade, proves that it is one of the most terrible death-dealing inventions ever known. The machinery is simple and easily worked, requiring but few attendants, who are perfectly protected from their adversaries' bullets; and it can be transported with much greater ease than an ordinary six-pounder. The bullets from it will, it is claimed, diverge 300 ft. in 1000 yards—the distance claimed at which it will effectually deliver shots—and the gun can be easily worked by one person in any direction, or made to shoot almost solid.

THE first manufacturer of buttons in America was one Samuel Williston. While he was dragging along, says an American paper, as a country storekeeper—his eyes having failed him while studying for the ministry—his wife bethought that she could cover by hand the wooden buttons of the time, and thus earn an honest penny. From this the couple advanced in their ambition, until they had perfected machinery for covering buttons, the first employed for the purpose in America. From this sprang an immense factory, and then others, until Samuel Williston made half of the buttons used in the world. His factories are still running at Easthampton, coining wealth for the proprietors, and known to every dealer in buttons all over the world. Samuel Williston is now between seventy and eighty years of age, and is worth from five to six millions of dollars, and has given 400,000 dols. to Easthampton for a seminary and churches, 200,000 dols. for the founding of a female seminary, and 200,000 dols. to Amherst College, besides lesser gifts to other kindred institutions.

THE well-known phenomenon that iron, with long use in which it is subject to strains of the nature of shocks, assumes a coarsely granular structure, has recently been illustrated by experiments made at the Friedens Hoffnung coal pit, near Waldenburg, on the hanging chain of the miners' cage, two years in use. A link of this chain broke at the first blow of an 11 lb. hand hammer into four pieces, whose surfaces of fracture showed a crystalline texture. Another link of the same chain, after having been annealed at a red heat, only broke after twenty-three blows with the same hammer, and in such a way that the fracture on the one side of the ring went right through, and the other side only half through, and presented a fibrous structure. These facts, says the *Scientific American*, indicate the importance in the arrangements for the lowering and raising of miners, of very careful observation of those changes of structure. They also appear to make desirable the introduction of spring boxes between the rope and the cage, so to modify shocks, and the annealing from time to time of the connecting parts between the rope and the cage.

A NEW RAIL NUT.—A new invention in the shape of a nut has been tried on the Boston and Albany Railroad. It is a little thicker than the ordinary nut, and across its face are sawed two slots crossing each other at right angles and cut almost through the nut. The opposite side of the nut is convex, so that when it is screwed up tightly its corners, being first made to touch the face of the iron behind it, cause the four sections of the nut, separated by the slots in front, to approach the centre of the bolt. This grip is tighter as the pressure behind it is greater, and it causes the threads of the nut to engage more deeply with those of the bolt.

OIL FROM WOOD.—In Sweden the manufacture of illuminating oil from wood has become a large and successful industry. The roots and stumps of trees are employed for the purpose. The wood is subjected to dry distillation, with exclusion of air, and a variety of products are formed which are of value in the arts. Among these may be mentioned turpentine, creosote, tar, acetic acid, charcoal, oil of tar and oil of wood. The wood oil cannot be burned in an ordinary lamp, but a camphene lamp can easily be adapted for the purpose. It is not explosive and is remarkably cheap. The pine tree is the best adapted for distillation, and there are fifteen establishments in operation in Sweden, three of which produce 15,000 litres (887 gallons) of oil annually.

NOTE.—If oil can be extracted from wood which grows in a climate as cold as Canada, the pine tree being the best adapted for the purpose, it would be very desirable that our Board of Agriculture should ascertain the exact process, as it might be very valuable to settlers in the backwoods to understand how to extract it.

SHARPENING EDGE TOOLS.—We obtain tee following from a German scientific journal:—It has long been known that the simplest method of sharpening a razor is to put it for half an hour in water to which has been added one-twentieth of its weight of muratic or sulphuric acid; then lightly wipe it off, and after a few hours set it on a hone. The acid here supplies the place of a whetstone, by corroding the whole surface uniformly, so that nothing further than a good polish is necessary. The process never injures good blades, while badly hardened ones are frequently improved by it, although the cause of such remains explained.

TO LIGHT A CANDLE WITH WATER.—Get a very small piece of phosphorus, and with a little tallow, place it on the rim of a tumbler; next get a lighted candle, and after having extinguished it, hold it to the glass, and it will at once ignite.

SUBSTITUTE FOR PLASTER OF PARIS.—Best whitening, 2 lbs; glue, 1 lb; linseed oil, 1 lb. Heat altogether, and stir thoroughly. Let the compound cool, and then lay it on a stone covered with powdered whitening, and heat it well till it becomes of a tough and firm consistence; then put it by for use, covering with wet clothes to keep it fresh. When wanted for use, it must be cut in pieces adapted to the size of the mould, into which it is forced by a screw press. The ornament may be fixed to the wall, pictureframe, &c, with glue or white lead. It becomes in time as hard as stone itself.

NEW 150-TON GUNS.—Though designs for 160-ton guns have been prepared, there are good grounds for believing that the Government have no serious intention of ordering any of the size to be constructed, they having been advised not to go beyond guns of 150 tons for general service. Several of these will be made within the next twelve months, and it is probable that they will be used for both the land and sea service.