In future this page, as well as page 13, will be devoted to Mechanics, Engineering and Practical Science.

MURRAY'S BRICK-MAKING MACHINE.

Engineering, a well-known and highly esteemed scientific journal, published in England, gives the following account of the machine illustrated on page 45, and of the litigation arising out of the infringement of the patent taken out by the inventor. It says:—

A judgment of considerable importance to inventors, patentees, and infringers has recently been delivered in the Court of Chancery by the Lord Justice James. The cause of action was the infringement, by Messrs. Clayton, Sons, and Howlett, of Mr. Murray's continuous delivery brick-making machine. Before entering into the particulars of the Chancery suit, it may be as well to describe this apparatus, which we illustrate on page 45. Fig. 1 of our engraving represents an elevation of the machine complete; Fig. 2 is a plan of the cutting table; Fig. 3 is an enlarged section showing the method of attaching the cutting wires to the top and bottom bars; and Fig. 4 an end view of the cutting table. The apparatus consists of a pugging mill, moulding die, and cutting table, the two latter apparatus being protected by separate patents; it was the latter portion —the cutting table—which formed the subject of the recent litigation. The pugging mill is cylindrical, instead of being in the form of an inverted cone and being provided with arrangements for cutting off the flow of the clay, as in the ordinary intermittent action machines. The cylindrical form enables it to be worked with less expenditure of power than those in general use. The clay on leaving the pugging mill is conducted to the die, which is so constructed that the faces of the clay are lubricated, the clay being thereby delivered with less friction, and consequently with a smooth and even surface. For the purpose of imparting to the clay a thin film of lubricating material which will insure this smoothness of surface, the sides of the die are made hollow, and contain the liquid lubricant, which exudes from the hollow sides through holes made in their faces. The perforated faces are covered with felt, which becomes saturated with the lubricant, and prevents it running out too quickly. The hollow vessels forming the sides of the die are held in place by screws passing through lugs formed on the mouth of the machine. They are readily removed for cleansing or covering, and are replaced without deranging any other parts of the machine. The lubricant is supplied continuously to the boxes from the cylindrical reservoir shown in our engraving. The clay in passing into the cutting table impinges upon the felt-covered boxes, and carries away with it the necessary thin film of lubricating material.

Assuming that a quantity of clay of sufficient length to form twelve bricks has issued from the mould, this length is cut off by means of a vertical wire mounted in a reciprocating frame, which moves to and fro on guides affixed to the side standards. The proper length of clay thus severed from the advancing mass, is pulled forward by hand on to the cutting table. Arrived there it receives a lateral push, at right angles to its line of previous motion, which forces the mass against a series of fixed wires. This lateral movement of the clay is effected by means of a push-board, which, as it advances, pushes the clay against and past the fixed wires, thus dividing the mass into the required number of bricks. The push-board is actuated by a rack and pinion motion under the table, best seen at Fig. 4, and which is worked by a crank handle. On this handle being released the weight causes the push-board to be at once drawn back to its original position. The bricks thus formed are by this lateral movement deposited on a portable board, on which they are removed to the barrow. Referring to Fig. 3, it will be noticed that the bars to which the cutting wires are connected are slotted. The wires are attached to pins in the upper bar with screws and nuts, and are kept taut by means of india-rubber tension springs. The bars being slotted permits the wires to be shifted either further apart or closer together, thus altering both their gauge and angle, so that the thickness and the bevel of the bricks can be varied to suit the requirements of manufacture. The cutting table is the key to the numerous advantages possessed by Mr. Murray's apparatus, and which consist in dispensing with several auxiliary movements which necessarily encumber and consequently diminish the working efficiency of the intermittent delivery machines with rotary action dies in general use. As the block of clay to be divided up on the cutting table is only an inch longer than is required, a very small amount of waste is thrown back for second manipulation. The removal of the bricks, too, from the machine is effected without their being handled, so that they sustain no injury from that source. It requires but one set of men to attend to one of these machines, so that a great economy of labour results as against an intermittent delivery apparatus, which requires two sets of attendants. In the arrangement under notice, brickwork foundations are unnecessary, the machine being mounted on cast-iron foundation plates.

