THE MILLING EXHIBITION. No. VI.

Having described the complete system exhibits, we pass on to those not claiming to be complete exhibitions of systems, but still showing different processes for reducing and dressing wheat and middlings. Stand No. 32, was the joint exhibit of Messrs. W. Gardner, Gloucester, and Lampitt and Sons, Warwick. On the ground-floor of their stand a number of two-roll porcelain roller mills were exhibited These machines are manufactured Beyer Frères, of Paris; they are simple, are belt-driven, without gearing, and a novelty in the feed gear is introduced. The usual feed-roll is discarded, and the feed is effected by the direct draw in of the rollers. The bearings are well lubricated, and the level of the oil can be seen from the outside; the framing is very strong, and cast in one piece. A single screw acting on a spring sets the movable roller closer or further from the fixed one; two adjusting screws are provided at the back of the machine to-keep the rolls parallel with each other should the bearings wear unequally. The rolls are run at differential speeds of two to three, the driving roll running at 300 per minute. Messrs. Beyer make these rolls of porcelain or chilled iron, preferably the former. Another of these roller mills, with two rollers on each shaft and a reciprocating and ways motion was archibited. cating end-ways motion, was exhibited. On the upper floor were the dressing machines—a four-reel bolt-chest with variable incline to each reel. An improved silk centrifugal, had a wrought iron trussed reel and Thompson and Lampitt's Acme roll bars for the better distribution of the flour and to ensure its proper progressive motion to the tail of the reel. These bars are shown in Fig. 52. Mr. Gardner also exhibited a Smith's circular stone staff—a very carefully built-up ring of wood, got up to a true surface for dressing millstones.

On the next stand, No. 31, that of Messrs. Munden, Armfield, and Co., of Ringwood, was a novelty in silk dressing reels. In addition to the usual revolving motion, the reel is caused to reciprocate rapidly backwards and forwards in the direction of its length, to give a better sifting action to the reel; each bar of the reel carries vanes to receive the meal on its upward course and distribute it on the down-

to dress as much as the upward side. This machine, shown in Fig. 53, was thoroughly well made, and worked very steadily, the crank shaft for giving the reciprocating motion being carried in strong iron brackets. Messrs. Munden, Arm-field, and Co. also showed a small cheap por-celain roller mill, bran dusting, and sundry other milling machines.

other milling machines.

Adjoining this stand was that of Messrs. J. Walworth and Co., of the Albert Works, Bradford, Stand No. 33. Fig. 54 shows in section one of Messrs. Walworth's aspirating purifiers, and affords a good example of the machines under the fourth division of the classification (Engineer, p. 345, May 15, 1881). The arrows show the direction of the air currents drawn in by the fan Z. The middlings are fed in by the feed roll at the bottom of the hopper K, fall on by the fan Z. The middlings are fed in by the feed roll at the bottom of the hopper K, fall on to the system of inclined planes P Q S T V, meeting the air currents, those particles too heavy to be drawn upwards through the passages R V W X Y, fall on to the system of the passages R V W X Y,

fall on to the sieve below, and the lighter pass on with the air into the large chamber A. Here again a second separation by weight takes place, and the heavy particles fall down to the opening B in the hoppered sides of the chamber, and are caught in the reciprocating sieve G, through which air is also drawn by the fan. Any particles which settle before arriving at the fan are taken out at the sides of the machine by the worm N¹; the remaining dust, &c., is blown into the stive room. From the number of times the middlings meet with the air currents, this machine should effect a very perfect separation. Messrs. Walworth also showed a wheat, rice, and barley separator on the same principle, but fitted with glass inclined planes at P Q, &c., instead of wood. This machine appears to be doing very good work. Amongst other exhibits of Messrs. Walworth were a wheat-brushing machine and bran duster, with a revolving iron cylinder, and some minor exhibits, such as samples of cast iron warning.

Crossing over to the other side of the hall, through stand No. 17—Messrs. Robey and Co., of Lincoln, who exhibit some fine engines of their well-known types, including a well designed 40-horse power fixed engine, with variable expansion gear—we came to the stand of Messrs. Whitmore and Binyon, of Wickham Market. They exhibited a substantial iron hurst for four pairs of 4ft. stones, Fig, 51 on their patent belt-driving principle. The tightening of the belt is effected by bodily shifting the frame carrying the stones, spindle, and lighter gear. They also show a centrifugal silk machine, of different design to others. The top of the case is of semicircular form, built up of wooden staves, and finished at the ends with brass hoops.

Fig. 55 shows a section of Hunter's purifier, with dust room attached. Fig. 56 is a perspective outside view of the same. In this machine the brushes for keeping the silk clean are fixed above, not below, as in most purifiers. For this Mr. Hunter claims special advantages. The machine is described as follows:—The middlings are fed at Y. The fans E force the wind through graduated alternate openings, G and H, under the silk—of which there are five to seven grades—the fine at the head, and the coarser at the tail. An equalised pressure is thus given to every square inch of silk. J is the frame holding the movable sectional screens; M is the cross-bar which receives the blow from the ends of the screen frame; W is the valve handle to regulate returns; O represents a series of frames covered with muslin to collect dust; D is the cam that lifts the dust frame to clear it, and allow wind to escape; X is opening for discharging purified sharps; T is opening for

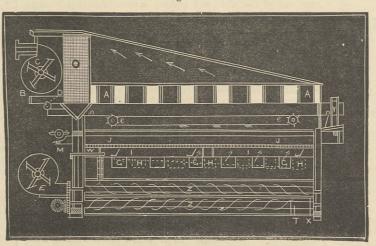
purification of middlings is effected by the pressure of wind underneath lifting the fibre as the screen frame agitates it on the surface. It cannot possibly get through the silk. The finer is carried upward, the coarser goes over the tail. Messrs. Whitmore also exhibited a well-designed 6-reel bolt chest, Fig. 51; the reels are placed alternately head and tail, thus making several conveyors entirely unnecessary; also small millstones for grinding middlings, and sundry other milling articles of their well-

Middings, and sundry other infilling articles of their well-known manufacture.

Next to Messrs. Whitmore and Binyon's stand was that of Messrs. A. B. Childs and Sons, who exhibited a fine collection of Wegman's porcelain rolls. Some of these were illustrated in The Engineer, page 61, July 25th, 1879, and page 346, May 13th, 1881; but some improvements have been introduced to meet the various requirements of millors. One Fig. 57, is driven by one helt ments of millers. One, Fig. 57, is driven by one belt passing over the two roll pulleys and two intermediate "idlers". The belt is kent tight by springs, energting on The belt is kept tight by springs, operating on forked idle pulley carriers, the stems of the forks being carried by socket brackets c, adjustable as to angle by nuts d, and as to height by the hand-wheels b b, shown in the engraving. Mr. Child has been an energetic advocate of the porcelain rolls for many years. In the exhibition he showed a very compact Millot's purifier and a self-acting lathe for fluting either porcelain or chilled iron rolls. This lathe, which is shown in Fig. 58, was at work during the

Mr. F. Nell, of Mark-lane, London, Stand No. 13, showed amongst other things the Excelsior Purifier. A special feature in this machine is the arrangement for keeping the silk sieves clean by means of india-rubber balls, shown in Fig. 59. Across the bottom of the sieves coarse wire-cloth is stretched to the framework, and in compartments formed by the frame of the sieves are placed india-rubber balls of such size as will freely play in the space between the wire and the silk without rubbing the latter. motion of the shaker, together with the rough surface of the wire-cloth, causes the balls to jump and dance about in all directions, thus jarring the silk and keeping the meshes free and open—a very simple and, we should think, effective device. Another feature in this purifier is shown at L in the section, Fig. 60. The middlings enter at the hopper ward side of the reel, thereby causing that side of the reel A, pass down the spout M on to the detacheurs L, con-

Fig. 55.



sisting of rapidly-revolving arms of iron wire; a great portion of the dust and fibre is carried off by the wind-current to the fan by the trunk G, the middlings drop on to the lower detacheur L_2 , similar in construction to the upper one, and a further portion of dust, &c., is carried off in the space between the inner and outer hoods. After these two separations the middings drop into the hopper C, and are discharged upon the shaking sieves below, to be then finished. The action of the air-currents on the cloud of falling middlings was very interesting and instructive to observe. Mr. Nell also exhibited a number of Steven's patent roller mills; the flutes in these rolls are of rounded section shown in the diagram Fig. 61, and are cut parallel, not twisted. Special merit is claimed for these rounded grooves; but they would seem calculated rather to bruise than split the wheat. Fig. 62 shows the pressure adjustment and the roll bearings; the large hand wheel A gives the permanent or wide adjustment, the smaller hand-wheel B a fine adjustment, and the spiral spring gives the necessary pressure. A lock nut is provided on the adjustment screw to prevent the rolls from coming into actual contact. Gearing is used to ensure permanent differential speed.

TRAMWAYS IN IRELAND.

Although there is great room for improvement both in the construction and working of tramways, the system appears to be making steady progress. We shall shortly have another of the very complete tramway returns issued annually by the Board of Trade, which will show a considerable increase over the return issued for June, 1880; but taking this latter return, we find the mileage open for traffic was—in England and Wales, 269 miles; in Scotland, 48 miles; in Ireland, 50 miles. The capital in Scotland, 48 miles; in Ireland, 50 miles. The capital expended was—in England and Wales, £4,160,590, or equal to £15,470 per mile; in Scotland, £843,950, or equal to £16,880 per mile; in Ireland, £660,916, or equal equal to £13,770 per mile. The gross revenue was—in England and Wales, £972,513, or equal to £3600 per mile; in Scotland, £240,714, or equal to £4814 per mile; in Ireland, £129,706, or equal to £2700 per mile. These figures show the remarkable development that has taken place. They also exhibit a feature that is brought to notice by the proceedings of a Select Committee of the House of Commons to which the Tramways (Ireland) Amendment Bill has been referred, namely, that in Ireland the mileage returns; A is expansion chamber above the screen; E is perforated belt for carrying brushes; C is an exhaust fan to withdraw wind through the cloth in dust collector. The

Trade, and by Mr. Kincaid, Mr. Brett, and other engineers, contains interesting information on this subject, that given by Mr. Kincaid being especially valuable in comparing the experience gained in different countries where

There have been no less than three tramways Acts for Ireland, viz., 1860, 1861, and 1871, and now a fourth has been introduced into Parliament, and has been referred to a Select Committee, who are taking evidence which contains interesting information and points for consideration. The objects of the Bill are fourfold: (1) To raise the limit of tolls fixed by the Act of 1860 for the carriage of goods; (2) to increase the limit of speed; (3) to remove some legal obstructions that are found to exist in working under the Act of 1861; (4) to relax the restrictions contained in the Acts of 1860 and 1871, by which the tramway must be laid approximately in the centre of the road,

and level with its surface.

The maximum tolls authorised by the Tramways-Ireland-Act, 1860, are limited to from 1d. per ton per mile and upwards, according to the class of goods carried; but in the Tramways Act of England there is no such limit, and the Provisional Orders issued under that Act authorise a toll of 3d. per ton per mile and upwards for similar goods, and on some tramways the toll is authorised as high as 1s. 2d. per ton per mile and upwards. It is obvious that the toll of 1d. per ton per mile would not pay on tramways, and the alteration proposed in this restriction is one of the most important objects of the Bill. The comparatively small quantity of goods to be carried, and the heavy gradients over which they must be hauled requires a higher toll than that fixed for railways to give a profitable return over working expenses. Mr. Kincaid's argument is that as the cost of cartage along the roads is generally in Ireland from 6d. to 1s. per ton per mile, the charge on the tramways should be limited to something below this, say 4d., so that under any circum-stances the district would get the benefit of lower rates, and the maximum rate chargeable would be specified in the Order in Council for each case.

The speed authorised by the Act of 1871 is limited to three miles per hour in towns and six miles in the country, and this it is proposed to raise to eight and twelve miles

ely. As the Board of Trade have authorised a speed of eight miles per hour in such towns as Bristol, Glasgow, Sunderland, and Dewsbury, this alteration does not appear unreasonable. The third alteration to be reasonable. The third alteration to be effected by the Bill does away with the necessity of having the Order in Council confirmed by Parliament in the case of an unopposed Order, thereby simplifying the proceedings, and considerably shortening the period required between the first application and the final authorisation of the project.

It is certainly remarkable that every tramway in Ireland is authorised by special Acts, although three Acts of Parliament have been passed which would apparently obviate the necessity of incurring such expense. The Lord Lieutenant in Council is empowered to authorise a tramway in a similar manner as the Board of Trade is empowered under the Tramways Act, 1870, and yet we find that although in England the Provisional Order issued by the Board of Trade has been found quite satisfactory, the Order in Council under the Irish Acts has been found so in-operative that in every case an Act of Parliament has been

found necessary. Lastly, it is proposed to enable tramways to be laid on the side of the country roads, and without the restriction specified in the Acts of 1860 and 1871, that they shall be level with the surface of the road. This anticipates a construction similar to that adopted at Wantage, where the rails are laid for a considerable distance on the side or unused portion of the road. Last year a tramway was authorised from the Giant's Causeway to Bushmills on a raised causeway similar to a footpath at the side of the roadway, with a kerb and gutter separating

but site of the foatway, with a kero and guest separating it from the roadway.

During last session an Act of Parliament was passed whose title does not appear to bring it within the range of our subject, but which, nevertheless, may possibly affect to a great extent the extension of the tramway system in Ireland. The Act was called the Relief of Distress (Tarland). Act allowed the Relief of Distress the contract of the results of the system of the results of the system. (Ireland) Amendment Act, 1880, and it authorised the Government to advance capital for the construction of railways and tramways, a list of which is scheduled to the Act. This schedule consists of forty-two lines, of which fifteen are tramways, amounting to a length of about 300 miles, and the rest are railways. Up to the present little or nothing has been done under this Act, but if the Bill at present before Parliament is judiciously and liberally framed, it is very likely that we may see a very large extension of the tramway system throughout Ireland within the next few years. within the next few years.

On the Continent the tramway system has developed more rapidly than in this country, principally within the limits of the large towns; but in Italy a very considerable extension has been carried out along the high roads of the country. From a return presented to the Italian Parliament last year, we find there are 400 miles working, 154 miles under construction, and 1007 miles applied for. greater portion of this mileage consists of lines laid along the side of the country roads. These so far have proved great boons to the locality, and most of them have given very successful results. There is no doubt Ireland would reap great benefit from a similar state of things. How far a change of the law would effect this it is of course hard to say, but at all events the changes proposed in the Amendment Bill would assimilate the law to the conditions under which tramways have been legalised in Italy

The tolls chargeable and the speed workable are both elements which in Italy are less restricted than in Ireland, and the expenditure on the construction and maintenance of the lines is very much reduced by the permission-which in Italy is easily obtained—to construct the lines on the side of the roads instead of the centre in those parts of the

country where the width of the main roads makes such a system of construction possible. It is true that in a long length of line the rails must, when the route passes through villages, be laid in the centre of the road, with all the expense attending the construction of paved street tramways; but for the rest of the distance a large expenditure is saved by laying a simple system of permanent way when there is width on the side of the road.

The capital shown on the preceding page to have been expended on tramways is no guide to what might be done in the further development of lines in the country parts of Ireland. The average cost of £13,770 per mile expended on existing lines refers exclusively to tramways in the streets of towns, and covers not only expensive construction and equipment, but very large preliminary outlay in Parliamentary proceedings. The expenditure contemplated now, does not exceed an average of £5000 or £6000 per mile, and would probably be less. In many parts of the country the space at the sides of the roads might be utilised, and not only would the adjacent districts reap the immediate advantage of better means of communication between the villages along the main roads, but the cheaper and quicker system of carriage would facilitate the transit of agricultural produce, and the commodities and necessities of life, as well as the opening out of quarries, of timber districts, the establishment of brickfields, lime

kilns, and other industries, on properties which otherwise are shut out from such development by the cost of road carriage. There are no doubt many objections that can be raised against the extension of these lines—such as the heavy gradients constantly met with even on comparatively leve roads, the jealousy that arises against the appropriation of the public road to private enterprise, the nuisance alleged against the passage of engines, but the facilities given and the improvements adopted are gradually overcoming these objections, and the great extension of the system in Italy is a good proof that the benefits are appreciated. The following is a list of the Italian lines, taken from a return presented to the Parliament at Rome ast year, by the Minister of Public Works.

ITALY, MAY, 1880.—TRAMWAY	s now Wo	ORKING.	
Name of Tramway. Leng		Motive power.	
Bergamo-Treviglio-Arsago-Lodi	36 miles.	Locomotive	
Sarronno-Tradate	$4\frac{1}{2}$,,	,,	
Cuneo-Borgo San Dalmazzo	6 ,,	,,	
Cuneo-Dronero	11 ,,	,,	
Cuneo-Dronero Piazza-Cavour ai Bagni in Rimini	$1\frac{1}{2}$,,	Horse	
Genoa-Sampierdarena)	Bull Bolled		
Sampierdarena-Pegli >	15 ,,	,,	
Sampierdarena-Bolzaneto			
Talamone al mare	1/2 ,,	,,	
Florence-Peretola	4		
	11	"	
Milan-Saramo	$13\frac{1}{2}$,,	Locomotive	
Tradate Saronno	5 ,,	,,,	
Milan-Monza	$9\frac{1}{2}$,,	Horse	
Milan	11/2 ,,	_ ''	
Milan-Gorgonzola-Vaprio	$15\frac{1}{2}$,,	Locomotive	
Milan a Sedriano-Cuggiono	28 ,,	22	
Sedriano-Corbetta 5	SOME THE REAL	ge as the designation	
Sant Angelo Lodigiano-Lodi-Crema-	32 ,,	,,	
Soncina	Minute 1	The state of the s	
Lesmo, Casate Nuovo, Casinago,	13		
Monticello	10 ,,	"	
Milan, Meleguano, Sant Angelo and		The same of	
Colombano	28 ,,	,,	
Lodi-San Colombano-Chignolo Po	12 ,,	Loco, & Horse	
Milan-Niguarda-Cusano-Novo-Desio-			
Seregno-Pavia-Guissano	16 ,,	Locomotive	
Naples	14 ,,	Horse	
Naples-Torre del Greco	$5\frac{1}{2}$,,	.,	
Vercelli-Trino	$11\frac{7}{2}$,,	Horse & Loco.	
Vercelli-Gattinara	20 ,,	,, ,,	
Palermo	81,	"Horse"	
Palermo-Rocca-Palermo-Trapani	11,,	"	
Milan-Pavia	8 ,,	Locomotive	
Rome-Ponte Milvio	2 ,,	Horse	
Rome-Tivoli	18 ,,	Locomotive	
Turin	14 ,,	Horse	
Turin-Moncalieri Turin Stradale di Rivoli	7 ,.	Locomotive	
Turin Stradale di Rivoli	2 ,,		

ITALY.—TRAMWAY CONCESSIONS APPLIED FOR.

Name of Tramway.	Length.	Motive power	
Linea Asti, S. Damiano-Casale-Cam-	37 miles.	Locomotive	
agna-Alessandria-Sale 5		2300021100210	
Novi-Ovada	16 ,,	"	
Chivasso-Serralunga	27 ,,	99	
Romano-Soncino	$10\frac{1}{2}$,,	,,	
Val Seriana	$20\frac{1}{2}$,,	,,	
Provincials roads of Brescia	$22\frac{1}{2}$,,	,,	
Brescia-Bargo-Iseo-Gardone-Orzinovi	137	ELLIE THE E	
Quinzano, &c	101 ,,	"	
Isola del Lira a Ceprano, Rocasecia	15 ,,	Horse	
Camerlata-San Rocco di Como-		T	
Camerlata-Chiasso }	$7\frac{1}{2}$,,	Locomotive	
	9 ,,	,,	
Varese-Tradate	18 ,,	12	
Como-Cantù, Maraino de Milano)	20 ,,	3,	
Erba per Inverigo-Arosio-Lecco per	43	and on the first wall	
Olginate ed Osuago	40 ,,	,,	
Milano, Arosio, Erbo, Como ed a Lecco	32	E STATE THE PARTY OF THE PARTY	
Milan, Campreno, Camerlata-Como	11	33	
T) TT T G T	57	"	
	7	99	
	57	,,	
Varese-Laveno-Como-Lecco Fino-Saronno-Fino San Pietro Martire		"	
	$\frac{14\frac{1}{2}}{10^2}$,,	23	
Cremona San Giovanni, &c	18 ,,	23	
Piadina, Casalmaggiore	10 ,,	23	
Ferrara	188 ,,	>>	
Pistoia-Calcaida	35 ,,	"	
Milan-Corsico	$3\frac{1}{2}$,,	"	
Milan-Lentate-Como per Affori,			
Cesano, Maderno, Bartassina,	271 ,,	- manument	
Capreno, Asuago, Camerlata a	2/2 33	22	
Como)		The state of the s	
Milan-Binasco-Pavia	$20\frac{1}{2}$,,	22	
Milan-Gallarate	$25\frac{1}{2}$,,	22	
Gravellana-Intra	114 ,,	,,	
Arona-Bavena	$13\frac{1}{2}$,,	, ,	
Arona-Gravellona	$36\frac{1}{2}$,,	"	
Parma-Borgo San Domino	10"		
Parma-Langhirano	1 + - "	"	
Piacenza-Cremona	201	"	
Siracusa	20	"	
Pinerolo-Fenestrelle	911	"	
Torino-Casale-Gassino	01	"	
Lorino Cacare Gassino III III III III	02 "	"	

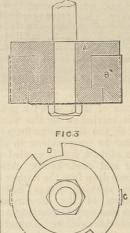
ITALY.—TRAMWAYS IN COURSE OF CONSTRUCTION.

