

a davit, from which is suspended a hopper for holding the materials, the cement being supplied in bags, ready for being run into the mixer. This arrangement is adopted for filling concrete into a trench or the heating of a pier, the mixer being supported over the opening on two balks of timber, and a waggon containing the materials following on the same line.

To receive a charge, the door of the mixer is brought uppermost, a catch in the cogs of one of the wheels holding it in that position. The door is allowed to rest on a stay provided for that purpose, as shown by dotted lines in fig. 2. The hopper containing the materials in proper proportion is swung round on the davit to the position shown in dotted lines; and while the materials fall into the mixer, the water contained in the tank is allowed to run in by a flexible hose. The hopper is then swung clear of the mixer, the door closed, and the requisite number of turns given. To save the necessity of counting or guessing, a simple tell-tale is added for giving notice when a sufficient number of revolutions (as determined by the weight and nature of the materials) has been given. A screw thread is cut on the projecting end of the mixer shaft, and an iron plate with a hole in it is hung on the screw. The rotation of the shaft causes the plate to move towards the end until it drops off, and thus indicates that the determined number of revolutions has been accomplished. For a less number of revolutions, a nut or distance-piece of the required thickness is put on the end of the shaft. When the proper number of turns has been given, the mixer is stopped with the door downwards, the door fastening is released, and the charge of concrete falls in a mass into its place, the discharge being instantaneous. The mixer is then turned, so that the door comes upwards again, and refilled as before. While the mixer is being turned, two men fill the hopper from a waggon with raised sides.

Fig. 3 shows the arrangement of the machine for making concrete blocks for pier and harbour works. The mixer is mounted on a light travelling frame, capable of being moved from one mould to another; and the materials, filled into a large tray, holding from 10 to 15 tons, are lifted on to a raised portion of the travelling frame by the steam travelling crane, which removes the concrete blocks when formed.

It is stated that, with this mixer turned by hand, a gang of six men, with a boy for attending to the water cistern, can make from 30 to 40 cubic yards of concrete blocks, or a much larger quantity of concrete in bulk, in a day, of better quality and at a cheaper rate than can be done by shovel mixing; and that when the mixers are turned by steam, twice these quantities are produced.

The great advantages of this mixer are its portability, compact shape, and self-contained arrangements, which permit of its being easily moved from place to place, and used in different parts of a work, thus dispensing with a mixing platform and measures. Another great point is that nothing is left to the judgment of the workman. The proportion of materials is predetermined, as well as the number of revolutions necessary; so that, with but little supervision, a concrete of uniform quality is produced.

Mr. Messent is engineer for the Tyne Harbour improvements, Newcastle, and joint engineer with Mr. J. F. Ure for the Whitehill Point staiths, Tyne Harbour. Besides these works, his concrete mixer has been used with great success on the Aberdeen, Alexandria, Madras, and Kurrachee Harbours, the Stobcross Docks, and on many other works of a similar character.

From his great experience in this class of construction, Mr. Messent may be regarded as an authority on the subject of concrete; we think well, therefore, to subjoin his notes as to proportions, strength, &c.:—"For concrete blocks or ordinary walls, 6½ parts clean gravel or shingle, 2½ parts sand, and 1 part Portland cement should be used. For the above proportions 2½ bushels of cement will be required for a cubic yard of concrete; and for the hand concrete mixer, made to mix ½ yard charges, the cement should be measured into bags containing 1½ bushels, one bag being required for each charge; the hopper being the proper measure for the gravel and sand. Broken slag and broken bricks or granite spawls may be used instead of granite or shingle. For large masses of concrete in foundations or quay walls, the concrete may be made with 2 bushels of cement per cube yard, or 1 bushel to each charge of hand mixer, while in cases where extra strength is required over openings, or to resist wear or abrasion, the proportion of cement may be increased to 3 bushels per cube yard. In each case the concrete may be cheapened, without deterioration, by placing large stones in the fresh mixed material, care being taken that the stones are all surrounded by and separated from each other by concrete. The Portland cement should weigh not less than 112 lb. per struck

bushel, lightly filled or sifted into the measure, and, if made into test bricks, immersed in water as soon as they will hold together, should, after seven days' immersion, require at least 2½ cwt. to break by tension each square inch of the breaking section of the brick. The usual area of the breaking section (B) of test brick is 1½ inches x 1½ inches = 2½ inches."—*Iron*.