Such is the apparatus—or at least a portion of it, the cutting table—which gave rise to the action between Messrs. Middleton and Messrs. Clayton. To render this clear we should observe that in Messrs. Clayton's machine the clay runs on to a lubricated metal table, and by a turn of a handle from left to right this table is made to pass under a fence board, which is attached to the frame of the machine, and, being fixed, retains the block of clay in a stationary position, whilst the table recedes from under it. A series of cutting wires travelling with the table pass through the clay, which is left on a portable board on the other side of the wires. By a reverse action of the lever the board with the bricks upon it is placed in a position to be removed from the machine, and the metal table is ready to receive another block of clay. On the other hand, in Mr. Murray's machine the metal receiving table, the standards, the wire bars, and the brackets upon which the portable board rests, are all stationary, being attached to the framework of the machine. The clay is delivered on to the lubricated metal receiving table, and by the action of the lever from right to left—just the opposite of the movement in Clayton's apparatus—the push-board is brought up to the block of clay, which is thus moved to the wires in a parallel course. The action of the push-board being continued forces the clay between the wires, and it is delivered in the form of bricks on the portable board beyond the wires.

This colourable imitation of Mr. Murray's invention led that gentleman in January, 1869, to apply to the Court of Chancery for an injunction against Messrs. Clayton to restrain them from manufacturing and selling these machines upon the grounds that they were infringements of Mr. Murray's patent; that these machines embodied, in fact, but a transposition of the parts, and a reversing of the action of Mr. Murray's apparatus. Mr. Murray's patent, we may mention, was dated June, 1866, Messrs. Clayton's being dated September, 1868. The cause came before Vice-Chancellor Bacon who dismissed the bill with costs in January last. The Vice-Chancellor came to the conclusion that the plaintiff's patent was invalid on the ground that it has been anticipated by prior inventions. Conscious of the strength of his cause Mr. Murray appealed to the Lord Justices, and they on the 6th of last month (May) delivered their judgment entirely and unreservedly in his favour. In delivering judgment Lord Justice James observed that Mr. Murray had given his own statement of his having been the first and true inventor, and had produced as to the utility and the *de facto* novelty of his invention a mass of evidence—as to which there had been no cross-examination and no contradiction—"in my mind," said his lordship, "stronger almost than any I had ever witnessed in any case in this court." The witnesses in the case were engineers, a superintendent of Government works, and practical brickmakers, the sum of whose evidence went to show that the invention was both sufficient and original. One of the witnesses spoke to the bricks being worth two shillings a thousand more than those made by ordinary machines, while Mr. Bernays, the Government engineer, spoke very highly of the superiority of the apparatus over those in general use. To sum up, the Lords Justices were of opinion that there had been no anticipation. They considered the plaintiff's case was fully made out, and they granted him a perpetual injunction against the defendants, who had to pay the costs of the suit. There can be no question as to the perfect equity of this decision, and the only wonder in our mind is how Vice-Chancellor Bacon could possibly have arrived at the conclusion he did?

FRENCH RIFLED FIELD ARTILLERY.

The new French 14-pounder breech-loader may be looked upon as one of the results of the recent war. The artillery in use during the early part of the campaign—that on the La Hitte system—was very defective, though since 1867 experiments had been made with a view to improving it, which resulted in a breech-loading gun of great promise. The experience thus obtained was only turned to practical account when the German armies were approaching Paris. Upon the models obtained, which represented 14-pounder breech-loaders, (generally called "canon Trochu") 200 field-pieces were made in Paris during the siege under the personal superintendence of the then governor of the capital, General Trochu. Considering the shortness of time, and the many other works which were required for the immediate defence of Paris, the efforts of the French artillerists cannot be too highly praised. According to the "Histoire Critique du Siége de Paris," there was not sufficient steel in the city for the breech blocks, and the steel axles of some of the locomotives brought to Paris had to be used for that purpose. The following account of the gun is condensed from the *Jahrbücher fur die Deutsche Armee und Marine*," one of the best military papers published in Europe:—