Name of Tramway.	Length.	Motive power.	
Lucci-Bagni di Lucca Vicenza-Valdagno-Bivio di Arzignano Turin-Piazza della Statuto de Chieri Bari-Barletta Milan-Guissano Milan-Monza a Monticello Verona-Soave-Trenago Cerignola-Foggia-Otranto	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Locomotive Horse Locomotive "" "" Horse	
Florence-Campi	$\frac{3}{6\frac{1}{2}}$,,	Locomotive	

VAVASSEUR'S NAVAL GUN CARRIAGE.

A CARRIAGE and brake constructed by Messrs. Vavasseur and Co. is now under trial with the 6in. new type gun, which promises great things, and which has already proved its excellence in trials made by the Government. Speaking generally, the idea is as follows:—There are two cylinders, A and B, Fig. 1, fixed to the carriage, each moving on a piston fixed on a rod C and D, attached to the slide. Each piston has two openings cut in it which allow the liquid to pass through from one side to the other of it, but to the piston is attached a disc which moves round so as to close the openings as far as may be desired—Fig. 3. This closing action is effected by a rifled motion imparted to the disc by means of projections running in spiral grooves in the interior of the cylinder. Supposing the piston and rod to be themselves incapable of rotation, then the closing action of the disc would be an unvarying one, depending on the spiral of the prooves. The piston itself, however, can be set in any desired position, so that the openings may be partly closed before recoil, position, so that the openings may be partly closed before recoil, and entirely closed at a corresponding point in the cylinder, so as to limit the recoil absolutely. The value of this can be exhibited by pressure diagrams, which show that with a very reasonable pressure indeed, as shown by the diagram, a very short recoil can be secured. Running up is effected by the gun's own weight, which acts directly a by-pass valve is opened; the rate of running up being limited by the rate of escape of a liquid through the by-pass valve, cannot be quickened inconveniently by the rolling of a ship. The arrangement is, therefore, specially adapted for sea service. The simplicity is apparent on inspection of the actual compressor. of the actual compressor.

The tendency to decrease or increase the space available for the liquid in the interior of the cylinders from the exit or entrance of each successive length of piston rod is obviated by entrance of each successive length of piston rod is obviated by attaching one piston rod to the front end, and the other to the rear end of the slide, and making a communication from one cylinder to the other, so that the loss of space in one from the entrance of piston rod is compensated by the corresponding increase of space from the exit of piston rod in the other. E and F in Fig. 1 are the traversing gear. For a recoil of 36in, the slide is 9ft. 6in, long; for one of 20in, the slide need not project beyond the breech of the gun. Mr. Vavasseur now proposes to check recoil in about three calibres, though the exact amount is arbitrary according to strength of cylinder. Thus he would pull up a 12in, gun in 3ft. For broadside guns, and, indeed especially in long breech-loading guns, this short recoil gives great advantages. The pressures obtained at Woolwich may be seen in diagram, Fig. 5. To the underside of the carriage are fixed



underside of the carriage are fixed two cylinders of wrought iron or steel, similar to the cylinders of hydraulic buffers now in use in the service. These cylinders are con-nected together at the rear end by a pipe, and are rifled with two helical grooves. Each cylinder is fitted with a piston working freely as in the service hydraulic on the circumference of which is cut a groove, into which works a gun-metal ring or valve, having two projections working into the two rifled grooves in the cylinders. Across each piston and valve are cut two passages, making two direct communications from one side of the piston to the other. The piston rods of each cylinder are held by brackets fixed one at the front and the other at the rear end of the slide. By means of a short lever and adjusting screw each piston

can be moved round its axis and the passages in the pistons placed in any required position with respect to the openings in the valves; by this means the openings for the passage ings in the valves; by this means the openings for the passage of the liquid from one side of the piston to the other can be enlarged or contracted at will, irrespective of the contraction of the openings due to partial rotation of the valve caused by the rifled grooves during the recoil of the carriage. The piston rods being fixed one to the front and the other to the rear end of the slide, it is evident that as the cylinders move during recoil one piston rod is being withdrawn from one cylinder, while the other piston rod enters the other cylinder, and the liquid thus displaced by one piston rod flows through the pipe connecting the two cylinders, and compensates exactly for the deficiency caused by the withdrawal of the other rod. This arrangement allows both cylinders and connecting pipe to be kept full of liquid, and entirely suppresses all air space. The amount of twist given to the grooves rifled in the cylinders is such that while the passages both cylinders and connecting pape to be kept this of liquid, and entirely suppresses all air space. The amount of twist given to the grooves rifled in the cylinders is such that while the passages in the piston may be full open at the commencement, they may be nearly or wholly closed at the end of the recoil. To regulate the movement of the gun while running out, a valve is placed in the pipe connecting the two cylinders. This valve opens by the pressure caused in the rear end of one cylinder during the recoil. of the gun, and it is evident that when closed so that no liquid can pass from one cylinder to the other, the gun-carriage cannot move, as any movement in either direction would be to force one of the piston rods into a cylinder already full. The movements valve are controlled by a lever carrying a roller moving on a guide bar placed inside one girder of the slide.

The action of the brake is as follows:—The pistons are first adjusted to give the amount of opening necessary for the recoil adjusted to give the amount of opening necessary for the recom-desired, the amount of opening required of course varying with the charge of powder. As the cylinders move along the slide during recoil they, by means of the rifled grooves, partially rotate the valves carried by the pistons, and thus gradually con-tract the openings in the pistons till the gun is brought to a state of rest, where it is kept by the closing of the running out valve which cuts off all communication between the two cylinders. This is effected by an incline on the rear end of the guide bar which controls this valve.

To run out the gun, the incline at the rear end of the guide

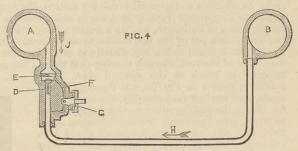
bar is raised. This opens the running-out valve, and the carriage bar is raised. This opens the running-out varve, and the carriage being mounted on rollers the gun runs forward by gravity, if the slide has sufficient incline, or by any suitable mechanical means. The valve is kept open and closed automatically by means of the roller working on the guide bar, which is at that point inclined downwards. At the end of recoil the valves herer quite close the openings in the pistons, and as the pistons themselves fit easily, there is plenty of room for the flow of the liquid past the piston as soon as the running out valve is

opened.

The advantages claimed for this brake over the service hydraulic buffer are:—(1) That the gun is controlled automatically while running out. (2) The openings in the pistons for the passage of the liquid can be made so large at the commencement of recoil in comparison with those of the Woolwich buffer, that of recoil in comparison with those of the Woolwich buffer, that it reduces very much the strain on the fighting bolt. In the case of a 24 centimetre French gun, the energy of recoil of which is about equal to the 10 in. 18-ton Woolwich gun, it can be demonstrated that the strain on the fighting bolt, with the compressor above described, is considerably less than one-half of that given under similar conditions by the service buffer. (3) By moving two screws the passages in the pistons can be readily adjusted, and the recoil regulated for different charges. (4) The movement of the valves regulating the openings in the pistons is so uniform, unvarying, and exact, that there must be great so uniform, unvarying, and exact, that there must be great uniformity of recoil, especially as the gun and carriage are mounted on rollers, and the irregularity of recoil avoided, due to the friction of two surfaces sliding one over the other, sometimes clean, sometimes dirty, and sometimes partially lubricated. The advantages claimed for this brake over all others of its class are the entire absence of packings on the pistons, and of valves controlled by springs, difficult of access, uncertain and irregular in their action. It leaves also the carriage free to move at the beginning of the recoil, and does not stop it suddenly at the

end, so that all shocks and concussions are avoided.

In our engraving A B, Fig. 4, are the compressor cylinders; C C¹ C², pipe connecting the two cylinders; D, check valve closing, when shut, passage between compressor cylinders; E, stop for check valve; F, passage round check valve or by-pass through which liquid flows to run out the gun to the firing



position; G, cock controlling by-pass; H, direction in which liquid flows during recoil; J, direction in which liquid flows while gun is being run out. As the check valve D closes by gravity, so soon as the pressure caused by the recoil of the gun gravity, so soon as the pressure caused by the recoil of the gun ceases, there is no way for the liquid to pass to allow the gun to be run out, except through the by-pass F, which is controlled by the cock G. It is proposed to make this passage so small that when the cock G is full open the gun cannot run out violently, and when the cock G is closed the gun cannot move except towards the rear of the slide or in the direction of recoil.

THE SOCIETY OF ENGINEERS.

THE PREVENTION OF SMOKE.

THE PREVENTION OF SMOKE.

At a meeting of the Society of Engineers, held on Monday evening, June 13th, in the Society's Hall, Victoria-street, Westminster, Mr. Charles Horsley, president, in the chair, a paper was read by Mr. A. C. Engert, on the "Prevention of Smoke," The author, in choosing the title of the "Prevention of Smoke," instead of "Consumption of Smoke," gives it as his opinion that smoke, once produced by the atmosphere and while being carried by the air, cannot be consumed, as every particle is surrounded by a thin film of carbonic acid. When, however, smoke is condensed as soot, heat will liberate the carbon from the acid, and then the former will burn rapidly. If this theory is found to be correct, carbon cannot destroy the germs of disease floating in the air. For the consumption of smoke, many ingenious and elaborate inventions are on record, but not yet adopted on account of expense and complexity of mechanisms. A simpler apparatus is, therefore, required.

inventions are on record, but not yet adopted on account of expense and complexity of mechanisms. A simpler apparatus is, therefore, required.

To prevent smoke, the cold air must not be allowed to come in contact with the gases arising from green coals, and, for this purpose, the furnace is, so to speak, divided into two parts. The fire-door is removed from the boiler, and a box fixed on in front. On each side of this box, rails are placed inside, on which a plate or shutter may rest, which may be pushed forward or backward as required. When pushed forward it passes within the boiler and drops over the fire-bars some eighteen inches, thereby cutting off the draught, and preventing the condensation of the gases arising when fresh coals are put on, thus preventing smoke and the cooling of the boiler. A still more simple apparatus can be made with the same results, if the opening or flue will admit a higher box. The shutters can be cast together in one piece at an angle of about 130 degrees, to hang within the box on two pins or bolts, thus forming a swinging shutter. A rack is attached to the front of the shutter, to regulate the movement. The advantages of this apparatus are—the cooling of the boiler is entirely avoided, the gases are consumed so that smoke is prevented, and there is a saving of from 15 to 20 per cent. of heat and coal. In ordinary open firegrates the same object is attained—viz., the prevention of the cold air coming into contact with the green coal, by removing the fire lump, and substituting for it a cast iron box, which stands out at the back, and is open in front only, and which is to be filled with coal. Within this box is a movable iron plate, which can be forced forward, carrying with it the coals from which the gases have been extracted and consumed by the heat in front, or moved backwards when the box wants refilling. To regulate the draught so that the fire burns brightly in front, a plate is fixed under the grate coming forward at the bottom. Another plate resting on pins is placed

RAILWAY MATTERS.

They have "parlour cattle cars" in America now. Probably drawing-room pig trucks will come next.

THE electric railway between the Lichterfeld Station and the

THE death is announced of Mr. T. A. Scott, the very prominent railway manager and financier for many years for the Pennsylvanian Railway Company. Several railways owed their origin and success to him, and he will be much missed in American railway circles.

A SERIES of experiments was lately made at the Madras Railway in order to ascertain whether India coal could be used with advantage in Madras; but the results are said to have shown conclusively that even the deservedly famous Kurhurballee coal could not compete with patent fuel at any anything like the prices obtainable.

An American has told someone that Pan Handle engine No. 22, recently pulled a train from Columbus to Denison, running one mile in 45 seconds, and 19 consecutive miles in 16 minutes. An American paper remarks:—"This was fast; but, by the way, what was the size of the train?" It might also be asked, what was the weight of the train, and the distance in English yards between the milestones?

milestones?

In France the Government has arranged with the railway companies so that postal packages not exceeding three kilogrammes (6.6 lb.) in weight, not more than 24in. long, and whose cubic contents are not more than about 1300 cubic inches, will be carried between any two points in French territory for 6d. when delivered at a station, and for 8½d. when delivered at the house of the person addressed, this including a Government stamp value 1d. Arrangements have also been made with adjacent countries so that packages like the above will be sent to Germany for 11d., to Luxembourg for 8½d., and to Belgium and Switzerland for 11d.

In the report of the directors of the Madras Railway it is stated

bourg for 8½d., and to Belgium and Switzerland for 11d.

In the report of the directors of the Madras Railway it is stated that "an important saving in the cost of raising water for the engines has been effected by the use of pumps, which have been put down in the place of the buckets and ropes formerly used for the purpose. It is found that a much smaller number of men can do the work with the pumps than was necessary with the buckets and ropes, and although there was at first some prejudice against the pumps, the coolies prefer them now. The cost of raising water this half-year is nearly £458 6s. 8d. less than in the corresponding half of 1876, before the introduction of pumps; there is also now a saving of £86 14s. 4d. as compared with the last half-year.

To work the traffic of the Madras Railway economically the

a saving of £86 14s. 4d. as compared with the last half-year.

To work the traffic of the Madras Railway economically the directors say that it is of the greatest importance to have engines of the most powerful kind, and the latest additions to the stock, now nearly three years old, have been most valuable in this respect, so much indeed are the big engines sought after by the traffic department that there is often no small difficulty in apportioning them fairly. It is possible to nerease the power of some of the engines by fitting them with larger cylinders as the old ones wear out; a beginning has been made in this direction, and it is a question well worthy of consideration whether it would not pay to put larger cylinders to some of the engines even before the old ones are worn out.

out. In France, during the year 1880, 603 miles of railways of various sorts, not including light railways, were completed and opened for traffic, making a total in the country at the end of the year of 14,740 miles, besides 148½ miles of private railways—in mines, &c. In the same time 57 miles of light railways were opened, making a total of 1356 miles of roads of that class. Algeria had 715 miles of railroad in operation at the end of 1880. The expenditures for new railroad construction by France in 1880 were nearly £11,000,000—nearly £1,200,000 for roads, the substructures of which are constructed by the State, more than £1,400,000 for completing lines which the State has purchased, and nearly £5,000,000 for new lines which the State has undertaken to construct wholly on its own account—the rest for lines which are to be built wholly by corporations.

THE report of the South Indian railway directors states that at the end of 1879 the length of line opened for traffic was 634 miles. This was increased during the year 1880 to 648 miles by the completion of the section from Chingleput to Walajabad, fourteen miles, and on January 1st of the present year the only remaining portion of the line, that from Conjeeveram to Walajabad, seven miles, was brought into operation. This completes the entire system of the company as at present sanctioned, which is 655 miles in length, consisting of :—Main line: Madras, Tuticorin, 443½; branches—Negapatam, Tanjure, 48½; Erode, Trichinopoly, 89½; Tinnevelly, Maniyachi, 18½; Arkenam, Chingleput, 38½; Villapuram to French frontier, 16½; total 655. On the completion of the large bridge over the Gingee River, and the bridges on the Chingleput Conjeeveram section, where temporary structures are at present used, operations on construction account, as at present authorised, will practically be brought to a close. The total amount expended on capital account to December 31st, 1880, is £3,993,659, representing a cost per mile of railway open, including rolling stock, of £6097.

Altogether the number of persons killed and injured on rail-

ALTOGETHER the number of persons killed and injured on rail-ways in the United Kingdom in the course of public traffic during the year ending 31st December, 1880, as reported to the Board of Trade, was as follows:—

	1880.		1879.		
	Killed.	Injured.	Killed.	Injured.	
Passengers:					
From accidents to trains, rolling				1	
stock, permanent way, &c	28	905	75	602	
By accidents from other causes	114	709	85	705	
Servants of companies or contractors:				1.00	
From accidents to trains, rolling		1			
stock, permanent way, &c	23	118	8	118	
By accidents from other causes	523	1962	444	1833	
Persons passing over railways at level		-			
crossings	74	30	64	30	
Prespassers (including suicides)	330	156	308	137	
Other persons not coming in above					
classification	43	79	48	88	
Total	1135	3959	1032	3513	

During March last there was, according to the Railroad Gazette, record of a total of 113 railway accidents in the United States, whereby 38 persons were killed and 177 injured. Sixteen accidents caused the death of one or more persons; 25 caused injury but not death, leaving 72, or 63.7 per cent. of the whole number, in which no injury to persons is recorded. As compared with March, 1880, there was an increase of 48 accidents, of 29 in the number killed and of 144 in that injured. These accidents may be classed as to their number and causes as follows:—Collisions: Rear collisions, 25; butting collisions, 6; crossing collision, 1; total, 32. Derailments: Broken rail, 10; broken wheel, 1; broken axle, 7; broken truck, 1; broken bridge, 3; spreading of rails, 2; snow, 3; washout, 1; accidental obstruction, 3; cattle on track, 2; open draw, 1; misplaced switch, 9; rail removed for repairs, 2; purposely misplaced switch, 1; unexplained, 34; total, 80. Broken connecting rod, 1. Six collisions were caused by trains breaking in two, three by misplaced switches, two by failure to obey orders and one by a flying switch. An unusual number both of collisions and derailments are unexplained; probably many of the latter were caused by snow, and some of the collisions may have been due to the confusion resulting from snow blockades. There were 70 accidents in daylight; 34 at evening or night, and in nine cases the time is not definitely fixed. There were 32 accidents traceable directly to defect or failure of road or equipment; four to the elements; four to unavoidable accidental obstructions; 38 to carelessness or defects of management; one was malicious, and 34 unexplained.

NOTES AND MEMORANDA.

The number of hours of bright sunshine, recorded with Campbell's Sunshine Instrument, during 1880, was 1214, which is about the same as the average of the four years for which records have been made at Greenwich.

As the mean of thirty-nine closely-agreeing results, Herr Seubert obtains the number 194.46 as the atomic weight of platinum. If this number is accepted the atomic weight of platinum is less than that of gold.

THE errors of the Westminster clock during the year 1880 were under 1sec. on 31 per cent. of the days of observation, between 1sec. and 2sec. on 47 per cent. between 2sec. and 3sec. on 18 per cent., and between 3sec. and 4sec. on 4 per cent.

Goods dyed rust, buff, or chamois shades with salts of iron, Science say, occasionally undergo a slow combustion. The ferric oxide is alternately reduced by the organic matter of the tissue and re-oxidised by the oxygen of the air.

IN 1873 115 million bushels of grain were brought to the Atlantic ports of Canada, of which 66 millions were carried by rail and 46 millions by water. In 1879 the quantity had increased to 261 million bushels, of which 201 millions were carried by rail, and 60 millions by canal.

THE mean daily motion of the air in 1880 was 281 miles, being two miles greater than the average. In January the mean daily motion was 147 miles below the average, in September sixty-eight below the average, and in November sixty-one above the average. The greatest daily motion was 954 miles on March 2, and the least 33 miles on January 29.

M. LAURENT has found that a silvered glass mirror may be made to exhibit magical reflections by means of heat. He heats a brass tube, and applies the end of it to the silvered face. If the mirror surface is opposite a screen, the section of the tube is reproduced in white; if the former is turned away from the screen, the image, which is seen only after removing the tube, is dark.

Mr. E. J. Mills proposes that the solids in potable waters should be estimated by accurately observing the time which a glass bulb takes to rise through a measured depth—22 centimetres—of the water. Care must be taken that all the surfaces are clean, and that the temperature is constant. In some experiments made by him the time was taken by a metronome beating thirds of seconds. This method, he says, determines every constituent that is foreign to distilled water.

At a recent meeting of the Meteorological Society a paper, entitled "Comparison of Robinson's and Osler's Anemometers, with Remarks on Anemometry in General," was read by R. H. Curtis, F.M.S., in which the author gave a clear statement of the present state of anemometry, and pointed out the defects in Osler's and Robinson's anemometers, which are the chief forms of recording instruments used in this country. This paper may be of service to some engineers.

The mean temperature of the year 1880, according to the metereological observation at Greenwich Observatory, was 49'4 deg., being 0'1 deg. above the average of the preceding 39 years. The highest temperature was 87'5 deg. on May 26, and the lowest 17'2 deg. on January 27. The mean temperature was below the average, 5'3 deg. in January, and 4'0 deg. in October, and above the average, 2'4 deg. in February, 2'7 deg. in March, 2'6 deg. in September, and 3'4 deg. in December; in other months the mean temperature differed little from the average.

HERR SEELHEIM describes experiments in the Zeitschrift für anal. Chem. on the percolation of water through soils, from which he draws the following general conclusions:—Only that stratum of any soil which is composed of the smallest particles need be considered in determining the permeability by water of the soil of a district. The composition of a soil must be ascertained, otherwise experiments on a large scale furnish no measure of the permeability of that soil. The thickest stratum of sand allows the passage of many hundred times more water than a layer of clay only one centimetre thick. The permeability of dykes may be regulated by inserting layers of clay between layers of sand.