IMPROVEMENT IN WOOD-BORING MACHINES.

(See page 237.)

The object is to construct a machine to bore at any angle, or at any depth.

A A are the supports; B B the reversible fastenings; C C the fastening screws; D trunnions connected with gear support; E the driving shaft; F the driving gear; G lifting pinion; H the auger shaft; K the angle indicator, provided with a threaded socket. The machine is fastened to the material to be bored, by passing the screws, C, through the reversible fastenings, B, into said material. A bit of the requisite size is screwed into the socket of the auger-shaft. The auger or bit is placed against the material to be bored at the angle required. The crank is then turned and the hole bored. To withdraw the auger or bit, the driving gear is thrown out of gear, which brings the lifting pinion, G, into gear with a rack upon the auger shaft. The motion of the crank is reversed, and the bit or auger is withdrawn from the hole. The auger shaft is caused to turn by a key placed in the driving gear and fitting in a slot in the shaft, permitting said shaft to slide upon it.

To bore a hole deeper than can be bored by the auger-shaft represented, attach a similar shaft to the one shown, by screwing it into the top of it.

IMPROVEMENT IN SPOKE SOCKETS.

(See page 237.)

The engraving is a side view of a part of a wheel to which this improvement has been applied. The object is to furnish a device for fastening a spoke that has broken off at the shoulder of the tenon, to prevent the spoke from wearing the felly and from rattling, and to prevent the spoke and felly from breaking, and which shall be simple in construction, easily applied to the wheel, and effective in use, holding the spoke securely and firmly in place.

The invention consists in plates provided with shanks, and so formed as to fit upon the side of a felly and spoke, to fasten said spoke when broken off at the shoulder of its tenon.

A represents the felly, and B the spoke of a vehicle wheel. C is a plate of such a shape and size as to fit upon the side of the felly, A, and which is provided with a shank, c', which is so formed as to fit upon the side of the spoke B.

The device, C c' is cut out of sheet-iron, and is then struck up with dies to bring it to the proper shape. In using the device one of the plates C c' is applied to each side of the felly and spoke to be fastened, and is secured in place by screws or rivets.

The plates C c' are designed to be made of different sizes, so that they can be obtained to fit wheels of any size, and the owner of the vehicle can apply them for himself whenever needed.

A NEW FIRE EXTINGUISHER.—A new fire-extinguishing chemical compound has been lately devised, which, in its application for extinguishing fires, is quite different from the fire annihilators in general use. The new composition is a mixture of chemicals which, on being ignited, evolve sulphurous acid and carbonic-acid gases, which fill the apartment or building, producing an atmosphere which smothers combustion. A successful trial of this invention was recently had in front of the City Hall, Philadelphia. A board shanty, 13 feet square and 10 feet high, was erected to represent an apartment, and furnished with a door, window, and a stove-pipe coming through the roof. The interior was coated with tar. On a bench were placed seven basins containing benzine, coal oil, and naphtha. In one corner was a 10 lb. box of the extinguishing compound, with a fuse attached to it running round the walls, on the self-igniting plan. The combustibles were set on fire, and in an instant the interior was one sheet of flame, bursting out through the door, window, stove-pipe and every aperture. A few moments after the compound was ignited, the gases that were generated therefrom instantly subdued the flames, and in less than half a minute the fire was entirely extinguished. The new substance is called "Reec's Compound Fire Extinguisher."