"The barrel of the 14-pounder is made of bronze, and has an average weight, with breech, of about 13 cwt., and a diameter of the bore of 3.348 inches. The gun is therefore proportionately heavier than any of the existing field-pieces, though of these two-thirds have a larger bore. The outer shape of the barrel, as seen in Fig. 1, is certainly of a very ancient character. The bore is arranged in a similar manner to that of the Prussian breech-loaders; it is divided into the rifling, the intermediate cone, the space for the charge, and the portion forming the breech. The rifling is 62 in. long, and consists of 14 wedge-shaped grooves, the lands of which get gradually wider towards the mouth of the gun, in order to increase the friction between the lead casing of the projectile and the grooves, and to form a better guide for the projectile. The length of the turn or twist of the grooves of the 14-pounder is only 25 calibres, corresponding to an angle of 7 deg. and 10 minutes. The space for the charge is projected for more than two-thirds of its length with a cylindrical steel lining, which extends also for the whole opening of the bore. The steel lining was perhaps chiefly adopted to prevent any injury to the metal in closing the breech, as well as to check enlargements in the charge chamber, which might happen if the breech and the cartridge are brought into direct contact with the metal of the barrel. The breech itself is very similar to that of the breech-loaders of the French marine and coast artillery of 1864-66; it consists chiefly only of two parts, the screw-bolt, *a*, and the door, *b*, Figs. 3, 4, 5. The bolt is made of steel, and is provided for half of its length with left-handed threads of a trapezoidal section, Fig. 6; of these threads one-sixth part of the circumference is cut away, leaving three equidistant places between, corresponding spaces being left in the female screw, cut in the steel lining; this arrangement has been adopted in order to save as much time as possible in opening and closing the breech, for if the plain parts of the bolt part coincide with the threads of the female screw, one-sixth of a turn completely closes the opening. The front part of the bolt, by which the gas-tight joint is made, is cupped, as shown in the figure, the inner cylindrical surface being provided with several twisted grooves; on firing, the brass bottom of the cartridge is pressed into these grooves, and is retained by them after the gun has been fired, so that when the breech is opened, it is withdrawn. The breech-bolt contains also the vent, which passes from the bore in the direction of the axis of the barrel, but takes an inclined direction until it reaches the upper rear edge of the screw-bolt, as shown, in order to facilitate the introducing of the match-tube. The tendency of the screw-bolt to draw out the door of the breech is prevented by the two screws, *c*, which fit into the grooves, *g*, cut at right angles to each other in the outer surface of the screw bolt.

"The outer or rear part of the bolt terminates with two round pins of different diameter, upon which are fastened a wrought-iron crank, *d*, and a bronze handle, *e*; the former is used for loosening or tightening the bolt, the latter for drawing it out or bringing it into the gun. The handle is also provided at the upper part with a trough for the purpose of catching the match tube thrown out of the vent when the gun is fired. The bronze door, *b*, moves horizontally upon the wrought-iron pin, *l*, at the left-hand side of the rear of the barrel, the door is provided on the right-hand side with a steel catch, *h*, with spring, *i*, and when the breech is shut, the catch, *h*, is secured by the detent, *k*, screwed into the bottom of the barrel. The gun is worked in the following manner:

"*Opening the Breech.*—By a sixth of a revolution of the screw-bolt towards the right-hand side, the screw is drawn off, and the door is opened towards the left.

"*Shutting the Breech.*—The door is closed and fastened, the screw-bolt is put in and secured by a sixth revolution towards the left.

"The serving of the 14-pounder appears to be simple, easy, and requiring but little time, but whether this is really the case only a longer and uninterrupted use of the gun can prove. It might seem doubtful whether the cartridge packing would be perfectly gas-tight, or whether, on the other hand, the gases which penetrate between the threads of the screw may not seriously interfere with the easy movements of the latter. This, however, appears to be certain, that the surface of contact of the breech-bolt with the gun offered by the threaded portions is much too small. The total weight of the breech is about 92.4 lbs.

"The sight of the 14-pounder consists of a fixed metallic tangent scale, to receive which the barrel is provided at the rear end with a vertical hole, and a small steel sight screwed into the disc next to the right-hand trunnion. The whole arrangement is that generally known as a "a short line of sight," its length is 33.543 in., the total length of the barrel being 83.858 in. The projectiles used for the 14-pounders are howitzer and shrapnell shells.