Or 237 chronometers now in the bands of the Astronomer Royal

OF 237 chronometers, now in the hands of the Astronomer Royal, 43 belong to various chronometer-makers, who have placed them here for the annual competitive trial, and the remaining 194 are the property of the Government. Of the 43 competitive chronometers, 13 are fitted with supplementary compensation, and one has a palladium spring. The chronometers of all classes are ordinarily rated once a week, the competitive chronometers once a day. Every chronometer is tested in a temperature approaching to 100 deg. Fahrenheit, for one or more periods of three or four weeks each. And every competitive chronometer is rated several days in positions corresponding to the four cardinal magnetic directions.

An apparatus, named an automatic methanometer, or automatic

An apparatus, named an automatic methanometer, or automatic analyser of fire-damp, has been recently brought before the Geneva Physical Society by Prof. Monnier. The fire-damp, in presence of air in excess, is decomposed in a glass vessel by a platinum wire rendered incandescent, and the condensation produced acts directly on a mercury manometer, having platinum wires inserted in its tube. The air of the mine is automatically forced by bellows, every hour and half hour, into the burner. The receiving apparatus stands in the central office. The system includes several electromagnets, two batteries, pendulums with escapement, an alarm bell, &c. Nature says it is complex, which will be admitted.

DURING the past year the Greenwich time-ball has been regularly dropped automatically at 1h. on every day throughout the year, with the exception of six days when the violence of the wind made it imprudent to raise the ball, and eight days when the severe frost of last winter prevented its being raised; and of one day when there was an accidental failure. The Deal ball was not raised—on account of high wind—on ten days. It was not dropped—through failure in the telegraphic connection—on seven days, and was erroneously dropped about 5sec. too soon by telegraph signals on one day; and on another day it was not dropped at 1h. owing to telegraph signals continuing up to 1h.; on one day the current was too weak to release the trigger. On every other day the ball has been dropped automatically at 1h.

The action of finely divided palladium, platinum, and rhodium, when heated in a stream of coal-gas, has recently formed the subject of experiments by Herr Th. Wilm. He finds that these metals decompose the gas, that when palladium is used a doposit of carbon takes place at some distance from the heated metals; that with platinum the carbon is deposited on the metal, but that on heating in a stream of air the carbon is burnt completely away, and the metal remains in its original form; with rhodium, however, the carbon appears to form a compound, the volume of which is considerably greater than that of the metal itself; this compound Nature says, is decomposed only with difficulty, leaving metallic rhodium in a much more bulky form than that which it possessed before the experiment.

THE first six chronometers in the competitive trial of 1880 were on the average slightly inferior to those of 1879, there being in particular no one chronometer of remarkable excellence. In the first few years after the strict and systematic examination of competitive chronometers, beginning with 1856, the accuracy of chronometers was greatly increased. For many years past it has been nearly stationary. Sir George Airy interprets this as showing that the effects of bad workmanship are almost eliminated, and that future improvement must be sought in change of some points of construction. For instance, the impact of the escape-wheel upon the pallet of the balance-axis takes place very near to that axis, and must produce considerable friction, though of short duration. The Astronomer Royal proposed to the late Mr. Charles Frodsham to meet this by use of a broader pallet and a lighter impact of longer duration. The decease, however, of that accomplished horologist prevented the completion of trials which he had commenced.

MISCELLANEA.

An interesting pamphlet relating to the centenary exhibition on the 9th inst., and entitled "George Stephenson and the Progress of Railway Enterprise," is published by Mr. A. Reid, Newcastleupon-Tyne.

THE St. Gothard Tunnel cable, which was manufactured at the works of Messrs. Felten and Guilleaume, of Mulheim-on-Rhine, cost 3.80 marks per metre. It was laid in an iron tube, covered with wood, and fixed to the wall of the tunnel.

The total cost of carrying out the new gas works scheme at Smethwick will be £110,000. Of this sum £53,324 will have to be paid to the Birmingham Corporation as the result of the gas arbitration between the Corporation and the Smethwick Local Board.

DURING the past fortnight a serious landslip has taken place in the parish of Walcot, Bath, in consequence of which a large number of houses have been condemned by the surveyor, and are being rapidly pulled down. The land continues slipping over a large area at from an inch to an inch and a-half a day, the destruction of property being very great.

In this column of our last impression it was mentioned that the erection of a meat freezing establishment at Orange, New South Wales, was in progress. Since last week we learn that the refrigerator was supplied by Messrs. J. and E. Hall, of Dartford, and that the same firm is now manufacturing two larger machines, under Mr. T. B. Lightfoot's latest patent, to be sent out and put to work at the same establishment.

In the Coalton coal mines in Kentucky an endless wire rope is used to haul the cars in and out in a tunnel one and a-half miles in length. The engine has two 10in. by 24in. cylinders, and two 7ft. diameter drums, placed one in front of the other, over which the ‡in. wire rope runs respectively five and four times. At the other end of the tunnel the rope runs over a movable drum, so arranged as to take up the slack of the rope.

A WEEK ago Fleet-street and the Strand near the Temple Bar Memorial were stopped on one side to permit of the laying of an expensive bed of concrete and wood pavement. On Wednesday the whole length of this was split up again, the bed of concrete ruined, and the wood pavement too, to lay some telegraph pipes. Want of community between the different authorities is, in this way, spending thousands of pounds of the ratepayers' money per week in pure waste.

On the 14th inst. a large water tank upon the top of a tower at Chelmsford burst. The tank, which is constructed of cast iron plates to hold 40,000 gallons, was being pumped full of water after having been caulked. When almost full it burst with a loud report, three sides of it falling to the ground. There were two lads in the tower at the time, but neither of them was hurt. An inquiry into the cause of the failure will be held. Nothing is known certainly on the subject as yet.

THE perforations in sheets of postage stamps are effected by passing the sheets between two cylinders, one above the other, and provided with a series of raised bands, which are adjusted to a distance apart equal to that required between the rows of perforations. Each ring on the upper cylinder has a series of cylindrical projections or punches which fit corresponding depressions in the bands of the lower cylinder; by these the perforations are punched out. The machine, as used in the Government printing department, was patented in 1852, by Mr. Archer.

The negotiations that have been some time in hand touching the arranging for the iron trade of South Staffordshire of an insurance fund against accidents in lieu of the Employers' Liability Act have fallen through. The Ironmasters' Association offered to the men to contribute 25 per cent. of the fund, and on two separate occasions meetings of the operative works' representatives from each ironworks were summoned to consider the offer. The attendance was, however, so small, that no decision was come to. The representative committee of masters and men consider the present attitude to be tantamount to a rejection by the operatives of the employers' proposals. The negotiations, having failed, are now terminated.

The great steamship City of Rome was launched on Tuesday at Barrow. Just before the launch ought to have taken place a donkey boiler on board exploded. A large number of workmen were on board at the time, and one of them—Henry Welch, twenty-four years of age, a foreman plater—was killed. John C. Lucas, twenty-five years of age, living at 51, Hall-street, was severely lacerated about the head and body, and died soon after his admission to the North Lonsdale Hospital. Thomas Walker, seventeen, living at Bath-street, was also severely injured about the head and body, one or both of his legs being broken. He died at the hospital shortly afterwards. The lives of three other men are despaired of. The explosion took place in immediate proximity to the large platform which had been erected at the bow of the City of Rome for spectators.

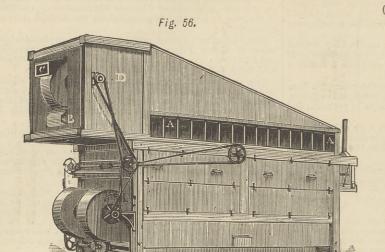
On Thursday and Friday the Royal Commissioners upon Acci-

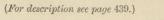
On Thursday and Friday the Royal Commissioners upon Accidents in Mines witnessed some very interesting experiments on the application of electric lighting to coal mines. The place selected for these experiments was the Pleasley Colliery, near Mansfield. The pits are about 1600ft, deep and the workings are very extensive, but in the present instance the light was applied to three workings only, situated at a distance of about one-third of a mile from the bottom of the pits. The Swan system was employed. The lamps themselves were inclosed in lanterns of a very ingenious construction, designed and made by Messrs. R. E. Crompton and Co., which enabled the very fragile glass bulbs to be carried about without fear of accident. The number of lights employed in all was ninety-four, which were worked by the current of an ordinary Gramme machine driven by a portable engine placed near the top of the upcast shaft. The whole of the arrangments were carried out under the personal superintendence of Mr. Harold Thompson, of the firm of R. E. Crompton and Co. The Commissioners, including Mr. Warrington Smyth, Professor Tyndall, Professor Abel, and others, spent two days in examining and testing in various ways the success of the experiment, and expressed themselves as highly satisfied with the results obtained.

Much alarm was caused at Sutton Bridge on Sunday night in

Much alarm was caused at Sutton Bridge on Sunday night in consequence of a threatened "blowing up" of the lock basin of the new dock. One of the men engaged at the river entrance observed a boiling up of muddy water, and the sudden appearance of a pile near the brickwork of the southern abutment. Some time after the earth near the lock on the north side began to crack and subside, and in half an hour a shed had given way, two portable engines had been precipitated into a wide chasm, and a fissure opened in the ground alongside the coping of the lock wall 60ft. or 70ft. in length, and in places 30ft. wide. Another subsidence and opening appeared on the southern side of the lock, and it was feared that a couple of tides, now at high springs, might undermine and burst up the massive walls, and carry away the ponderous lock gates. Gangs of men were promptly at work to do all that was possible toward stopping the mischief, and the water was partly run off. A deep hole has been eroded at the dock end of the lock, the water finding its way either under the foundation of the masonry and the invert or bottom of the lock—which is of brickwork, 3½ft. thick upon 10ft. thickness of concrete—or, as many think, merely making a passage at the back of one wall. Mr. M'Kerrow, C.E., having been summoned from London, inspected the dock, and a consultation was held as to the steps to be taken, At low water the boiling up of water at the river end of the lock still continued, but the danger had not increased. No further fissures had opened to endanger either the warehouses or the building containing the 50-horse engine and the hydraulic machinery. If no serious and prolonged task has to be undertaken for insuring the safety of the works, the proposed celebration and opening fixed for the 29th inst. will not be postponed.

MACHINERY AT THE MILLING EXHIBITION.





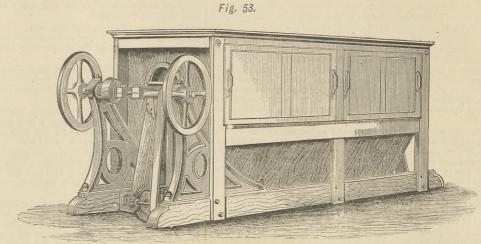
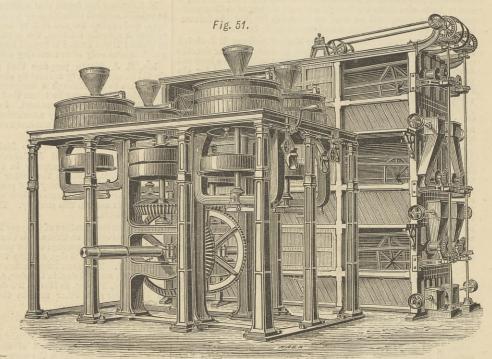
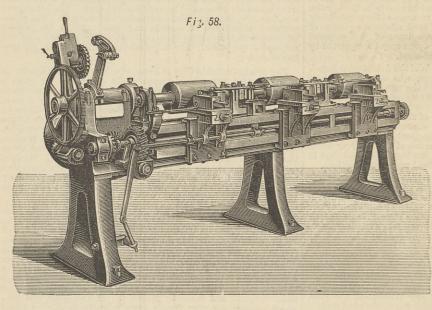
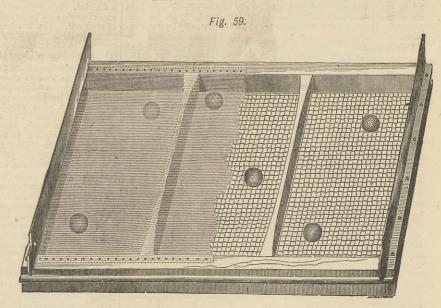
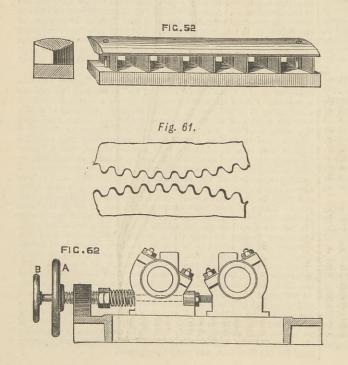


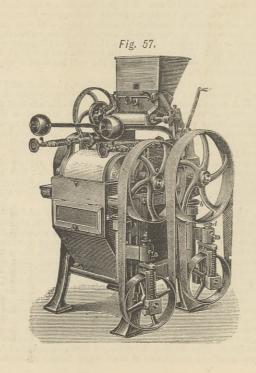
Fig. 54.

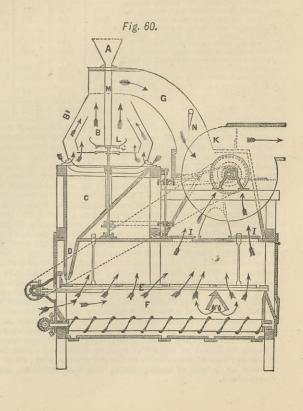


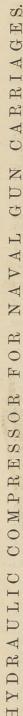


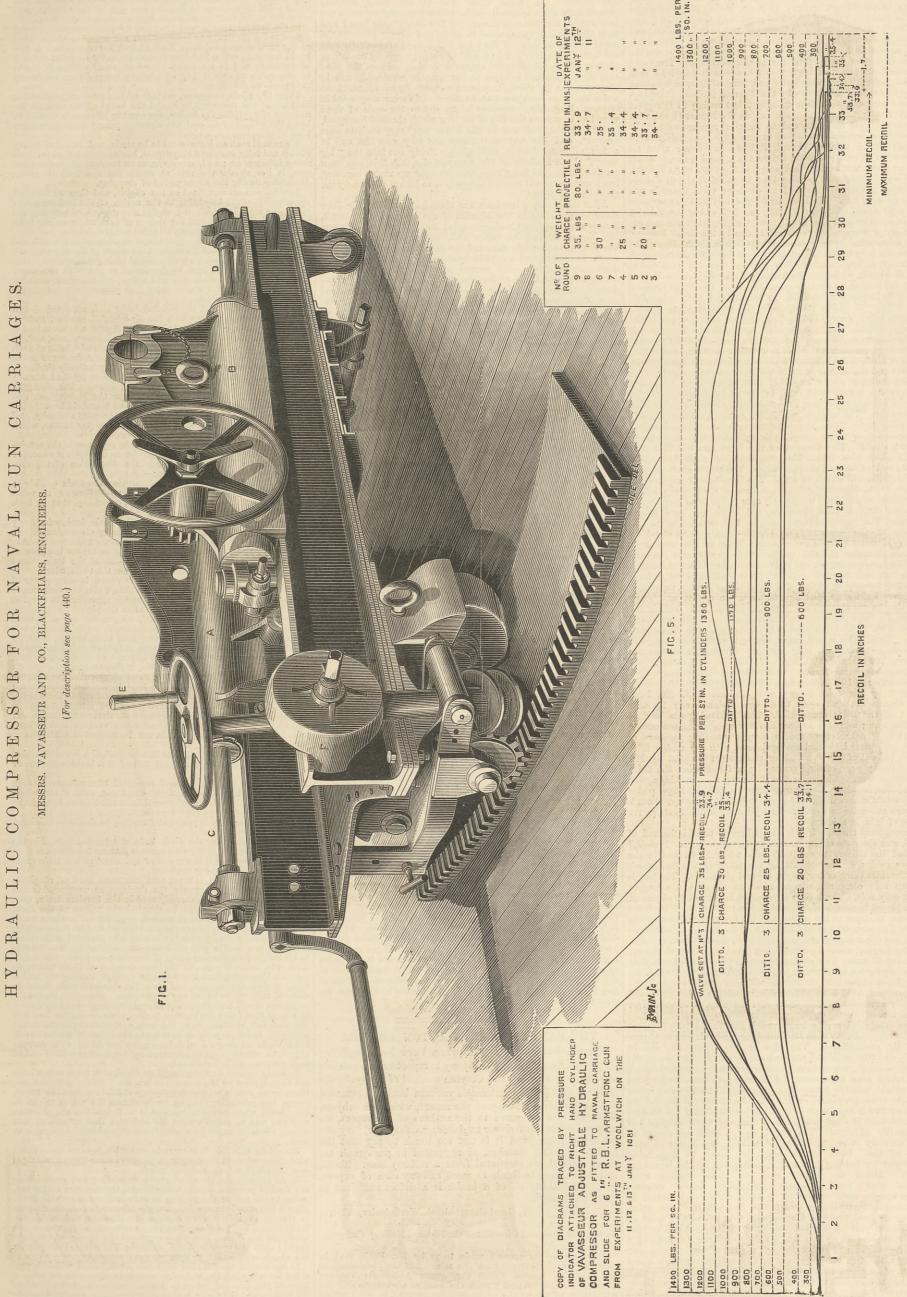












LAUNCH OF THE S.S. CITY OF ROME.

TUESDAY was a great day with the people of Barrow-in-Furness, as well as one of great interest to many of the leading ship constructors of our country who assembled at the works of the Barrow Shipbuilding Company, at the invitation of the directors and the Duke of Devonshire. The great ship, the City of Rome, and the Duke of Devonshire. The great sinp, the City of Kone, built for the Inman Steamship Company, was to be launched; and Barrow, made holiday in honour of the great event. The sight-seers were not, however, confined to those invited to see the launch from the yard, or to the people of Barrow, for every available foot of ground from which the launch could be seen was covered with spectators, who had reached Barrow by about thirty, two special trains run by the Furness Pailway Company thirty-two special trains, run by the Furness Railway Company. It was a busy day with this company, but owing to the great length of the trains which are run on the Furness lines, with the traffic, the enormous number of excursionists was safely taken to and from Barrow, though it was many hours after all that was to be seen was over, before the special trains, running close on each other's heels, had emptied the town of its visitors, The City of Rome was to have been launched at eleven o'clock, but owing to the prevalence of an off shore wind the tide was but owing to the prevalence of an off-shore wind the tide was about an hour late. We have so fully described this enormous passenger vessel at pages 98, 99, and 127 of our last volume, that it is unnecessary to recall more than her chief dimensions. The City of Rome is only excelled in size by the Great Eastern, while as remarked by one speaker at the luncheon which followed the launch, she is by far the largest really commercial ship in the world, for though so large, she is built to perform everyday work and to earn dividends, while the Great Eastern was built, according to though so large, she is ofth to perform everyday work and to the great Brunel, to demonstrate a principle. The Great Eastern, it may be mentioned, is 692ft. in length and 83ft. in breadth. Her weight is 12,000 tons, and the nominal horse-power: Paddles, 1000; screw, 1600. The City of Rome, which is the seventy-seventh vessel constructed by the Barrow Company, is of the following dimensions:—Length over all, 610ft.; length between perpendiculars, 546ft.; extreme breadth, 52ft. 3in.; depth of hold, 37ft.; tonnage, 8826 tons; indicated horse-power 10,000; and the estimated indicated horse-power in regular work driving the ship at 18 knots is 8000, which is to be passed through one hollow shaft 2ft. in exterior diameter and 14in. internal diameter, carrying a four-bladed built-up propeller 24ft. in diameter. The engines, which are ready for their place in the ship, have three high-pressure cylinders 43in. diameter, superposed upon three low-pressure cylinders 86in. in diameter and 6ft. stroke. The diameter of the crank shaft is 25in., and of the crank pins 26in. The length of the main bearings is 33½in., and of the crank pins 28in. The crank shaft, as built up complete, will weigh 64 tons. The thrust shaft has thirteen collars, 39½in. diameter, giving a surface of 6000 square inches. rollars, 39½ in. diameter, giving a surface of 6000 square inches. This piece of shafting weighs 17 tons. The first part of the propeller shaft is 25 in. diameter, and 30½ ft. long, and weighs 18 tons. The engine bed-plate weighs 100 tons. The cooling This piece of shafting weighs 17 tons. The first part of the propeller shaft is 25in. diameter, and 30½ft. long, and weighs 18 tons. The engine bed-plate weighs 100 tons. The cooling surface of the condensers is 17,000 square feet, equal to nearly 17 miles 360 yards of tubing. There are two air-pumps, 39in. in diameter and 3ft. stroke; these pumps, and the feed and bilge pumps, are worked by levers attached to the crossheads of the aft and forward engines. There will also be a large centrifugal pumping engine, which can either be used for pumping heavy leaks or to discharge through the condenser. There will also be three auxiliary pumping engines, for feeding the boilers, for bilge pumping, and for deck purposes. Steam will be supplied by eight cylindrical tubular boilers, fired from both ends. Each boiler is 14ft. mean diameter, and 19ft. long, with a steam receiver 13ft. long and 4ft. diameter, and has six furnaces 3ft. 9in. diameter, three at each end, so that there are forty-eight furnaces in all. The fire-bars are 6ft. long, giving a grate surface of 1080 square feet. The shell plates of the boilers, supplied by Sir John Brown and Co., are 24ft. 8in. long, 4ft. 4½in. wide, and 1¼in. thick, and weigh nearly 2½ tons each; all the holes are drilled. The internal parts are of Bowling iron; and each furnace has its own separate combustion chamber. These boilers are to carry a working pressure of 90 lb. per square inch, and are lap-jointed with the wedge fillet pieces cut out of the plates under the system adopted by Mr. James Humphreys, of the Barrow Works, for securing the truly cylindrical form of the boiler, and at the same time making a good strong simple joint. The arrangement necessitates larger plates than would otherwise be necessary, and must be costly, though perhaps not quite so costly as butt joints with double strips for than would otherwise be necessary, and must be costly, though perhaps not quite so costly as butt joints with double strips for plates of 14in. in thickness.

plates of lin in thickness.

Throughout the ship iron is used wherever possible instead of wood, and the state of the interior work, which is still "in shell," enabled the visitors to see that wood will only be used in the saloons, cabins, &c., as a sheathing, the whole of the framework and the sides being of bar, angle, tee and plate iron. The hull is cut up into compartments as much as possible, the longest being only 60ft. The boilers are divided into two lots of four in each, placed in completely separated compartments. The floors are 34in, in depth at the centre, and the decks are of iron—facts which give some idea of the strength of the vessel. The frameare 34in. in depth at the centre, and the decks are of iron—tacts which give some idea of the strength of the vessel. The framework is of the ordinary form, but of great strength, the stern frame, in one forging, made by the Mersey Steel and Iron Company, weighing 33 tons. The estimated weight of the vessel, complete and ready for sea, is 8000 tons, and her displacement, at 26ft. mean draught, is 13,500 tons, so that she will have a dead-weight carrying power of 5500 tons. The cubical contents of her holds will give her a measurement capacity of 7720 tons, at 50 cubic feet to the ton.

The construction of a large vessel like this hardly involves greater responsibility than the launching, and this was most successfully accomplished. The slips or ways were 3ft. 6in. in width, and the cradle of unusual strength. Taking the cradle length as 500ft., the surfaces in sliding contact were 3500 square feet, which gave a pressure of 2.28 tons per square foot, taking the weight as 8000 tons. This pressure, it will be seen, is less than is often permitted on the ways for smaller ships but the than is often permitted on the ways for smaller ships, but the extra surface is so comparatively easily obtained that the wisdom of employing it when dealing with such enormous weights will be readily admitted. The vessel was chocked and shored in be readily admitted. The vessel was chocked and shored in the ordinary way, two principal jointed dog shores at each side of the bows at an angle of about 15 deg. being employed for holding her and releasing her by the launching cords. Above the higher ends of these angular strut shores were vertical boxes containing heavy weights. These weights were suspended by cords, which were carried to the staging immediately under the figure-head. Here these cords converged, and two loops passed over a block of wood at the bottom part of a small mahogany guillotine frame or box. In the upper part of this box a weight of about a quarter of a hundredweight was suspended by a silk ribbon passing out through the top. The bottom of the weight carried a sharp knife. At a given signal the whole of the minor shores were

with the words, "Success to the City of Rome." She was immediately handed a pair of silver scissors, with which she severed the silk ribbon, and the guillotine cut the cords suspending the weights, which fell and knocked away the dog shores. A little water was at the same moment dog shores. A little water was at the same moment pressed into a few hydraulic jacks, which thus slightly eased the bow weight, and the ship moved. A few creaks were heard and then the monster commenced to glide, and having attained the speed due to the angle of the ways, she moved majestically into the water, ploughing it into a mild froth, increased by the falling timbers which she discarded as she entered it. From the time that she commenced to move to the time the whole ship was in the water was but about 50 seconds. Just before she entered the the water was but about 50 seconds. Just before she entered the water the ropes by which two immense cable were suspended in festoons along either side were let go, and to the ends of these were two enormous bundles of bar iron which checked her speed, and as soon as she was in the water two heavy anchors were dropped, and the way on the ship was very soon lost, and in a few minutes she was motionless. Fairly out into the "big water," she lost much of her apparent size, but this was soon regained as several large tugs were brought up under her bow, head and storm and showed themselves to be but villages by the head, and stern, and showed themselves to be but villages by the

great City of Rome.

After the launch a luncheon was given in the works, Sir John Ramsden presiding in the absence of the Duke of Devonshire. Toasts were proposed and responded to by Mr. Charles Inman, Mr. Ernest Inman, Mr. John Fell, and the Hon. F. Stanley. The day was splendidly fine, and the launch was everything that could be desired, but a terrible fatal accident—if the word accident may be used—sadly marred the proceedings. A vertical winch and crane boiler placed close to the entrance to the upper deck from the great gangway incline was under steam, and soon after eleven o'clock exploded with the report of a piece of For the first moment it was thought that it was an ordinance. For the first moment it was thought that it was an announcement for preparations to let go, but the next moment showed too plainly what had gone wrong, for over the port side of the vessel a torrent of hot water was falling on to the gangway, while a cloud of steam obscured the view; fragments of wood and cinders fell in quantity, while the upper part of the shell of the boiler flew far away over the starboard, other pieces going in different directions. A large number of workmen were on board at the time, and one poor fellow, named Henry Welch, twenty-four years of age a foreman plater was blown uninto the air. twenty-four years of age, a foreman plater, was blown up into the air, and fell a distance of 60ft. at least, between the City of Rome and a steamer in course of construction adjoining. He was found to be dead when he was picked up. John C. Lucas, twenty-five years of age, was severely lacerated about the head and body, and he died soon after his admission to the North Lonsdale Hospital. Thos. Walker, seventeen, was also severely injured about the head and body, one or both of his legs being broken. He died in the hospital a short time after the accident. Three others, it is thought, may not recover, and several are severely injured. One gentleman, a visitor, was standing near the boiler at the time of the explosion, but escaped with a drenching; while a man close to him was killed, and the near bulwark considerably damaged. The boiler seems to have been an old one, and was only tem-porarily used to haul material up to the deck. The cause of the explosion is supposed to be a fixed safety valve.

HORIZONTAL ENGINE.

HORIZONTAL ENGINE.

The illustration shows a good example of a class of engine which Messrs. Hayward Tyler and Co. are building, and for which they claim various advantages in details of design, as well as the application of their now well-known "Rider" expansion gear to compound engines of the modern type. The advantage of the Rider cutoff, as shown, and by several years' working, is that it gives a diagram showing very high economy of steam, together with a most sensitive regulation of the cut-off by the governor; while, at the same time, being so simple that the working surfaces are found to wear to a more exact fit after working for some years than was even possible in first making. The simplicity of the construction also makes this class of engine much less expensive to build than those of the Corliss type and other arrangements to build than those of the Corliss type and other arrangements which regulate the cut-off by more complicated arrangements of parts. The Rider cut-off is therefore found, we are informed, particularly advantageous for engines up to 150 or 200-horse po where the work is irregular and high economy of steam is desired.

The engine shown on page 436 has a high-pressure cylinder

 $16\frac{1}{2}$ in. in diameter and low-pressure cylinder $25\frac{3}{4}$ in. in diameter, the stroke being 30in. The high and low-pressure cylinders are placed in tandem on one bed plate, the condenser being behind the low-pressure cylinder and worked by a continuation of the piston rod. The bed plate is of strong box section, with rather peculiar arrangements for securing absolute accuracy of all centre lines in erecting the engine. The crossheads are of wrought iron, forged and cut out in the lathe. The guides are arranged very completely with oil reservoirs, so that the oil is caught and returned to the surfaces. In these details this engine is very similar to those for the Twickenham Sewage Works illustrated in THE ENGINEER. The cylinders are steam-jacketted, and with double ends. The governor which regulates the Rider cut-off gear is of the Porter type. These engines are all got up with a high style of finish, besides having what is of more importance, most accurate workmanship throughout. The condenser is of the injection type, of ample size, with india-rubber disc valves on gun-metal seatings, and convenient hand holes at the sides for access to the lower valves.

THE SANDERS AND CLAYTON BRAKES.

MESSRS. BRAMWELL AND COWPER have been employed by the Midland Railway Company to report on the relative merits of the Sanders and Clayton method of applying the Sanders and Bolitho automatic vacuum brake in practice. We have received a copy of the report, which we subjoin. With all due deference to the authors of the report, we may point out that clever engineers as they are, they are not railway men, and it is not too much to say that the notion of using scotches, as suggested in paragraph 3a, never could have emanated from a railway man. and we venture to think to most railway men of experience, the leaking off of a brake is a defect sufficient to quite condemn it.

37, Great George-street, Westminster, S.W., May 3rd, 1881.

To the Chairman and Directors of the Midland Railway Company. Gentlemen,-

hundredweight was suspended by a silk ribbon passing out through the top. The bottom of the weight carried a sharp knife. At a given signal the whole of the minor shores were knocked out by men lining the sides of the vessel. Then Lady Constance Stanley swung a bottle of wine, which was suspended from about 50ft, overhead, against the bows, and christened her

Bolitho's automatic vacuum brake," we beg leave to say that, having on more than one occasion heard the respective views of Mr. Sanders and Mr. Clayton, and the criticisms of each of these gentlemen upon the views of the other, we have since made such experiments, as in our judgment were necessary, with the two trains fitted respectively by Mr. Sanders and by Mr. Clayton, and offered to us for such experiments, and for our investigation.

In the first instance it was proposed by your company (having regard to the proximity to London) that the trains should be tried on the piece of line between Bedford and Northampton. A few trials, however, sufficed to show that owing to the frequent changes of gradient, and to the many curves of small radius, it would be impossible to obtain any satisfactory comparative results by runs made on this line.

These few trials, moreover, made it evident some self-registering instrument was necessary to record the speed of the train at the

instrument was necessary to record the speed of the train at the moment of applying the brakes, the number of seconds needed to bring the train to rest, and the distance passed over during the

bring the train to rest, and the distance passed over during the time of stopping.

We caused such an instrument to be made, and are glad to say that it has fully answered its purpose, having recorded all the foregoing information; and, moreover, as an incident of its construction, it has shown the rate at which the speed of the train diminishes during the whole period of stopping.

The instrument was fixed on the engine, and thus we had full opportunity, while attending to the action of the instrument, of seeing the mode in which the engine was worked, of noticing the pressure of the steam and the degree of vacuum prevailing from time to time, and of observing all other needful details.

The engine to which the instrument was fixed was No. 109, and with its tender was used throughout the whole of the experiments.

This engine and tender were furnished with steam brakes. One and the same lever is used by the driver to put both the steam brakes and the vacuum brakes into action, but the arrangement is such that the vacuum brakes come into play shortly before the

This engine and tender were furnished with steam brakes. One and the same lever is used by the driver to put both the steam brakes and the vacuum brakes into action, but the arrangement is such that the vacuum brakes come into play shortly before the steam brakes are applied.

The Clayton train and the Sanders train each consisted of two four-wheeled guards' vans and ten six-wheeled coaches, making twelve vehicles in all, every one being fitted with a vacuum brake which, in the case of the vans, operated on all four wheels, and, in the case of the coaches, operated on the four end wheels of each coach, leaving the middle pair of wheels free. A reference to the appendix will show that the two trains were practically similar in length, weight, and percentage of weight acted on by the brakes.

Our experiments were conducted on the 8th and 9th of April, and again on the 26th of that month, upon the Nottingham and Newark line, and upon the Nottingham and Mansfield line.

The 27th was devoted to experiments in the yard at Derby, and to investigating into the mechanical details of the brakes, which we caused to be taken to pieces for the purpose.

We now beg leave to make the following report as to the conclusion to which we have arrived, leaving for an appendix the account of the details of the experiments and the description of the construction of the brakes themselves:—

1. With respect to the power of stopping the train quickly to obviate accident, there appears to be no difference in value between the two modes.

2. With respect to the ability of applying the brakes from any of the guard's vans, independently of action by the engine driver, there appears to be no difference in value between the two modes.

3. With respect to the whole of the vacuum brakes being automatically applied in the event of separation of the train, there appears to be no difference in value between the two modes.

3. With respect, however, to the continued holding power of the brakes of a severed train, it appears that, owing to a variati

3b. Ability to re-start the application of "scottnes" to the wheels.

To the Clayton train, it will be seen from the previous statement that at the expiration of two minutes the vacuum brakes have ceased to hold, and thus the train can be re-started without any

preparation.

In the Sanders, however, prior to a re-start of a severed train, the air must be let into the front end of the brake cylinder of each carriage.

This appears to require about one-third of a minute to each carriage; and thus, if two men are employed, even if the whole train of twelve vehicles were severed from the tender, it might be re-started in from two to three minutes.

train of twelve vehicles were severed from the tender, it might be re-started in from two to three minutes.

In our opinion there is practically nothing to choose on this head between the two modes.

4. Power of shunting the whole train or a portion thereof in the absence of an engine fitted with vacuum making apparatus.

In the Clayton train, at the end of two minutes the train could be shunted without any preparation.

In the Sanders train, if fitted with the same kind of couplings for the vacuum pipe between the carriages as were used in the Clayton train, and were generally used in the Sanders train, then before this latter train could be shunted, the valves at the front part of each cylinder must be opened, requiring for a whole train, as above stated, about two or three minutes. But if the couplings of the vacuum pipes between the carriages be provided with valves according to a sample pair exhibited and applied by Mr. Sanders to his train, then the carriages, if detached by hand—but not if severed by accident—can, by the mere shutting of these valves, be separated from the tender or from one another without the brakes being of necessity applied, and thus the Sanders train could be shunted forthwith without any preparation. Moreover, the guards or porters would have the power of applying once—but only once—to a train thus fitted the vacuum brakes, after the engine had left the train and of doing so to the train as a whole or to individual carriages, but if they did so once apply the brakes then to enable the train to be shunted with an engine not fitted with vacuum apparatus, the air must be admitted by hand to the front end of each cylinder, as before stated.

It would appear that the couplings fitted with these valves have not been applied by Mr. Sanders in practice. So far as we can see, there is no reason why such couplings should not be thus fitted, except the possibility that, by inadvertence, the valves might be

not been applied by Mr. Sanders in practice. So far as we can see, there is no reason why such couplings should not be thus fitted, except the possibility that, by inadvertence, the valves might be left closed when coupling up, and thus, unless the guard in the rear van was to observe from his indicator that something was wrong, the train might be started without the brakes being able to work.

Except for this risk, it appears to us that a Sanders train, fitted with these valves in the couplings, possesses some slight advantages over the Clayton train not thus fitted.

over the Clayton train not thus fitted.

5. As regards the power of easily regulating and maintaining any desired pressure on the brake-blocks, the Sanders brake has, owing to the fact of there being no automatic release of the brake after it has once been applied, a slight advantage over the Clayton in respect of this power; because the pressure with which the brake-blocks are pressing upon the wheels can be regulated to a nicety by the driver, and when regulated the blocks will remain applied with the same pressure, until, by his action, their grip on the wheels is increased, or their release is effected.

In the case of the Clayton train the arrangement which is pro-

In the case of the Clayton train the arrangement which is provided for allowing the brakes to automatically come off after a lapse of two minutes, prevents this nice regulation of the power of the brakes, and the result is that after the driver has, in descending a long steep incline, applied them, their holding power gradu-

ally diminishes, involving the temporary taking off of the brakes during the re-making of the vacuum preparatory to their re-appli-

ally diminishes, involving the temporary taking off of the brakes during the re-making of the vacuum preparatory to their re-application.

6. With respect to the power of making repeated stops, such as required for Metropolitan Railway traffic, and of getting away quickly, it appears that, having regard to the time needed for passengers to get in and out of the train, there is not any practical difference in value between the two brakes.

7. Mechanical construction and certainty of action.

We do not deem it needful to comment here on certain differences in the details of the rods and levers employed in the two brakes to convey the power from the pistons to the brake blocks, these differences are stated in the appendix; but with respect to the construction of the brake cylinders themselves, and of the parts auxiliary thereto, we desire to observe that whilst the Clayton cylinder is vertical and is contained in a jacket reservoir, mounted on trunnions, the weight of the piston acting to take off the brakes, the Sanders cylinder is horizontal, the reservoir is detached, and the brakes are taken off when the carriages are detached from the engine, solely by the action of a spring; and when the carriages are attached to the engine so that a vacuum can be re-made, are taken off by the action of the spring, aided by the atmospheric pressure on the area of the trunk piston rod.

In the Clayton mode the packing is a rolling one—similar to that long used in the Kennedy water meter—while in the Sanders mode the packing is a rubbing packing of the "cup" construction. Moreover, in the Clayton, the cylinder being vertical the weight of the piston and its rod does not add to the friction, while in the Sanders mode, the cylinder being horizontal, the weight of the piston does add to the friction. Moreover, the rolling packing is one that has much less friction than a rubbing packing, and we believe will not be found to be subject to undue wear.

The Clayton mode, by the use of trunnions to the jacket of the cylinder—involving

enumerated here.

8. With respect to the power of examination and adjustment of

8. With respect to the power of examination and adjustment of the brakes when in a train at work on the line; we are of opinion that the Clayton mode of application is somewhat better in this respect than the Sanders mode of application.

9. With respect to the question of the first cost and the cost of it maintenance, it appears to us that there is not any practical difference in value between the two modes of applying the principle of the Sanders and Bolitho brakes.

In our judgment, as a whole, the mechanical construction of the Clayton mode of application of the Sanders and Bolitho principle of automatic vacuum brakes is preferable to that of Mr. Sanders, and is likely to be attended with somewhat greater certainty of action.

action.

In conclusion, we desire to say that Mr. Clayton and Mr. Sanders afforded us every information; we also desire to express our thanks to those officials of your line who co-operated with us in carrying out the experiments for the attention they were good enough to show us, and we especially desire to express our appreciation of the thorough and efficient manner in which Mr. Loveday, who was with us on the engine during the whole of the experiments, carried out every wish we expressed.

In the appendix will be found, as already stated, a detailed account of the construction of each brake, a tabular statement of the trials, and diagrams exhibiting graphically the results obtained.

obtained.

We have the honour to be,

Gentlemen,

Your obedient servants,

(Signed)

F. J. BRAMWELL, E. A. COWPER.

37, Great George-street, Westminster, S.W., 16th May, 1881.

W. Thompson, Esq., Chairman Midland Railway Company. BRAKES.

Dear Sir,—In our report of the 3rd instant on the above subject, we deemed it well to confine ourselves strictly to the terms of the resolution under which we acted, namely, that we should report upon the relative advantages and disadvantages of the modes of application adopted by Mr. Clayton and Mr. Sanders respectively of the principle of Sanders and Bolitho automatic vacuum brake, and thus it is that, except so far as may be inevitably incidental to a report upon the relative advantages and disadvantages, there is no expression of opinion from us as to the actual value of the two modes of applying the Sanders and Bolitho principle.

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We understand, however, that you would be glad to have our opinions on this point, and we now have much pleasure in conveying them to you by this letter.

In doing so we bear in mind, and we beg leave to refer to the circular of the Board of Trade of the 30th August, 1877, setting forth the conditions, a to e, which should be fulfilled by a continuous brake

ous brake.

a (1) "The brakes to be efficient in stopping trains; (2) instantaneous in their action; (3) and capable of being applied without difficulty by engine-drivers or guards."

1. In both the Sanders and Clayton modes the brakes are, as will appear on reference to the details in our before-mentioned report, very efficient in stopping trains. This is proved by the fact that although applied to only 74 per cent. of the weight of the carriages and brake vans, these brakes, in conjunction with the steam brakes applied to only 83 per cent. of the weight of the engine and tender, stopped the train when running on a level and straight line at a speed of 39 miles per hour, in 210 yards from the time when the order was given to apply the brakes, or in 253 yards at a speed of 52 miles an hour.

2. The action of these brakes is very rapid, owing to, among other things, the admission of air automatically at the rear end of the train.

the train.

It appears from the diagrams appended to our report that, in from about two to three seconds after the order is given to apply the brakes, they begin to affect the speed of the train. As a matter of fact, from the time of the order being given to the time at which the train comes to rest, when moving at a velocity of 35½ miles an hour, not more than thirteen seconds are needed.

3. The brakes are capable of being applied without difficulty by the engine driver, or from any or all of the guards' vans forming parts of the train.

the engine driver, or from any or all of the guards' vans forming parts of the train.

b. "In case of accident to be instantaneously self-acting."
In case of accident involving severance of the train, or the rupture of the air main in any part, the brakes in both Sanders' mode and Clayton's mode are thereby forthwith rapidly and automatically applied to all parts of the train.

c. "The brakes to be put on and taken off—with facility—on the engine and every vehicle of a train."
In both modes the brakes are put on, as already stated, with facility from the engine, and from the guards' vans, and could, were it desirable—which it is not—be so made as to be quite readily put on "with facility" from every vehicle.

With respect to the taking of the brakes off, this in the Clayton train can only be done from the engine itself, and in the Sanders

train can only be done from the engine itself, and in the Sanders train can also only be done from the engine itself, unless the train be at rest, and some person descend on to the line for the purpose, but as a matter of practice, however desirable it may be to have the ability of putting the brakes on from the guard's van, no need exists for enabling them to be taken off with facility except from the engine.

d. "The brakes to be readily used in daily working."

In both modes of application the brakes are used with great advantage in the regular daily working of the train, and are applied

gradually and gently, and thus bring the train to rest without any

injurious shock or concussion.

e. "The materials employed to be of a durable character, so as to be easily maintained and kept in order."

In both modes the materials of the brakes fulfil the above con-

ditions.