"The howitzer shell has, compared to the bore of the barrel, the considerable length of 9.448 in., or 2.8 calibres; the head, formed with a flattened point, is only a little more than one-tenth of the whole length of the projectile. The cylindrical part of the howitzer shell is surrounded by a thin lead covering with four swellings, between which the cylinder has a diameter equal to that of the bore without the grooves. The weight of the fully-charged howitzer shell amounts to 15 lbs.

The shrapnel shell, of a similar construction to that of the howitzer shell, contains 120 balls of zinc, each weighing rather less than 5 oz. The howitzer shells have percussion fuses of the ordinary French pattern, whilst the shrapnels are provided with time fuses of a construction similar to those used in the Swiss breech-loaders. The cartridge, which is like that used for the French mitrailleuse, is 9.763 in. long, and weighs 3.43 lbs. With respect to the results obtained with this gun it is stated that the initial velocity of the howitzer shell is about 1,312 ft., and that the maximum range is fully 6,000 yards.

The St. Stephen, N. B., *Courier* says a new granite quarry of great value has been discovered at St. George, near the head of Lake Utopia. The stone is of a deep red color and commands a high price in the New York market. We understand it is to be worked by an American company. An engineer and staff are now making arrangements for immediate active operations.

A proposition has been entertained to tunnel under the Strait of Canso, between Nova Scotia and Cape Breton, where the strait is only two and a half miles wide, for the purpose of connecting the Island of Cape Breton with the mainland. The cost is estimated at $2,500,000. This idea is connected with a proposition to run a line of steamers from Glasgow, or other British port, to Louisburg, the most easterly point of Cape Breton.

TO PROTECT IRON AND STEEL.—Prof. F. Grace Calvert, of England, has discovered that the carbonates of potash and soda possess the same property of protecting iron and steel from rust as do those alkalies in a caustic state. If an iron blade is half immersed in a solution of either of the above named carbonates, it exerts so protective an action that that portion of the iron which is exposed to the influence of the damp atmospheric air does not oxidize, even after a period of two years. Similar results have been obtained with sea water, to which have been added the carbonates of potash or soda. The applications of this fact are numerous and important.

A NEW WATER-LEVEL INDICATOR.—M. Plaudié, a French engineer, has designed a new water-level indicator for vertical boilers, in which the water stands from 20 ft. to 25 ft. above the ground, and which is consequently difficult to observe directly. He obtains the indications of the level at a convenient height by the difference in pressure of two liquid columns, the one having a fixed height, and the other being variable, according to the change of level in the boiler. These differences in the pressure are indicated by the movement of a mercurial column inclosed in a U tube, which communicates at each end with one of the tubes just mentioned. This apparatus works very well in the shops at Seraing, and other establishments.

OLD RUBBER.—A fortune awaits the happy inventor who shall teach manufacturers to restore old rubber to the condition in which it was before vulcanization, for with that secret, there would be practically *no consumption* of this invaluable article. The thing has been done, and successfully, and we have ourselves seen pieces of vulcanized rubber, possessing great strength and elasticity, which were made entirely from old car-springs; but it has never been accomplished on a large scale, and awaits the enterprise and ingenuity of some new Goodyear to develop it.

Meantime, old rubber has its uses. By a system of steaming and passing between rollers, it is reduced to a semi-plastic state, and in this condition is used in combination with a coarse fabric for heel stiffening, a purpose to which it is admirably adapted, its waterproof qualities being of especial value. There is in a neighbouring city a factory devoted entirely to this branch of manufacture, where several hundred tons of old rubber of all kinds are consumed annually.

Old rubber is also largely used to mix with new raw material in the manufacture of all kinds of rubber goods. It serves to give bulk and weight, and, if it does not increase, it certainly does not lessen the strength of the fabric. It may also be mentioned that powdered soapstone, white-lead, terra alba, and other heavy substances enter largely into the composition of almost all rubber goods, the use of which becomes apparent when it is remembered that they are generally sold by weight.