The foregoing requirements "A" to "E" obviously relate principally to the ability of the brake to stop a train to prevent accident. In fact, with the exception of "D," there is little or no reference to the other matters which have to be considered in determining on the fitting of railway rolling stock with brakes to fulfil the requirements of ordinary daily traffic.

Those other matters have, however, as appears in our report of the 3rd inst., been thoroughly considered by us, and we are therefore enabled to say, in conclusion, that in our judgment, whether as regards the ability to rapidly stop the train to prevent accident, or whether as regards the ability to make frequent stoppages with a passenger train without shock to the passengers, and to rapidly get away from a station, the principle of the Sanders and Bolitho automatic vacuum brake, as applied by the Sanders mode, and as applied by the Clayton mode, results in a cheap, simple, and durable brake, good and powerful in its action, for providing for the safety of the travelling public. applied by the Gard and powerful in the durable brake, good and good

LETTERS TO THE EDITOR.

[We do not hold ourselves responsible for the opinions of our correspondents.)

ENGINE-ROOM ARTIFICERS.

SIR,-Your recent articles on the necessity of reform in the engineering branch of the Royal Navy have been keenly perused by all classes of the service, and particularly by the class most immediately concerned. It is unnecessary to state that your suggested scheme of a practical mechanical staff under the superintendence of a scientifically trained officer has, notwithstanding its intrinsic merits, met with little favour from the men who engineer the Navy at present.

intrinsic merits, met with little favour from the men who engineer the Navy at present.

Apropos of the suggested practical mechanical staff, I may say that the country already has the advantage of their services as engine-room artificers, and instances have occurred under my own observation in which they have taken entire charge of the engineroom in large ships in face of the many obstacles thrown in their way by their engineer officers. To such an extent has this system of discouragement been carried, that improvements in their pay and position which were deemed advisable by a special commission, which sat six years ago, under the presidency of Admiral Sir A. Cooper Key, have not yet been put into operation. Such a course of conduct can only be to the serious prejudice of the service, as, in consequence, competent and intelligent men can only be obtained at a period of great depression in the engineering trades. By your permission I will now proceed to give a brief sketch of the class and its duties. its duties.

Engine-room artificers were first introduced into the Navy in the year 1868, with the double object of bringing men of more direct mechanical skill into the engine-room, and to reduce the number of commissioned officers in the steam department. This far-sighted policy of the Admiralty has proved so far successful, that there are at present upwards of seven hundred artificers doing the duty formerly performed by engineers. This fact renders it unnecessary for me to dilate further on this particular point. It is very essential that the position of this class should be improved, as they are engineers in all but name, having to produce certificates of apprenticeship, and prove themselves efficient engine-room watch keepers before they are confirmed in their rating; but this rating is in such close proximity to that of the stoker, that the artificer, relieving a commissioned officer, often finds it difficult to secure that ready obedience to his orders which is so especially necessary in an engine room. I defer further consideration of this important subject for the present.

R. N.

June 14th.

June 14th.

COLD AIR MACHINES.

SIR,—I have no objection to answer the questions of your correspondent "Zero," which appeared in last week's Engineer. The Bell-Coleman ship's provision refrigerator, now on board the Kaiser-i-Hind, was originally constructed to run continuously for the whole voyage to Calcutta and back, occupying about 100 days. In point of fact it did do this the first voyage, keeping the meat chamber at 25 day. Feb. mber at 25 deg. Fah.

chamber at 25 deg. Fah.

In the second voyage, just concluded, it was determined to make certain experiments, viz., stopping the machine during the time the ship lay in Calcutta—ten or fourteen days—and also, if possible eight hours every night, to diminish working expenses, and any repairs that were done during the voyage were done within this limit of time, and simply consisted in replacing some moving parts, by spare gear always carried on board with these machines. Under these circumstances the temperature of the meat chamber averaged 25 deg. on the voyage out to Calcutta, and about 31 deg. to 32 deg. on the return, the meat being frozen hard the latter part of the voyage.

of the voyage.

In future it is intended arranging the machinery, both on this ship and on other ships of the same company, to secure the proper temperatures with such stoppages as may be desirable, which is merely a question of the ratio of chamber capacity to the power of machine used to cool it.

J. J. COLEMAN.

45, West Nile-street, Glasgow, June 14th.

SIR,—From Mr. Coleman's letter of June 7th, your readers might infer that in criticising the performance of the refrigerators supplied by the Bell-Coleman Mechanical Refrigeration Company, I selected as examples experimental machines of antiquated type and not those now offered to the public. What improvements have recently been carried out it is, of couse, imposible for me to say, but it is only fair to let it be known that in discussing this subject I have had before me in my mind two refrigerators erected and put to work so recently as six or seven months ago, probably about the twenty-fifth or twenty-sixth machines constructed on Mr. Coleman's plan, whereas the refrigerator illustrated in The Engineer of 13th May, 1881, is only the second made with my drying apparatus, though the seventh cold air machine built by my firm. Fortunately, from the way in which orders have been coming in since the trials with the experimental machine at Dartford, we are now able to add a good many more to the numbers just given. are now able to add a good many more to the numbers just given. I do not think that Mr. Coleman can seriously wish to state that my method of abstracting moisture is analogous to his own. The processes are not even so similar as are the two methods of condensing steam by surface transfer of heat and by injection of cold water. Certainly we both have aqueous vapour and air to deal with, and both wish to condense the vapour into water, but the method of condensation and the apparatus are most totally distinct. Mr. Coleman, so far as I am aware, not having published indicator diagrams, or any complete statement of results obtained with his diagrams, or any complete statement of results obtained with his machine, I am, unfortunately, not in a position to properly examine into the question of steam consumption; but as I have previously stated, there is in my opinion no question that cold air is produced as economically by my system as by Mr. Coleman's—indeed more so when the actual utilisation of the cold is taken into account. However, if Mr. Coleman will publish some of his diagrams and results we shall then be better able to judge of these matters. The supposed increased prime cost of my machines is of course quite a fallacy, as I think Mr. Coleman will see if he considers that against

all his drying pipes, I have only the extra cost of a trunk instead of a piston rod, and a small cast iron box for collecting the condensed vapour.

Regarding the space occupied, it is, of course, obvious that for Regarding the space occupied, it is, of course, obvious that for machines of similar cylinder diameter and piston stroke, with same length of connecting rods, equal clearances, packing spaces, &c., those on my system can be made to take up just so much less room than those on the Bell-Coleman plan by the amount occupied by the drying pipes, as my coolers and water depositor can be combined with the bed-plate of the machine itself. Probably, Mr. Coleman is comparing one of his refrigerators with short connecting rods, small fly-wheels and little clearances, with those which are now being constructed on my system for the Peninsular and Oriental Steam Navigation Company, in which efficiency has very rightly been the first object kept in view, though after this, everything has been made as compact as possible.

There are some other matters mentioned in Mr. Coleman's

There are some other matters mentioned in Mr. Coleman's letter upon which I should have liked to touch, but not having much spare time at my disposal just at present, I shall, perhaps, ask you to let me trespass on on your space at some future period.

2, Granville Park, Blackheath, S.E.,

14th June.

SIR,—It may reassure your correspondent "Zero" to know that on the voyage out the Bell-Coleman machine worked perfectly on board the Kaiser-i-Hind. The same may be said of the voyage home, the breaking of a piston-rod, a temporary failure of the circulating pump, and the occasional renewal of some of the air valves, being the only casualties which occurred. The meat was delivered in good condition.

Southampton, June 16th.

MODERN MILLING MACHINERY.

SIR,—Your correspondent, "French Burr," is evidently no advocate of roller mills; he further does not betray much acquaintance with the subject, or the extent of their application. That misapplications of the roller system have been made, and will be made, is not disputed; this cannot always be avoided where many rush in to supply roller systems—whether having experience or not—and under-cutting their neighbours. One could not but remark in the recent exhibition, that there was some improvement backwards. It is undoubtedly desirable—as all must know who have studied the structure of a grain of wheat—that its reduction should be performed in stages in such a way as to produce, firstly, the largest amount of semolina with the least amount of flour and branny dust, and these operations being followed by effectual separation of the products at each reduction, for, unless these separations are effectual, recourse must be had to exceedingly fine dressing or re-dressing of the finished flour. Fine dressing was noticeable at the exhibition. Whether this is traceable to some imperfections in the separations previously made or not, I will not say; but it cannot but be better to dress with coarser cloths, and keep the flour clear by more effectual treatment in the preceding processes. Many millers are now giving great attention to this subject of roller milling, and, just on the eve of mastering the guiding principles, they see new systems introduced which revolutionise the ideas they have gained. Combinations spring up which perform a host of operations in the space of a nutshell. There is always this tendency in competition to outdo one another; but it cannot be good to spoil a process by carrying it out imperfectly for the sake of saving space. There is very little advantage over older methods in that way, and the results may prove damaging to the roller system in the end. So far as one could see, thoroughness of the various operations was wanting at the exhibition, and many millers who, if they be no judges of machine

LAW AND CLARK'S "CIVIL ENGINEERING."

SIR,—Referring to Mr. Law's letter in your last number, I have, in the preface to the new volume, explained my motives for the omissions he complains of. The arrangement of the new issue is, in my opinion, better than the sad jumble of the previous issue. When I name the divisions of the new issue it will be seen that there is method in it. Introduction: Elementary Principles and Construction. Part I. Inland Engineering, in 23 chapters. Part II. Marine Engineering, in 11 chapters. Part III. Hydraulic Engineering in 12 chapters. Mr. Law's general charge of slovenliness, unsupported by evidence, signifies nothing. He writes as if the new book were substantially Law's book. As a matter of fact I have contributed 290 pages of new matter to it.

There is one point on which he and I differ. He did not, except

There is one point on which he and I differ. He did not, except There is one point on which he and I differ. He did not, except in one or two instances, acknowledge the sources of his information. I have freely acknowledged my authorities in order to give credit where it was due, and to guide readers to the fountain-heads for further study. Thus it may be a factitious air of originality was impressed upon the previous issue, whilst the results of my portion of the work may occasionally appear but to reflect other neonle's experience. people's experience.

people's experience.

If Mr. Law will turn to the index, he will find eight references to "concrete," as to which he remarks that I left his five lines untouched. "Revisions" now-a-days are severely criticised; so I thought it best to leave alone the remaining original text. Portland cement is mentioned once or twice in the new portion of the work, and for steel and its uses there are two index-references.

I come to the charge of "substituting scissors and paste work for pen and brains." It is too late now—the world knows better—for engineers, whether they happen to be great or happen to be small, to sneer at literary work. Those who are given to sneering are usually such as do not themselves possess the faculty of writing with force and conciseness. I forgive Mr. Law; but he should not have made a contrast of paste with brains. There are brains and brains. Some brains are like paste; but some people's paste is better than other people's brains. I shall not press the comparison. As neither Mr. Law, nor I, nor any other engineer, knows, or can know, every branch of engineering by direct experience, one must needs, when branch of engineering by direct experience, one must needs, when one writes on civil engineering, work, to a greater or less extent, on the experience of other people. This is what Mr. Law has done; this is what I have done; but there is at least this difference between us, that, as I have said, I have acknowledged my sources, and that he, for the most part, has not—a practice which needs only to be named to be condemned.

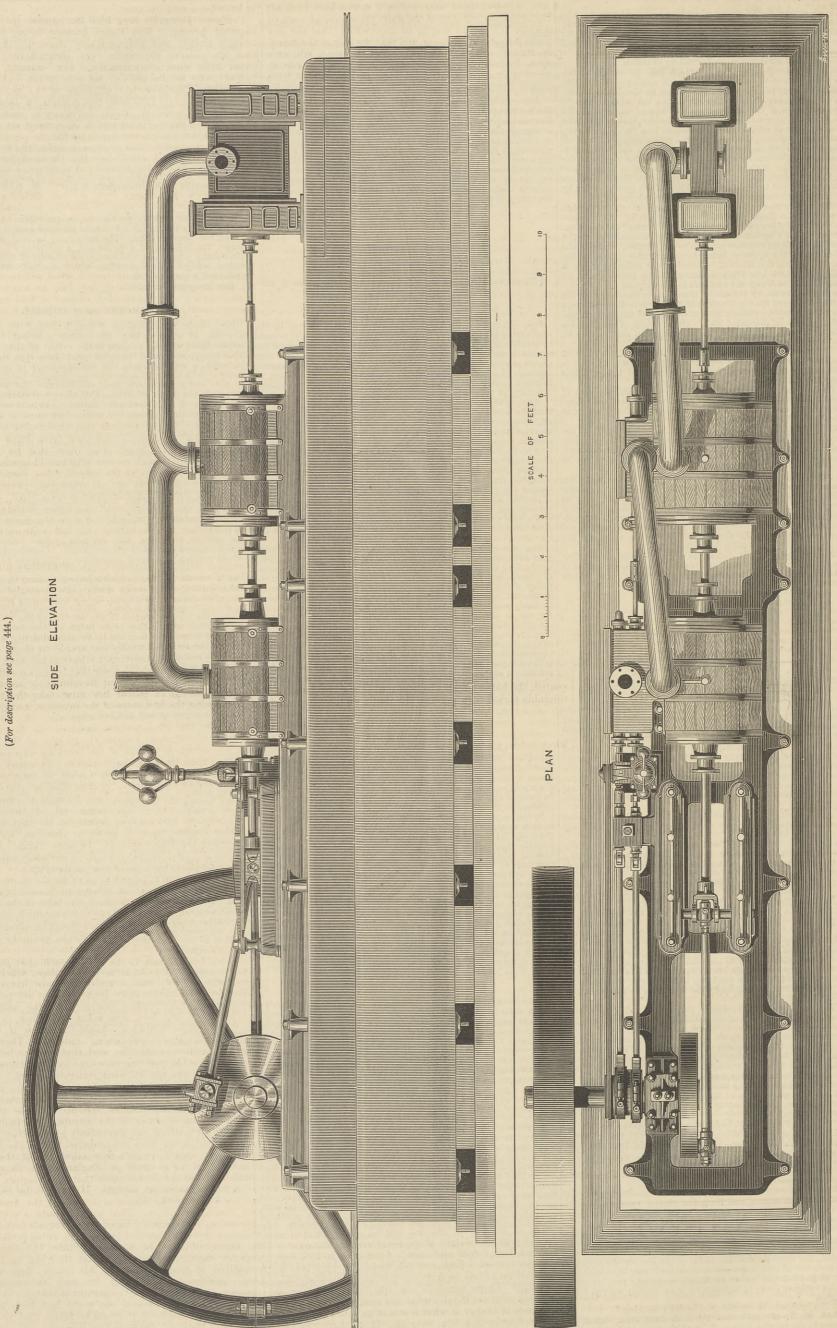
8, Buckingham-street, Adelphi, London, June 14th.

D. K. CLARK.

Horsehide Belt Lacing.—A correspondent of the American Machinist describes a very durable belt lacing which was made as follows:—A dry, untanned horsehide was soaked in water until soft enough to cut, and then cut into strings. These were made soft and pliable for sewing by "sawing" them over a square-cornered iron. The belt was then sewed with the hair side inward the first time across, and outward on the finish, so that the hair took all the wear. After the string had dried it was as solid as any hooks, with the advantage that it could not unhook. It wore remarkably well, and did not cut the belt holes.

HORIZONTAL CONDENSING ENGINE.

MESSES. HAYWARD TYLER AND CO., LONDON, ENGINEERS. (For description see page 444.)



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notice will be taken of communications which do not comply with these instructions.

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*** All letters intended for insertion in THE ENGINEER, or containing questions, must be accompanied by the name and address of the writer, not necessarily for publication, but as a proof of good faith. No notice whatever will be taken of anonymous communications.

W. E. K.—The "Ingenieur's Taschenbuch" you can obtain through Messrs. Trübner, Lulgate-hill.

J. R.—The foreign patents drop with the English patent, irrespective of the manner in which the latter is determined.

J. F. (Bristol)—We have answered you through the post, but if you doubt that a letter directed only to Bristol will find you, you had better call at the Bristol post-office, and make inquiries.

E. M.—The passage you quote tells you plainly that the maximum strain on the bolts must not be sufficient to stretch them appreciably—that is to say, the maximum strain must not exceed the limit of elasticity. If the bolt be already strained by screwing up close to its elastic limit, it is evident that a further strain due to the action of the wind may overpass the safe limit.

E. H.—The fact that you propose one law for the rich and another for the poor is so repugnant to English ideas of justice that it has only to be named to be condenned. Besides, even if it were possible to grant a poor man protection for his invention for 5s, while the rich man would have to pay £5, you would be face to face with the difficulty of depining the meaning of the words "poor" and "rich," which would be insurmountable.

T. T.—The steam from impure water will itself be practically pure. If, however, the water used in the boiler be fouled with sulphwretted hydrogen, that gas will pass out with the steam, and may tain the heated water. However, for all practical purposes you may regard the steam as perfectly clean and wholesome, but you must not forget that from 5 to 15 p

BEETROOT SUGAR PRESSES.

SIR,—Can any engineer give me particulars—size of ram, pressing box, tc.—of hydraulic presses used to extract the juice from bectroot?

Hull, June 16th.

A. I. C. E.

PEAT AND CONCRETE MACHINERY.

FEAT AND CONCRETE MACHINERY.

(To the Editor of The Engineer.)

Sire,—Will any of your readers say who may be makers of machinery for cutting, cleaning, and preparing peat as a substitute for the ordinary uses of coal, including the manufacture of gas? Who are makers of the best machinery used for the manufacture of artificial concrete blocks from sand, cement, and lime, serviceable for housebuilding?

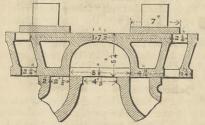
Darlington, June Sth.

J. W. S. AND Co.

BELL METAL SLIDE VALVES.

(To the Editor of The Engineer.)

SIR,—I beg to thank "Foundry Manager" for his answer to my query of the 30th May, and further to supply "Foundryman" with the particulars he desires. Working pressure = 65 lb. per square inch, revolutions = 45 per minute, space between back of steam chest and slide valve = 9in.



The connection of valve with excentric is as usual for a horizontal engine, namely, a slide block on the end of valve spindle coupled to the excentric rod by the ordinary strap end. I also enclose a section of valve showing cut-off plates.

Birmingham, June 14th.

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THE ENGINEER.

JUNE 17, 1881.

THE STORAGE OF ELECTRICAL ENERGY.

A GREAT deal has been written lately concerning the GREAT deal has been written lately concerning the ge of electricity by means of Faure's secondary bat-That M. Faure had succeeded in improving upon storage of electricity by means of Faure's secondary bat-

the Planté pile has been known for some time in scientific circles, but no undue importance was attached to the fact. Of late, however, most extraordinary stories have been set on foot; and the columns of the daily press have announced that steam is in a fair way to be superseded; that the day of gas-lighting is all but over, and that the ship of the immediate future will be propelled by electricity. We have contented ourselves up to this moment with an announcement of the nature of M. Faure's invention, and we have refrained from doing more lest we should inadvertently lend the invention a notoriety it does not deserve. M. Faure's patents have been bought up in France, and there is good reason to believe that a company to work them has already been formed there, and that an attempt to form a similar company in this country will soon be made. The most exaggerated claims have been put forward for the invention—claims so exaggerated that there was reason to think that no one would be foolish enough to believe them. Unfortunately, however, Sir William Thomson unwrittingly greaters a letter to the Sir William Thomson unwittingly wrote a letter to the *Times*, which appeared on the 9th inst., and which might easily be used with great effect by the promoters of a company. Sir William Thomson told the world that he had carried a million foot-pounds with him stored in a space of one cubic foot. This sounds very large, and the daily press in certain cases became more enthusiastic than ever. But large as "a million foot-pounds" sounds, it is really very little, and Sir W. Thomson has, we feel certain, been misunderstood, and his incautious words have been made to imply what he never meant them to convey. Before going further we may explain that the force stored up in Sir W. Thomson's "box of electricity" would not drive a 1-horse power dynamo-machine for more than half an hour, even if all the energy it represented could be made available in producing mechanical work. We may further explain that as a matter of fact there is no electricity whatever stored up in the box, which contains neither more nor less than a powerful galvanic battery, the duration of whose action is

As the claims of the Faure battery to notice as a moneymaking invention are being freely discussed, we propose to explain what it is in popular language—language which will not, perhaps, please the electrician, but will, nevertheless, convey to the reader who knows little or nothing of electricity a good idea of the action of this wonderful box, about which so much is being said. Probably all our readers know that if a plate of zinc and a plate of copper be immersed in a weak acid solution, and kept from touching each other, little or no action will take place. If, however, a wire be used to connect the two plates, what is called galvanic action takes place. A current of electricity passes through the wire, and the zinc becomes rapidly oxidised. After a time the zinc will all be oxidised, save a small portion inside, which is protected by the oxide from contact with the acid. When this happens, the action of the battery ceases. Now let it be supposed that a powerful current of electricity from another battery is driven in an opposite direction through the first-mentioned battery; the effect would be to undo what had been done, the zinc would be deoxidised and ready for work again, and if metallic contact were prevented, the battery might be kept ready for action for a considerable period. In practice the result we have indicated cannot be secured with zinc and copper, for reasons which we need not stop to explain. We have stated that it would, because the statement conveys a clear idea of what takes place in the Flynce betterns for although what takes place in the Faure battery; for although deoxidation of zinc cannot be effected practically in the way indicated, it is possible so to act on an oxide of lead as to produce an analogous effect. The Faure battery consists of a strip of lead covered with red lead Pb₃O₄, the red lead, which is an oxide or rust of the metal, being kept in place by a sheet of felt. Two such lead plates having been prepared, they are coiled up together like the spring of a watch. This couple is then immersed in an acid bath and a current of electricity from a discourse of the couple is the spring of a current of electricity from a discourse of the couple is the spring of the couple is the spring of a current of electricity from a discourse of the couple is the spring of the couple is the couple in the couple in the couple is the couple in the couple in the couple in the couple is the couple in t and a current of electricity from a dynamo machine is driven through it. After two or three repetitions of the process, it is found that the red lead coatings on the two plates have undergone chemical change, one is converted into peroxide of lead, Pb O_2 , while the other is converted into metallic lead. By establishing conditions under which the peroxide loses some of its oxygen and the metallic lead gains some, a current of electricity can be obtained at once. Such, in a few words, is the principle of the Faure secondary battery. It contains no electricity, but its parts are in a condition to produce a certain quantity of electricity at will, just like any other battery. The peculiarity of the Faure battery is, it is said, that the current produced is powerful, very large in quantity, and high in potential. But this may be said of many other batteries.

As to the value of such a battery as a mechanical agent, we have to bear in mind first that it creates nothing. can only give back a portion of the energy expended in producing the chemical change in the red lead, and there is every reason to believe that if employed to turn the best dynamo-electric motor to be had, not more than 50 per cent. of the original energy would be given back. Thus, instead of 1,000,000 foot-pounds in a box of one cubic foot capacity, we should have but 500,000 foot-pounds effective. But the great claim persistently urged for the Faure battery is involved in the idea that it represents vast concentrated energy—that nothing to parallel it in this respect is to be found in the whole world. Thanks are due to Professor Osborne Reynolds, of Owen's College, who lost no time in replying to Sir W. Thomson's statements. "The means of storing and re-storing mechanical energy," writes Professor Reynolds, "form the aspiration not only of Sir William, but of every educated mechanic. It is, however, a question of degree-of the amount of energy stored as compared with the weight of the reservoir, the standard of comparison being coal and corn. Looked at in this way, one cannot but ask whether, if this form of storage is to be the realisation of our aspirations, it is not completely disappointing? Large numbers are apt to create a wrong

as much energy as in $1\frac{1}{2}$ oz. of coal, which might have been brought from Paris or anywhere else in a waistcoat pocket, or have been sent by letter."

Professor Reynolds here hits the precise point which required hitting. The Faure battery is so far from being a unique and extraordinary storer-up of energy, that its powers are really very insignificant as compared with other arrangements. For example, a cubic foot of water weighs $62\frac{1}{2}$ lb., and so is 12.5 lb. lighter than Sir William Thomson's how although of the same dimension. Sir William Thomson's box, although of the same dimensions. To impart 1,000,000 foot-pounds of energy to a cubic foot of water it is only necessary to raise its temperature 20.7 deg. Professor Thomson may say that the work cannot be rendered available for the production of useful effect, and he is in a sense quite right; but so far as the bare statement that the Faure battery of one cubic foot contains 1,000,000 foot-pounds of energy is concerned, the assertion that a cubic of water when heated 20.75 deg. hotter than it was before, contains 1,000,000 more foot-pounds of energy, is equally true. Again, a cubic foot of air at a pressure of 500 lb. on the square inch, or 34 atmospheres, contains very nearly 250,000 foot-pounds of energy, and this in a most convenient form for re-appearing as mechanical power. Owing to the cooling which it will undergo in expanding a certain loss of useful effect will be incorrect. expanding, a certain loss of useful effect will be incurred, but the compressed air will not lose as much as the Faure battery. It is true that a vessel of four cubic feet capacity would be required to carry 1,000,000 foot-pounds in this way, but the engine and reservoir taken together need not be larger than the Faure battery and its dynamo machine taken together. We might, were it necessary, easily extend this list, and show that the Faure battery has really no claim to be regarded in its present form as much more than an interesting scientific toy. Twenty feet of coal gas will produce an indicated horse-power per hour in a good gas engine. There is no trouble whatever in compressing 20 cubic feet into a space of 1 cubic foot. If anyone will take the trouble to carry a cylinder full of gas thus compressed from Paris to Scot-land he will be in a position to beset that he had be land, he will be in a position to boast that he has done just four times as much as Sir William Thomson. That gentleman has carried 500,000 effective foot-pounds in his box; but 20 cubic feet of gas condensed twenty times represents 2,000,000 effective foot-pounds. All that Sir William Thomson can do with the Faure battery can be done with common coal gas. We do not know what it costs to charge a Faure battery, but we venture to think that coal gas will prove very much cheaper.

MR. ANDERSON'S PATENTS FOR INVENTIONS BILL.

The advocates of cheap patents have no reason to complain of the results of Mr. George Anderson's successful attempt, made on Wednesday afternoon, to get his Patent Bill read a second time. He obtained from the mouth of Mr. Chamberlain a tolerably explicit statement of the views of the present Government on patent law amendment; and this statement was almost wholly favourable to cheap patents. Those who advocate cheap patents have so far cause for contentment. Mr. Chamberlain holds that 14 years is sufficiently long for a patent to live; but he admits, or asserts, that any future change in patent law must take the direction of cheapening the first steps of the inventor, and probably reducing the cost of subsequent steps also. So far as we understand Mr. Chamberlain, however, he favours this reduction in cost solely because the income of the Patentoffice is now far in excess of the working expenses. 1879 the excess amounted to £144,000. This may or may not be a sound argument in favour of reducing preliminary patent fees, but we confess that we have never yet heard any good reason put forward to show that a profit ought not to be made out of the Patentoffice; on the contrary, it seems to us that to make the Patent-office earn a profit is just as legitimate as to make the Post-office do the same thing. But we hasten to add that too much profit is certainly earned by the Patent-office by a reduction in its efficiency. Why, for example, should it be left to us to do the work of the Government, and publish an Illustrated Record of patented inventions, which, as it now lies on the table of the Patentoffice library, fills a gap which the Government is unwilling to fill? Why should the Patent-office library be situated at the top of a house in Southampton-buildings, while the Patent-office Museum, in which there is not room to turn round, is in South Kensington? When the Government has provided a proper patent-office in an accessible place, which South Kensington is not, with a really first-rate library, and when all the officials who are quite efficient are paid at a rate corresponding to their merits, while the useless are superannuated and new men taken on—when, in short, the Patent-office is what it should be—then it will be time to talk about cheapening patents. There is a large surplus now, because the work that ought to be done is not done. For the rest, our views are too well known concerning cheap patents to need reiteration here. Cheap patents would not be a boon to the working man; very far from it. We are glad to find that Mr. Chamberlain does not like the United States system. It was said, he explained, that in America the number of applications taken out for patents was enormously greater than in this country; but it was to be remembered that in the United States more separate patents were taken out for the same invention than was usual in England. He thought it would be found on examination that one English patent covered three American patents. He must differ from the statement that, in the matter of inventions, the Americans were beating us hollow. That was, no doubt, a prevailing impression, but it was not based upon adequate foundation. Although it was undoubtedly true that, owing probably to the scarcity of labour in the United States, the Americans were an ingenious people, and that they had multiplied inventions in matters that in this country had usually been considered too trifling for such an exercise of ingenuity, still, if the really important inventions by which the trade and commerce of the world had been revolu-tionised were considered, it would be found that the vast majority of the inventors were English-men like Stephen-

son, Watt, Bessemer, and Siemens. To Mr. Chamberlain's views no exception need be taken. The adoption of the American system would, indeed, be a distinct evil. There is some danger that in the discussion of patent law amendment the American system will always be lauded by men who are caught by its specious appearance, and who forget that all is not gold that glitters. English inventors will do well to bear in mind that England gives more than the States for the patent fees in many cases. Mr. Chamberlain, as we have said, holds that the proportion is about as three to one; for important inventions the many cases. portant inventions the ratio is much greater. Thus, to cite a case, Mr. Eames recently patented a railway brake in the United States, and for just so much of his brake as was necessary for a complete train, he had to take out no fewer than thirteen patents. The whole brake would have been covered easily by one English patent, but the American law is very strict, and permits only one invention to be patented at a time. Thus, in the case of a vacuum brake, let us say, the whole apparatus could be included in one patent here, but in the States three patents at least would be necessary, one for the exhauster, another for the sacks, and a third for the hose coupling. Eames has had to pay in bare fees £91. In England his office fees for a three years' protection would be £25 only; at the end of that time a further payment of £50 would have secured his brake a term of four years more. Thus for £75 in fees he could have got seven years' protection, and seven years is about as long as the patent for a railway brake is likely to possess much value.

Mr. Anderson's Bill was permitted to be read a second time, but there is no prospect that it will ever become law. It abounds with defects, which overshadow the few good features which it really possesses. The Government has virtually promised to bring in a new Bill; but the promise is made by every Government, Conservative or Liberal, as soon almost as it takes office, and nothing is done. The fact goes a long way to prove that the existing law is not so bad after all. In the present day very vigorous protests are made on comparatively small provocation concerning any law deemed to be bad. Another proof of the comparative efficiency of the existing law is to be found in the growth of the business of the

Patent-office.

THE NORTHERN IRON TRADE,

The prospect in the iron industry, which is the staple trade of the teeming population of the North of England, is gradually but surely brightening. For some time there have been adequate reasons why very little should be said on the outlook of one of the most important industries in the kingdom. After the quickening which brought new life to a paralysed district, two years ago, the iron trade of Cleveland passed through several curious phases. Merchants made fortunes rapidly, while makers still continued to wade through the slough of commercial despondents. dency. Grave doubts existed as to whether the revival which had caused a brisk demand for pig iron, and which had filled the Tees with large ocean-line steamers, was not merely a delusion and a snare. Beyond the first flush of demand, which caused coal-owners and ironstone miners and blast furnacemen to stir uneasily and demand enhanced wages, there was no apparent soundness, and when it became necessary to enforce small reductions, quiet, sensible, business men deplored what with reason they deemed to be the flash-in-the-pan movement which had caused a turbulence of feeling without producing a lasting improvement. For the last few weeks, notwithstanding the intensely speculative spirit of the country generally, the iron trade everywhere has been dull. Prices have flagged, and stocks have accumulated; and acting in sympathy with the Glasgow market the Cleveland market has exhibited an air of languor and depression which augured ill for the summer prospect. By one of those unaccountable changes which influence business relationships quite as much as social or personal depression, relationships quite as much as social or personal depression, iron is in request, and as makers, generally speaking, are not burdened by long contracts, they are likely to feel the benefit. Upon the trade emerging from long depression two years ago, makers were so handicapped by forward contracts that the wave of prosperity had receded before they were able to take advantage of the benefits which it had offered. Now, however, they are mostly ready to account any bareful which it interests they are mostly ready to accept any benefits which circumstances may bring. It is a hopeful sign that the necessity for pledging the credit of the district for an indefinite period does not now the credit of the district for an indefinite period does not now exist. The pernicious system of selling at any price, merely in order to be able to hold on, did more real harm to the Cleveland district during the long period of bad trade than the fact of not selling at all would have done. But in more ways than a quickened demand for pig iron, the vitality of the Cleveland iron trade is beginning to be felt. While we write a depression which we dare to hope is quite temporary, has again fallen on the trade, but such fluctuations are to be expected; as when the tide comes in wave follows wave, yet the recoil of each is not tide comes in, wave follows wave, yet the recoil of each is not to be taken as evidence of permanent retreat. Already outside capital is being imported into Cleveland with a view of embarking in the steel trade. In that lies one of the chief grounds for ing in the steel trade. In that hes one of the chief grounds for hope for the future. Steady demand for pig iron within the district is perhaps not far off, and is much more to be relied on than an impulsive start forward, which is invariably accompanied by a relapse. It has long been the one great complaint of those who have the best interests of the busy Teesside community at heart that the great lack of the district was the existence within it of trades which may be termed auxiliary. In many ways that we the may be termed auxiliary. In many ways that want is now being supplied; and granted a few years of steady trade, the Cleveland district will be tolerably well prepared to bear the brunt of the slings and arrows of outrageous fortune if they should ever again

THE NEW FRENCH TARIFF.

LORD BEACONSFIELD, in a famous letter, expressed the opinion LORD BEACONSFIELD, in a famous letter, expressed the opinion that protection was dead. If his lordship were still living, he would be surprised to find how much talk there is about the dead thing under the name of reciprocity—the one word which Sir John Bowring declared had done more damage to commerce than any other in the language. Among the cotton lords of Manchester, as in the circles of steel and iron manufactures in South Yorkshire, the word reciprocity is more heard of to-day than it has been since the period when protection was prostrated. South Yorkshire, the word reciprocity is more heard of to-day than it has been since the period when protection was prostrated. Now the cutlery makers of Sheffield are crying out. With reason, too. We have, for instance, the firm of Messrs. Atkinson Brothers, of the Milton Works, who do a large continental trade. For some years they have been at great trouble and expense

introducing into France Sheffield-made table-knives of French patterns and style. By personally visiting French manufactories they have been able to overcome difficulties which at one time appeared insurmountable. Now they are beginning to reap the reward of their labours. The knives, being used by the million, are low-priced, and will be completely excluded from France should the new French General Tariff come into force, any Commercial Treaty based upon its principle—the substitution of a specific duty for an ad valorem one. Messrs. Atkinson give it as their own opinion, which they say is fortified by that of many French importers of English goods, that this desire of France to substitute specific English goods, that this desire of France to substitute specific for ad valorem duties, is simply a pretext to exclude most of the goods imported from England, which are mainly of the low-priced variety. This view is borne out by the occasions for disagreement the new tariff will create. Fine cutlery pays 600f, per 100 kilos.; other cutlery 375f, per 100 kilos. Each case of cutlery often contains from five to ten different qualities, and who is to say what is fine and what is not and whore it the and who is to say what is fine and what is not, and where is the line to be drawn? Messrs, Atkinson's case is typical of that of the whole of the cutlery makers who do a French trade; and it is proposals such as these of France that cause people who have been life-long free-traders to reflect on the awkwardness of the free trade which is all on one side. Thus it is that reciprocity the horse, "out of broken-down Protection," as Punch is now-a-days spoken of with increasing favour in the midland counties of England.

LITERATURE.

Graphical Determination of Forces in Engineering Structures. By J. B. Chalmers. Macmillan and Co.

Mr. J. B. Chalmers as author, and Messrs. Macmillan and Co. as publishers, in producing this book deserve the hearty thanks of the scientific engineering public. The book has several serious faults, and to point these out will be our distasteful duty; but its merits are so numerous that we have no hesitation in saying that it is by far the most important contribution as yet made by England to the published literature of the subject it deals with. In his ably-written preface Mr. Chalmers expresses his hope that his work may "be found to serve as a convenient text-book for engineering classes," If the faults we notice in the present are rectified in a second edition, we think there will be no special need for some time to come of another treatise on graphic statics to supersede this.

Hitherto students who wished to study this subject thoroughly had to do so in the German language. Very few original additions to the development of the subject have been made by Englishmen. A few have done good work infamiliarising English engineers with the new graphic methods. Mr. S. Bow has given us his extremely useful and elegant method of lettering the diagrams, and Prof. Fleeming Jenkin, in papers read before the Royal Society of Edinburgh, has given more complete diagrammatic representations of machines, which include the effect of friction on the resultant efficiency, than has ever been done before. But beyond these we know of nothing that has been done for the new science by English or Americans, except the occasional production of very indifferent and ill digested translations, either acknowledged or unacknowledged, of foreign authors. But that reproach can no longer be made against us now that Mr. Chalmers's book has appeared. Taking each bit by itself, we cannot say that it contains much that is absolutely mover, but considered volume as a whole, it has a perfect right to be considered as an original work. There is very little, if any, of it that is almost translation from other languages. Mr. Chalmers has thoroughly and comprehensively studied the subject and has then, after his own method and in his own style written a treatise on it which he has aimed at making complete. As a matter of course, he has learnt most of what he knows from continental teachers, but he is quite inde-pendent in his arrangement and treatment of the knowledge he has thus gained.

Mr. Chalmers is familiar not only with the theoretical development of the subject, which he seems to have mastered by careful study of nearly everything worth reading upon it, but also with its practical application. In this way he has obtained a masterly grasp of it, and in reading his book one feels this, in spite of the faults to which we have already alluded. It is pleasant to know this, and by inspiring by this means greater confidence in the mind of the student, the work will have the more

chance of becoming what its author hopes it may become, namely, a text-book for engineering classes.

In his first chapter Mr. Chalmers deals with the cord and force polygons of sets of parallel forces. This, of course, includes the finding of the centre of gravity, and the bending moments in beams. His numerous examples are for the most part such as would suggest themselves naturally to one acquainted with engineering practice. By constant repetition he is careful to drill the student to an understanding of the scale of the moment diagram, about which there is usually much confusion with beginners. Although his rule is right in its result, we cannot compliment Mr. Chalmers on the clearness of his explanation of what is really a very simple matter. The cord polygon is drawn to the same scale as the structure to which it refers, and we find on it a line, which is taken as a measure of a moment. The moment is obtained by multiplying this line by the pole-distance in the force polygon. A moment is a force multiplied by a linear dimension, and if the poledistance, which is a force, be measured to the scale of the force polygon to which it belongs, and if the cord polygonordinate be measured to the scale of the structure to which it belongs, and if these two be multiplied together, the moment is obtained in the correct units. This is simple and unambiguous enough, and we do not know why Mr. Chalmers should confuse matters by saying that "if the moment ordinate be measured with the scale of the force

polygon, the pole-distance must be measured with the scale of the frame, and vice versâ."

The constructions given for the centres of gravity of a trapezium and of an irregular quadrilateral are both very good. The latter may, however, be improved and shortened. If the distance of the same of diagonals be bisected, and if the distances of these points of bisection from the diagonal intersection be doubled, and the extremities of these double distances be joined, the

intersection of the lines joining them is the centre of gravity. This is even simpler and more rapid than the construction given by Mr. Chalmers for the trapezium, and, therefore, is best for all four-sided figures, and thus, also, attains the convenience of having only one construction which is easiest for all cases.

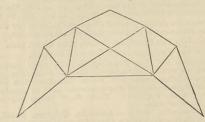
In one place we notice an extremely neat proof by reference to the evident construction of the diagrams of the proposition that the greatest bending moment occurs at the point between which and either point of support the load equals the reaction at that support. But on the next page we find an incorrect proposition enunciated, and proved by erroneous mathematics. The equation at the foot of the page has not its maximum when $P_A = P_B$. The first term is then a maximum, but not the whole quantity. There are, in reality, no two such positions as are referred to as giving a maximum moment. There is only one such position, which lies just midway between the two mentioned by Mr. Chalmers; that is, the maximum occurs when the centre of the beam lies midway between the centre of gravity of the system of moving load, and that point of the system immediately under which the maximum moment occurs. To determine the part of the moving load under which the maximum occurs, call its distance from the centre of gravity of the moving load d. Call W^d the weight applied at this point, and W the part of the moving load applied between this point and that support lying on the side of the point opposite the centre of gravity. Then d is such that its ratio to the whole span support tying on the side of the point opposite the centre of gravity. Then d is such that its ratio to the whole span is greater than the excess of unity over the ratio of (W + Wd) to half the whole moving load, and at the same time its—i.e., ds—ratio to the whole span is less than the excess of unity over the ratio of W to half the whole moving load. Mr. Chalmers has, unfortunately, missed these two facts through erroneous mathematical deduction. However, the error is not of much consequence, as maximum moments of this sort are of no great practical consequence, except, indeed, for beams of uniform section, as no beams requiring thorough calculation ever are. On the diagram Fig. 20, page 39, also, we observe a somewhat strange eccentricity in the line of the H moments not being con-

tinued up to the abutments.

The chapter dealing with "Open Framework," explains fully the construction of the corresponding force diagrams. There are a few misprints in it which are confusing, and we do not know why there should be a complete omission of the proof of the statement on the last line of page 46, which really contains the whole gist of the proon page 46, which really contains the whole gist of the proposition, and the really somewhat complicated proof of which is passed untouched. A good deal of this sort of obscurity occurs throughout the book, and would need considerable explanation in any ordinary class of engineering students. The obscurity occasionally borders upon absolute error. For example, on page 8 we read, "Triangles having the same vertex and bases upon the same straight line are reciprocal to similar triangles upon the same base and whose vertices lie upon a straight line parallel to the base." This is introduced by the remark that "the following reciprocity is evident without formal proof." Now the correct proposition is that "triangles having the same vertex and equal bases upon the same straight line, &c., and this introduction of the word "equal" makes a great difference, especially as the theorem is inserted for the purpose of proving the statement in the previous paragraph, where the bases in question are by mistake referred to as

respectively 7' and 4' instead of respectively 7' and (7' + 4') — 4 = 7', since 4' = 4.

In this chapter we notice the rather serious mis-statement that in order to secure "the property of indeformability," a "framework" "must necessarily be divided into trivaled." This technique is real with a restrict the restrict of the restrict This statement is made without any limitation of to framework whose links are incapable of resisting bending, and in consequence is liable to be much misunderstood by novices in design. But even if that limitation be taken as understood, although not expressed, the statement is incorrect, as may be noticed in the accompanying sketch, which shows a frame which is perfectly stiff,



although it contains a quadrilateral. Instead of asserting that triangulation is necessary, Mr. Chalmers would have done better to state the well-known simple criterion of stiffness without "redundancy."

We should also have been glad to see more explicit directions for the formation of stress diagrams. Everyone who has attacked any complicated frame of not perfectly regular shape, knows that unless a particular method is followed hopeless confusion is the immediate result. As one adds triangle after triangle, the diagram may take very various forms, but only two out of all these forms lead to finally successful results. These two corre-spond to left-hand and right-hand cyclical order in taking the stresses acting on each joint of the frame, it necessary to preserve the same order throughout the dia-The diagram should always be marked as being left-handed or right-handed with the marks If this is done, then at any time it can be at once recognised whether any particular

link is in compression or in tension, even though no external force act at either end of it, and without tracing the action from a joint where an external force acts up to the link in question. Mr. Chalmers gives none of these extremely useful practical hints; and, indeed, sometimes it appears as if he were not aware of them. For instance, on page 89 he gives an extremely clumsy "rule by which to discover the sign of stress in a bar." omits to explain devices which may be adopted to overcome the practical difficulties that arise in the construction of the stress diagram when two rods cross each other without being jointed at the crossing, and when an external force acts at a joint which is not situated on the outside boundary of the frame-diagram. It is just these sorts of difficulties which confuse and discourage those endeavouring to apply the graphic methods to practice, and it only requires a little elucidation to make nearly all

the difficulty disappear.

Later on we come to Heuser's very beautiful problem "to draw a cord polygon to given forces through three given points," and its numerous interesting and useful applications to hinged structures and to arches; and then to an interesting and original graphic discussion of the stresses on the section of a beam, where, as in the very instructive diagram of a rail section at page 138, the maximum stresses at different depths in the section are by exceedmum stresses at different depths in the section are by exceedingly neat and rapid methods calculated and plotted as curves. This subject is followed up in a fine set of diagrams, found at page 185. Then we have a very long chapter devoted to continuous beams, the length of which is better excused by the complication of the subject than by its practical usefulness. This is followed by three more interesting chapters on arches, suspension bridges, and the pressure of earth upon retaining walls, the last of which will be found to contain much that is new to all who have

confined their reading to the English language.

The volume concludes with a chapter on projective geometry, in which Poncelet's treatment of the subject is

We have expressed our great satisfaction at the appearance of this work, which is as much superior to Jay du Bois' hotch-potch of inaccurate translations from only halfunderstood German books as the work of a practical scientist is superior to that of an ignorant amateur. Mr. Chalmers has conscientiously performed a task which must have involved a great deal of patient labour, and required for its accomplishment not only much mathematical talent, but also practical ability. His work ought to be found of great value to English engineers, and we trust it will do much to assist in their better education. One other point of merit which we have not yet mentioned is the careful accuracy with which all the diagrams are drawn. The engraving of these is also good, except that when in the text heavy and light lines are referred to, it is not often that any distinction can be discovered in the

We have pointed out some comparatively trivial defects, but there are some others which are of graver consequence. It would be advantageous if the style of the English were improved. Long purely participal sentences without a single predicative verb are not admissible in English, although the heritimeter elliptic contraction of Comparative contractions. although the legitimate elliptic construction of German permits their appearance in that language. That the Germans talk of "seizing" a point or a line is no excuse for an Englishman using that word instead of the commonly used verb to "take;" nor is a "straight" English for "a straight line," although in the French and German languages the adjective is properly used substantively to mean "a straight line." One Germanism introduced at least in one proposition, will be quite unintelligible to the ordinary reader; "unter" in German means sometimes "provided that," or "if," but the English "under" is never used in this way. Mr. Chalmers indulges freely in these incorrect mannerisms, and is often tedious and clumsy in his language, and also in his mathematical methods. He also introduces strange mathematical signs—sometimes it appears as if he adopted almost anything that first occurred to his mind as being expressive, because he does not stick to the same devices throughout the book. The notation of his equations and of his forwest is also generally always as that forematic hearts. figures is also generally clumsy, so that frequently beautifully-drawn diagrams become confused and nearly unintelligible by being covered by the most ungainly compound symbols, the profusion of accents and suffixes-which, of course, are frequently printed wrongly—sometimes making it difficult to reconcile the text with the diagram.

The figuring of such complicated diagrams as often occur in graphic calculation is a matter of great importance, and we are much surprised that Mr. Chalmers has not used Bow's elegant notation, which so beautifully simplifies not only the reading of the diagrams, but also the theoretical understanding of the whole method of reciprocal figures. It also reduces greatly the number of letters required for the complete naming of every line, point, or area of the figures, and also simplifies the names given to these elements taken individually. Take, for instance, a quadrilateral with one diagonal with four external forces acting at the four corners.

With Bow's notation only six letters—1, 2, 3, 4, a, b—are required, whereas with the old system followed by Mr. Chalmers eight are needed—P₁, P₂, P₃, P₄, A, B, C, D. The areas are more simply named in Bow's notation, the lines are as simply named in the one case as in the other, and reference to the points is seldom required. But the greater superiority of Bow's notation consists in its almost forcing one to adopt cyclical order, so that in passing from frame to force diagram, or in constructing the latter, it is easy to avoid error, and so that the attention is forcibly attracted to the fact that in the reciprocal figures a space in one corresponds to a point—pole—in the other, which pole is the meeting point of the radii corresponding to the sides of the space. Also as may be noticed from the accompanying illustration—which is marked by a rotative right-hand arrow-if the cyclical order be marked on the drawing it is easy to read off the sign of stress in any member without loading the lines with arrow-heads, which are even unnecessary for the external forces. much like to see this excellent notation introduced in a second edition, which we hope Mr. Chalmers's book will soon reach.

THE STEPHENSON CENTENARY.

To the readers of The Engineer the chief interest in the commemoration of the centenary of the birth of George Stephenson, so enthusiastically celebrated in the North of England last week, will not be so much in the historical associations as in the practical display of the results of the works of the engineers of the past and present. To the thronged Tyne-side town there travelled safely by rail, it is estimated, not less than 70,000 persons on the day of the centenary celebration; and the fact that such a feat was possible is the best commentary on the progress made in the science of travelling between the time of Stephenson's birth and the present age. But from the thronged and gaily decorated streets of Newcastle, from the gorgeous procession of men of many trades, and from the decorated buildings and ornamented dwellings, we turn to the great works that are of chief interest to the readers of these columns, and to the locomotives of the past and present that formed so prominent and so useful a part of the centenary celebration display. It is a striking testimony to the growth of engineering in Newcastle to find that in the processions there were bodies of men, to the number of many thousands, from the works that have made the Tyneside famous; those of Stephenson and Co.; of Hawks, Crawshay, and Co.; of Black, Hawthorn, and Co.; of Sir William Armstrong and Co.; of the North-Eastern Railway Company, and others, contributing above 7000 workpeople connected with the various departments of the engineering trades in Newcastle and Gateshead. In the banners, the models, the devices, and the inscriptions they bore, there was, too, ample testimony to the great industry which has practically sprung up since the birth of Stephenson; and these may be said to have been, to the immense crowd of onlookers, amongst the most popular of the many processions which marched through the streets. But perhaps the most suggestive sight was that of the procession of typical modern locomotives from the works and engine stables of the North-Eastern Railway at Gateshead to Wylam-on-Tyne, or, rather, to North Wylam, close to which is the little cottage where the great engineer was born cottage where the great engineer was born.

Sixteen fine locomotives, drawn from various parts of the country, and furnished by seven of the chief railway companies, had arrived on the night before the centenary. and these were coupled together and proceeded from Gateshead across the decorated High Level Bridge to the Central Station at Newcastle, where they were awaited with much interest. The engines were:—(1) North-Eastern Railway's No. 363, built at Gateshead in 1860, and express passenger engine; (2) North British Railway's No. 493 "Netherby," built at Cowlairs, bogie passenger engine; (3) London and North-Western Railway Company's No. 619 "Mabel," standard passenger engine; (4) Midland Railway Company's No. 1521, built by Messra, Neilson, Clasgow, express passenger, engine; (5) Great Neilson, Glasgow, express passenger engine; (5) Great Northern Railway Company's No. 664, bogie passenger engine; (6) Lancashire and Yorkshire Railway No. 653, built by Sharp, Stewart, and Co., Manchester, bogie passenger engine; (7) North-Eastern Railway Company's No. 1268, express passenger engine, built at Darlington;
(8) London, Brighton, and South Coast Railway Company's No. 329 "Stephenson," express passenger engine, built at Brighton; (9) North-Eastern Railway Company's No. 1000, brighton; (9) North-Eastern Rallway Company's No. 1090, bogie tank passenger engine, Gateshead; (10) Lancashire and Yorkshire Railway Company's No. 313, goods engine; (11) Midland Railway Company's No. 1451, goods engine, R. Stephenson and Co., Newcastle; (12) North-Eastern Railway Company's No. 626, goods engine, Darlington; (13) North-Eastern Railway Company's No. 484, goods engine, Gateshead; (14) Lancashire and Yorkshire Company's No. 253, goods tank angine; (15) North Factorial Company's No. 253, goods tank angine. pany's No. 253, goods tank engine; (15) North-Eastern Railway Company's No. 1435, bogie passenger engine, R. and W. Hawthorn, Newcastle; (16) London and North-Western Railway's "Locomotion," built 1842, passenger

It will thus be seen that the typical locomotives comprised examples from the Gateshead and Darlington Works of the North-Eastern Railway, and from the works of Messrs. Stephenson and Messrs. Hawthorn, Newcastle, as well as from Manchester, Crewe, Cowlairs, Brighton, and Glasgow, so that there were represented engines designed by Messrs. Fletcher, Drummond, Webb, Johnson, Stirling, Wright, and Stroudley. The kinds repre son, Stirling, Wright, and Stroudley. The kinds represented were passenger, of the ordinary type, as well as bogie, and bogie tank; and goods, ordinary and tank. The passenger engines had in six cases six wheels, the Great Northern having eight wheels, and one or two others, including the bogie tank engine of the North-Eastern. The diameter of the driving wheels was least in the case of the older of the two families and the Landau Mark. furnished by the London and North-Western Railwaythe size being 6ft.—those with coupled wheels varying from 4ft. 6in. to 7ft., whilst the driving wheels of the Great Northern engine were 8ft. There was considerable variety in the brakes—the automatic, vacuum, and Westinghouse being put on some of the North-Eastern engines, whilst on one there were two hand brakes, the engine being a branch-line bogie tank engine. Generally, however, the Westinghouse brake seemed to be most in favour. This display of locomotives attracted great attention, and whilst the fine engine of the Brighton Company was admired very greatly for its general appearance, much resembling the well-known Grosvenor, it was pointed out by Northern men that it would not meet the requirements of the heavy traffic of the North. The Midland engine, just sent out of the adjoining works of Messrs. Stephenson, and designed for the centenary celebration, attracted perhaps the warmest encomiums, though the Great Northern, the London and North-Western, and the North British had each their admirers, and the supporters of the first engine of the North-Eastern claimed that its proportions made it the model locomotive for the heavy traffic of the northern passenger express trains.

Turning from this procession of alternate light and dark locomotives-of which eight were practically built for the

early engines of the railway day exhibited at Newcastle. Most of these have been illustrated or described in our "Links in the History of the Locomotive." They include—the "Locomotion," No. 1, built in 1825, for the Stockton and Darlington Railway; the "Billy," built some two or three years later for Killingworth, and much altered, but shown in preservation sufficient to enable steam to be got up in the boiler; the "Invicta," built for the Canterbury and Whitstable Railway; a South Hetton engine, with four small wheels, and an engine built in 1839, by Mr. Alfred Kitching, at his Darlington works, for the Stockton and Darlington Railway. It may be interesting to tabulate a few of the dimensions of some of the engines, to show the variation in a little more than fifty years:—

Name.	Boiler.	Cylinders.	Stroke.	Wheels.	Speed per hour.	Nominal power.
"Locomotion" North - Eastern Rail-	ft. in. ft. in. 10 0 × 4 0	ft. in. 0 10		ft. in. 4 0	Miles.	H.P. 16
way's No. 626 North - Eastern Rail-	11 0 × 4 2	1 5	2 2	5 8	50	550
	11 0 × 4 2	1 5	2 2	7 0	65	400
son"	10 2 × 4 3	1 5	2 0	6 6	65	-
way's No. 664	in the spin	1 6	2 4	8 0	-	-

There was additional completeness given to the exhibition by a lecture delivered on The Rocket, by Mr. J. A. Haswell, M.I.M.E., in which the growth of the locomotive was traced from the early attempts of Trevethick, Hedley, Stephenson, and Hackworth, down to a recent date, and which attracted to the amphitheatre of the Literary and Philosophical Society a large and an interested andience. In an adjoining room were shown models of locomotive and other engines, collected largely by the perseverance of Mr. Haswell from various parts of the country, and including models of Murdock's engine, illustrated in our last impression, of Trevethick's, of Blenkensop's, of Stephenson's "Locomotion," "Rocket," and "Invicta," as well as of others; of Brunton's "Iron Horse;" of marine engines, &c.; and drawings of earlier American engines—"Lion" (1829), the "Spitfire" (about 1830), the "John Bull" (1831), the "Best Friend" (1830), and others. From the opening breakfast to the closing banquet in the evening the centenary celebration must be considered in every way a success, to which the excellence of the arrangements from inception to detail, the variety, the reception given to the guests, and the manner in which the towns of Newcastle and Gateshead had taken up the the towns of Newcastle and Gateshead had taken up the idea, and fittingly and even gorgeously decorated the streets, squares, and public buildings, must be held to have largely contributed; and it is still more gratifying to find that the results of the commemoration are likely, in scholarship and hall, to be permanent, whilst the tree planted near the little cottage at Wylam may tell to future generations of the centennial appreciation of George Stephenson.

THE WOOL EXHIBITION.

No. I.

THE Crystal Palace authorities have determined to hold a series of annual exhibitions during the summer months of each year, and they have begun with one of wool, the machinery used in its conversion into fabrics, and the fabrics themselves. Bearing in mind the fate that befel the somewhat similar scheme of South Kensington, we are disposed to doubt that the Crystal Palace enterprise will be more successful. It is very difficult indeed to understand what such an exhibition is supposed to do. Teach it certainly does not. A few dozen languid visitors examine the carding engines, spinning frames, and mules in motion every day; but they learn nothing. The complex machinery put before them is a sealed book; there is no one to teach anything. If the Crystal Palace authorities want to teach, then they should appoint lecturers—if we may use the word—who would go round at stated hours and explain to the visitors what each machine is intended to do, and how it does it. What the exhibitors hope to gain we are at a loss to conceive. They can hardly expect to find customers at the Crystal Palace. Leaving this mystery unsolved, we go on to say that at the Palace is now to be found a small but good collection of spinning frames, looms, carding engines, wool-washing machinery, and so on, the whole being driven by a compound engine by Messrs. Galloway and Son, of Manchester.

Galloway and Son, of Manchester.

The most important collection of machinery is that shown by Messrs. Platt Brothers, and with this we shall deal first, not only for this reason, but because an important lesson may be learned by those competent to understand it—which the visitors to the Crystal Palace certainly are not—from their processes of treating wool as it is made into yarn. In the worsted districts of Yorkshire manufacturers are already beginning to be alive to the fact that in the carding, combing, preparing, and spinning of short fine wools, and producing tops free from oil, they are lamentably behind the worsted spinners of Fourmies and other combed-wool districts of France. Hence, for the immediate enlightenment of our readers it may be necessary to deal, first, with those novelties in machinery and processes, the adoption of which might raise our manufactures to equal excellence with those across the Channel. To economise space, our notices of the exhibition will only deal with those salient features of improvement in woollen machinery engineering which are of real

After the preparatory washing and cleansing process done on Messrs. McNaught's or Petrie's machines, the wool is taken to Messrs. Platt Brothers' double-worsted locomotives—of which eight were practically built for the centenary—there is suggestion in the contrast with the Messrs. W. T. Garnett, Bradford—is applied under the first

burring-steam-cylinder, the oil being supplied to a trough in which a smooth roller works; above this in contact with it, is another roller covered with cloth, also in contact with the burr roller. The oil is taken from the smooth roller by the covered roller, and from the covered roller to the teeth of the burr roller, by which it is imparted to the wood as it passes over the same. The sliver coming in balls from the carding engine is put up, doubled, and drawn on to the single head screw gill balling machine, which prepares it for the back-washing machine, where any oil which may have been put into the material when on the carding machine is taken out, and the wool is squeezed between rollers and dried over steam cylinders, and the fibres further dressed and straightened on the two-head screw gill balling machine, which is situate at the front of the back-washer. From this the balls are taken and put up to the screw gill lap machine and made into laps for the comber. After the comber the material is again gilled and passed on to the first drawing-frame, where it is placed on four bobbins; from thence it proceeds to the second drawing frame, and then to the reducing frame, where the size of the sliver is considerably lessened. On the completion of the process last named, the material goes on to the slubbing-frame, then to the roving-frame, and finally it is prepared for the

mule creel on the finishing roving-frame.

The tops have now passed through from eight to twelve operations, according to the quality or number of yarn required, without having received any twist. The rovings are at this stage taken to the self-acting mule, which is the only machine used for putting twist into the yarn. It will be seen that the processes above described accord with the usage of French wool combing and preparing firms. The latter having smaller diameters of rollers, are enabled to use wools of a much shorter staple than can be prepared by English firms. The principle of freeing the tops from oil has many advantages to recommend it. In the first place, greater economy is effected, and the yield of yarn, minus the weight of oil, is actually increased. The thread fills in the gloth better and cause the surface to feel after in the cloth better, and causes the surface to feel softer and more woolly without the oil than with it. A much superior shade can be obtained, especially in aniline colours, from tops where the artificial oil has been back-washed out than from material where the oil, grown viscid, is allowed to remain and repel the dyeing liquor. Then the system of drawing the wool through porcupines helps to keep the fibres apart, and so aids in forming a bulky thread. The novelty about Messrs. Platt's machinery does not lie so much in the subsidiary motions, however, recently patented for carrying out the details of worsted and woollen preparing and spinning, but in the application to British industry of those foreign systems of treating wool which have culminated in the great advance made by manufacturers from the combed-wool districts of France and Belgium in our own home markets.

KING'S COLLEGE ENGINEERING SOCIETY .- On Friday, June 3rd, KING'S COLLEGE ENGINEERING SOCIETY.—On Friday, June 3rd, Mr. P. A. Low read a paper before this society upon locomotives. The author contrasted various kinds of engines, pointing out in each case the special features of the one in question—the general outlines; weight, and its distribution upon the wheels; the brake power, tenders, &c.—using as illustrations many of the best known engines at present running, namely, the Great Northern express bogie, the Mogul engine on the Great Eastern Railway, the Glasgow and South-Western Company's engine, and the London, Chatham, and Dover Company's engine. He also gave some of the performances of each engine, and, in conclusion, quoted some facts to prove the advantage of single driving wheels over coupled.

the performances of each engine, and, in conclusion, quoted some facts to prove the advantage of single driving wheels over coupled.

Institution of Mechanical Engineers.—The following preliminary arrangements for the summer meeting have been made by the local committee and honorary secretaries. The reading and discussion of papers will take place in the Lecture-room of the Literary and Philosophical Society, by the kind invitation of the committee of the society. By the courtesy of the council of the North of England Institute of Mining and Mechanical Engineers, the Wood Memorial Hall will be thrown open as a reception room, for the use of members registering addresses, issue of programmes, &c. The North-Eastern Railway Company have liberally undertaken to provide special trains for the various excursions by railway, free of charge. The chief works, &c., in the town and district will also be thrown open to the members. The provisional arrangements for the meeting are as follows:—Tuesday, 2nd August: 10 a.m., reception in the Lecture-room of the Literary and Philosophical Society, by the Mayor of Newcastle, Mr. Jonathan Angus; 10.30 a.m., address of the president, Mr. Edward A. Cowper; 1.15 p.m., luncheon at the Assembly-rooms, by invitation of the General Committeef 2.15 p.m., special train from the Central Station to the works of Sir W. G. Armstrong and Co., Elswick; 4 p.m., special train from Elswick to Newburn, for members wishing to visit the Newburn Steel works by invitation of Messrs. John Spencer and Sons; leaving Newburn on return to Newcastle at 5.30; 4.15 p.m., return by special steamer from Elswick to the Swing Bridge, Newcastle, for members who have not gone on the excursion to Newburn; 4.30 p.m., inspection of Swing Bridge; 7 p.m., dinner at Jesmond Dene, by kind invitation of Sir W. G. Armstrong, C.B., F.R.S., past-president (evening dress). Wednesday, 3rd August: 10.0 a.m., meeting in the Lecture-room for reading and discussion of papers; 1.30 p.m., special train from Central station to Jarrow; special train from Jarrow to Newcastle; 7.30 p.m., annual summer dinner of the Institution, at the Assembly-rooms (evening dress). Thursday, 4th August: 10.0 a.m., meeting in the Lecture-room, for reading and discussion of papers; 1.15 p.m., luncheon at the Assembly-rooms, by invitation of the General Committee; 2.15 p.m., special steamer from the Quay on excursion down the Tyne; 2.45 p.m., visit to the works of the Wallsend Slipway and Engineering Company; 3.30 p.m., visit to the lead works of Messrs. Cookson and Co.; 4.45 p.m., visit to the Coble Dene Dock works (in progress); 5.45 p.m., visit to the new Piers at Tynemouth. 6.20 p.m., return from Tynemouth by special train; 3.30 conversations. the Assembly-rooms progress; 3.40 p.m., visit to the new Fiers at Tynemouth. 5.20 p.m., return from Tynemouth by special train; 8.30, conversazione in the rooms of the Literary and Philosophical Society, by invitation of the Society and of the General Committee. Friday, 5th August: alternative excursions to Sunderland, and to Haydon Bridge Lead mines. Excursions to Sunderland: 9.55 a.m., special August: alternative excursions to Sunderland, and to Haydon Bridge Lead mines. Excursions to Sunderland: 9.55 a.m., special train from Central station to Sunderland; 10.30 a.m., arrive at Sunderland; visits to Monkwearmouth Colliery, Messrs. George Clark and Co.'s engineering works, docks, chain-testing works, &c.; 2.30 p.m., dinner at Queen's Hotel, by invitation of the engineers of Sunderland. Excursion to Haydon Bridge: 10 a.m., special train from Central Station to Haydon Bridge; 10.50 a.m., arrival at Haydon Bridge; conveyances to mines (two miles); 1.30 p.m., luncheon at mines, by invitation of T. J. Bewick, Esq., and partners; 3.15 p.m., ordinary train from Haydon Bridge to Newcastle; 4.5 p.m., arrival at Newcastle.

THE IRON, COAL, AND GENERAL TRADES OF BIRMINGHAM, WOLVERHAMPTON, AND OTHER DISTRICTS.

(From our own Correspondent.)

(From our own Correspondent.)

Black sheets for Russia were to-day—Thursday—in brisk request on 'Change in Birmingham. Galvanising sheets were also in demand. For singles there were firms who asked £7 15s., while for doubles and trebles respectively their terms were £8 10s. and £9 10s. These terms buyers would not give; yet some of them had to advance upon the prices of a fortnight ago by 5s. per ton. This week there is an augmented business doing in fencing wire for Australia, consequent upon advices notifying a sudden clearance of accumulated stocks, and an advance in prices of 12s. 6d. per ton. Hoops and strips are in active demand. Makers who have a good repute in the home markets were to-day asking £6 10s., and obtaining it in a few instances. Others were prepared to book at from that figure down to £6; while a few others again might have been prevailed upon to take even less.

Girder and boat plates are selling fairly well, but not at improved rates, so considerable is the competition now experienced

improved rates, so considerable is the competition now experienced from Middlesbrough.

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Bars for home use are in diminished request, owing to the advanced age of the quarter. The leading quotations were £5 17s. 6d. and £6 5s. per ton severally.

There was not much done on 'Change in Wolverhampton yesterday or here to-day in pigs, consumers who need early supplies having bought pretty well a fortnight and three weeks ago. Most was done in Northampton pigs from £2 1s. 3d. to £2 2s. 6d.; and in common Staffordshire pigs at from £1 16s. 3d. to £1 17s. 6d.

was done in Northampton pigs from £2 1s. 3d. to £2 2s. 6d.; and in common Staffordshire pigs at from £1 16s. 3d. to £1 17s. 6d. Medium Staffordshire were from £2 2s. 6d. to £2 10s.; all-mine qualities were £3 to £3 7s. 6d. for high-class brands. Barrow pigs were quoted £3 5s., and Tredegar £3 7s. 6d., but favoured customers were able to place their orders at just a shade within those prices; and Wigan hematites left even more room for clever huving

those prices; and Wigan hemacies buying.

Coal was very dull of sale. The quotations were:—New mine furnace qualities, 7s. to 9s.; forge coal, 5s. 6d. to 7s.; and Cannock Chase, 7s. to 10s. per ton; all into boats at the pits.

The firm of Hassall and Singleton, of Birmingham, ironfounders and kitchen range manufacturers, have dissolved partnership. Henceforth the business is to be carried on by Mr. Henry T.

Hassall alone.

The rivet makers in the Rowley, Blackheath, and Old-hill districts, after striking for three weeks for an advance of wages to the "4s. list," have resumed work victorious. The 4s. list represents an advance of 12 per cent. on the prices hitherto paid.

The Corporation of Stafford have for some time past been seeking a new source of water supply, and boring operations have been more than once commenced upon a spot there known as the Common. The scheme has hitherto been a failure, because the boring in every fresh attempt has been stopped by the boring crowns being lost in the bore-holes; and the question has been discussed whether the boring should be continued or abandoned, and other steps taken for obtaining water for the town. At the request of the Council two hydraulic engineers—Mr. Stooke and Mr. Harrison—have reported on the matter, and their views were presented to the Council on Tuesday last. Definite action was, however, postponed, until the reports shall have been carefully considered.

The inquest upon the twenty-four men killed by the late cycle.

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The inquest upon the twenty-four men killed by the late explosion of gas at the Whitfield Colliery, North Staffordshire, owned by the Chatterley Coal and Iron Company, was concluded on Tuesday. It has resulted in a verdict of manslaughter against Mr. Edward Thompson, the manager. The evidence showed that after the fire had broken out efforts were made to extinguish it, but unsuccessfully. The manager then ordered all the horses to be got out of the pit; but before this could be accomplished an explosion occurred, which killed all the men in the mine, and three others on the pit bank. The jury considered that Mr. Thompson had been guilty of culpable negligence in not having, when he knew the fire to have got beyond control, first tried to save the men. Consequent upon the verdict, the Miners' Association in the district have determined to take proceedings against the Chatterley Company for compensation under the Employers' Liability Act, on behalf of the widows and orphans of the men who were killed.

NOTES FROM LANCASHIRE.

(From our own Correspondent.)

Manchester.—There has scarcely yet been sufficient time for business to fairly settle down after the Whitsuntide holidays, and what little has been doing during the past week can hardly be taken as an indication of the actual state of trade. Many of the ironwhat little has been doing during the past week can hardly be taken as an indication of the actual state of trade. Many of the ironworks had not got into full operation again until Wednesday, and although a very fair number of the usual frequenters of the iron market came on to 'Change on Tuesday, there was the general appearance of very little expectation of doing business. For the present the market appears to be stationary. Consumers here pay little attention to the fluctuations in the speculative markets at Glasgow and Middlesbrough, and as the actual requirements of local users of iron are very limited whilst there is the fact before them of the very large production of the raw material, it is doubtful whether any concessions in price would induce buying to any extent beyond what is needed to cover actual orders in hand. Makers, on the other hand, finding that they cannot force business with low prices, seem disposed to hold on at their present rates, which are anything but remunerative, and there is a general belief that prices have touched about their lowest point.

There is no material change in the position of Lancashire makers of pig iron. A few small orders continue to dribble in, and these, with the deliveries which are still being made on account of old contracts, about keep the present output moving off without any large additional accumulation of stock. The prices obtained average about 43s. to 44s., less 2½ per cent., for forge and foundry qualities delivered equal to Manchester.

In outside brands coming into this district, although there are still low sellers in the market, a rather firmer tone is noticeable in some quarters. Lincolnshire iron, for which sellers were quoting 42s. 6d. to 43s. 6d., less 2½, delivered equal to Manchester, has this week been advanced Is. per ton, and for some Derbyshire brands makers are holding out for about 46s., less 2½. For Middlesbrough iron, 46s. 10d. net cash is still quoted, but little or no business can be done at this figure.

In the finished iron trade

no business can be done at this figure.

finished iron trade stirring, but some of the principal makers in this district appear to be tolerably full of orders just at present. No better prices, however, are being got; in fact, sellers find it difficult to maintain the slight advance put upon sheets a week or two back. For delivery into the Manchester district the average quotations remain at £5 12s. 6d. to £5 15s. for bars, £6 5s. to £6 7s. 6d. for hoops, £6 15s. to £7 for common plates, and £7 12s. 6d. to £7 15s. for sheets.

Any local work of importance at present giving out seems to be chiefly on account of building operations and extensions undertaken by the municipal corporations or the railway companies in the district. Of railway work there has been a considerable quantity in hand of late, to some of which at present in progress or nearly completed reference has already been made. Amongst new work which is being commenced I may mention that the Lancashire and Vorkshire Railway Company has just put in hand an extension of which is being commenced I may mention that the Lancashire and Yorkshire Railway Company has just put in hand an extension of the bridge which carries Ducie-street over one entrance to the Victoria station at Manchester. This has been done with the view of giving access to a plot of land recently purchased for extension purposes from the workhouse authorities, and the addition which is being made to the bridge will have a span of 118ft. at the widest part, and will give a total width to the bridge when completed of about 310ft; The new portion will be constructed on two main girders with

transverse cross girders, all of wrought iron, and new face plates to the roadway, higher and of a more ornamental character than those at present on the bridge, will be put along the whole width. The same company is also putting in hand the erection of new goods offices, the removal of the present offices having been rendered necessary in consequence of the London and North-Western Railway Company laying down a new double line of rail from the Victoria to the Ordsall-lane stations. The new offices for the Lancashire and Yorkshire Company are being erected on the site of the old court-house adjoining Stanley-street, and the work in both cases is being carried out under the supervision and from the designs of Mr. Meik, the engineer, and Mr. Green, the architect for the company. The London and North-Western Railway Company have also just given out a contract for the erection of a new goods warehouse at Oldham, which will include a good deal of iron column and girder work. transverse cross girders, all of wrought iron, and new face plates to

goods warehouse at Ordnam, which will include a good deal of from column and girder work.

In the coal trade business has been practically at a standstill during the week. Many of the collieries were only getting to work again on Wednesday, and generally throughout all the Lancashire districts there has been very little doing. The demand has also been curtailed to the narrowest possible limits both for house fire and manufacturing classes of fuel, by the holidays and the stoppage of works. Prices are nominally without alteration, but a weak of works. Prices are nominally without alteration, but a weak tone is noticeable in the market for all classes of round coal; engine classes of fuel continue tolerably steady, and good slack is getting rather scarce. The average prices at the pit mouth are about as under: House fire coal, about 8s. 6d. for best qualities, down to 6s. 6d. for lower qualities; steam and forge coal, 4s. 9d. to 5s. 6d.; burgy, 4s. 6d. to 4s. 9d.; and good slack, 4s. to 4s. 3d. per ton. per ton.

The shipping trade continues very quiet, and both at Liverpool and Garston steam coal is offered at very low prices, 7s. to 7s. 6d. per ton being about the price at which there are sellers.

The reduction in the price of coal which has followed since the termination of the Lancashire strike, is making itself apparent in wages where the sliding scale has been put into operation, and in the Oldham and Ashton districts, as the result of the last returns, the men have this week to submit to a reduction of $2\frac{1}{2}$ per cent.

Barrow.—The great event of the week in this district has been the launch of the Inman steamer City of Rome from the yard of the Barrow Shipbuilding Company. Great interest was shown in the proceedings, and the launch was in every way a great success. In the iron trade no change can be noted in the quiet position which has existed for a few weeks past; but the probabilities seem to point to the future as a period of inactive trade. Pig iron is in smaller request, and makers are not booking orders to any extent, as they are not in most cases prepared to produce metal at present

smaller request, and makers are not booking orders to any extent, as they are not in most cases prepared to produce metal at present prices at a profit. The output has been reduced by the blowing out of several furnaces, but stocks are still very large. Prices show no variation from my last report. In the steel trade there is a heavy business doing, industrially speaking, but new orders are not so plentiful at prices which makers are disposed to accept to any great extent. The future of shipbuilding seems to be full of promise.

The Barrow Shipbuilding Company has a very full programme of work in hand. In addition to the City of Rome, it has at present on the stocks no less than five steamers, whose registered tonnage approaches 4000 tons. No. 80 is a steamer constructed to carry cattle. She is being built for the firm of Messrs. W. Johnston and Co., of Liverpool, and is 4000 tons burthen. She will be named the Lismore. Two steamers, Nos. 82 and 84, the Bearn and the Navarre, are being built for a French firm, and are intended to sail from a French port to America regularly. They are also 4000 tons each. Two steel steamers are in course of construction for the Peninsular and Oriental Steam Navigation Company, to be named Sutlej and Ganges, of 3600 tons each. No. 88 is a barge of 4000 tons each. Two steel steamers are in course of construction for the Peninsular and Oriental Steam Navigation Company, to be named Sutlej and Ganges, of 3600 tons each. No. 88 is a barge of 400 tons for Fleetwood. Last week a large screw steamer, named the Fenella, was launched from this yard for the Isle of Man Steam Packet Company, and she is receiving her engines and boilers, as well as her internal fittings, at the 100-ton crane, at the Devonshire Dock. Over and above this, two screw steamers, Nos. 89 and 90, for the Anchor Line, of 3140 tons each, are being built for the Barrow and New York direct service, and there are also two Ducal Line steamers building for Barrow owners, of 3500 tons burthen, being Nos. 92 and 93. The company is also constructing for Messrs. Clark and Standfield, of London, a new floating and depositing dock for the Furness Railway Company. This dock is so arranged that it can raise vessels for repairs, and if there is any pressure of business a vessel can be deposited on a staging on Old Barrow Island, and the dock liberated to take on another steamer. It will thus be seen that the shipbuilding company has work in hand for several months to come.

In other branches of trade the outlook is very cheerful, but, of course, minor industries will be greatly affected by whatever position is assumed by the iron and steel trades.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THERE has been rather more animation in the iron market this week. The more favourable nature of the Board of Trade returns for May had a good effect, and at the close of last week it was reported that the ironmasters had received some fresh orders from for May had a good effect, and at the close of last week it was reported that the ironmasters had received some fresh orders from the United States. To these strengthening reports was added another to the effect that there was a strong probability of a reduction being obtained in the French import duties on iron, and the quotations of warrants accordingly ran up 1s. 6d. to 2s. per ton. In the course of this operation a considerable quantity of iron changed hands, and the interest in warrants on the part of the outside public seemed to be on the point of reviving. Since then prices have been a shade weaker, and the market is in that uncertain position which makes it difficult to guess in what direction the next movement may be. The improvement has not as yet manifested itself in the statistics of the shipments, which are smaller than in the preceding week, although they compare favourably with those of the corresponding week of last year. Neither do the private advices from America to the larger iron merchants indicate that there is any improvement in the demand. The production is still much too large for current requirements, and about 1200 tons of pig iron have been added in the course of the week to the stock in Messrs. Connal and Co.'s stores, which now amounts to 563,000 tons. One furnace has been put out at Shotts Ironworks, leaving 120 in blast, against 115 in the same week of 1880. The imports of Cleveland iron have been rather smaller, but on the year to date they still show an improvement of 27,770 tons.

Business was done in the warrant market on Friday up to 46s, 10d, cash. On Monday forenoon transactions were effected

imports of Cleveland iron have been rather smaller, but on the year to date they still show an improvement of 27,770 tons.

Business was done in the warrant market on Friday up to 46s. 10d. cash. On Monday forenoon transactions were effected from 46s. 9d. to 47s. 1d. and back to 46s. 9d. cash, and 47s. to 47s. 3d. and 46s. 11½d. one month, the afternoon quotations being 46s. 7½d. to 46s. 4½d. cash and 46s. 9d. to 46s. 6d. one month. Tuesday's market was steady at 46s. 5d. cash and 46s. 6½d. one month to 46s. 3½d. cash and 46s. 4½d. one month. On Wednesday business was done at 46s. 5d. to 46s. 9½d. cash, and 46s. 7d. to 46s. 11d. one month. The market was irregular to-day—Thursday—with the quotations, on the whole, a shade lower.

In sympathy with warrants, makers' iron is quoted at 6d. to 1s. per ton advance, although quantities can easily be got at former prices. Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, is quoted at 54s. 6d.; No. 3, 48s.; Coltness, 55s. 6d. and 48s.; Langloan, 55s. 6d. and 48s. 6d.; Summerlee, 54s. and 47s.; Calder, 55s. and 47s. 6d.; Carnbroe, 51s. 6d. and 47s.; Clyde, 48s. 6d. and 45s. 6d.; Monkland, 47s. and 45s.; Quarter, 47s. and 45s.; Govern, at Broomielaw, 47s. and 45s.; Shotts, at Leith, 55s. 6d. and 49s.; Carron, at Grangemouth, 52s. 6d. (specially selected, 56s.) and 51s. 6d.; Kinneil, at Bo'ness, 47s. and 45s.; Glengarnock, at Ardrossan, 51s. 6d. and 47s. 6d.; Eglinton, 47s. and 44s. 6d.; Dalmellington, 47s. and 44s. 6d.

The malleable ironworks are generally fully employed, and new orders are reported in several instances, but prices continue low. The marine and general engineering trades also exhibit continued

activity, and the exports of iron manufactures from the Clyde show well. These were not noted in this report last week. For the fortnight they embraced £11,000 worth of machinery, of which £3440 went to Calcutta, £2163 to the Mediterranean, £1975 to Rouen, and £1730 to Boston; 178 tons of locomotives to Sydney, valued at £10,250, and 9‡ tons to Mauritius, £350; £4200 sewing machines, of which £1687 went to the Mediterranean, and £1640 to Rouen; 400 tons of steel rails, valued at £2400, for Sydney; £30,000 other manufactured goods, of which £5358 went to Boston, £3890 to Calcutta, £3425 to Singapore, £3170 to Bombay, £3324 to Sydney, £2323 to Canada, £2100 to Batavia, £1770 to Brisbane, and £1140 to Port Natal; 862 tons of pipes, valued at £5000, for Yarmouth; 482 tons of steel blooms, £3868 for New York.

The coal trade is becoming decidedly less active in both the home and export departments. At the different ports in the course of the past week the shipments have been considerably smaller, and show a total decrease at all the ports for the week of no less than 17,884 tons. Prices are also low, and complaints are heard in certain districts that the miners are not getting such full employment as of late. The Duke of Portland has allowed a deduction of

tons. Prices are also low, and complaints are heard in certain districts that the miners are not getting such full employment as of late. The Duke of Portland has allowed a deduction of 2d. per ton on all coal sent out of his estate during the past six months, an example which is worthy of imitation.

The affairs of the Glasgow Port Washington Iron and Coal Company (Limited) have been under examination by a committee of shareholders, who have issued a report disapproving of the conduct of the directors.

Mr. West Watson, City Chamberlain of Glasgow, has just issued his annual report on the vital, social, and economic statistics of the city, in which he states that commercial affairs have exhibited marked symptoms of a gradual revival from the serious depression which they had endured for some time. The condition of the shipbuilding trade may be regarded as especially gratifying, and says that the vessels on hand at present have a tonnage of 314,711, with a money value of about 13 millions sterling.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

(From our own Correspondent.)

MIDDLESBROUGH market was very fully attended on Tuesday, several persons from distant towns being also present. Among others Mr. S. G. Thomas was there, for the first time since his return from America. The hospitality and universal kindness he met with from our Transatlantic cousins, have impressed him greatly; and whether on that account, or by reason of his two sea voyages, he certainly looks in more robust health than when he left. Notwithstanding the good attendance, and the apparently greater disposition to activity which was manifest on Change, there was not much actual business done, and prices were with difficulty maintained. The spurt which, from some cause known only to the "bulls and bears" of Glasgow Exchange, had taken place towards the end of last week in the price of pig iron, had by yesterday come to an end. No buyer is disposed to believe that any advance can be maintained in the face of the over-production which is clearly going on in all the iron-making centres; whilst, on the other hand, further reductions may not improbably result from the keen competition which is everywhere visible; so that a waiting policy is generally adopted, and buying goes on only from hand to mouth. At the same time it is generally recognised that there is some probability of a better state of things ensuing before very long. Recent Board of Trade returns, and rail-way traffic returns, are decidedly encouraging. The pacific solution, one by one, of the serious foreign complications which the present Government has had to deal with since its succession to office, is tending to restore confidence. Only time is now wanted, and reasonable conduct on the part of producers, whether employers or employed, so soon as any return of prosperity may show itself. So long as an improved demand is merely the signal for an immediate and inordinate increase in the supply; so long as the knowledge that a trifling profit is obtainable in some department, is followed by a senseless scramble for it, so lo

Warrants 9d. more.

Plates for shipbuilding are being sold at £6 per ton; boiler plates, £1, £2, and £3 more, according to quality, the highest being suitable for fireboxes, or Galloway tubes. Angles, bars, and iron rails fetch about £5 7s. 6d. These prices are all free on trucks at Middlesbrough, less 2½ per cent. discount

In the steel trade the principal item of news is that Mr. C. E. Muller's Erimus Works are likely In the steel trade the principal item of news is that Mr. C. E. Muller's Erimus Works are likely to commence operations almost immediately. Several orders for steel rails have already been booked by him, and indeed no further ones can be entertained for delivery before September. Mr. Evans, mill manager from the Dowlais Ironworks, has been engaged to take charge of the manufacturing department, and will commence his new duties in about a fortnight. The process adopted will be the ordinary one, and not the basic process. The pig iron used will be hematite, purchased from producers thereof—of whom there are now three at least—in the Cleveland district. The ore employed in the manufacture of this pig iron is almost entirely from the Bilbao district in Spain. It is reported that Messrs. Bolckow, Vaughan, and Co., have been exporting considerable quantities of ferro-manganese, containing about 10 per cent. of the latter metal, to the United States, vià Hartlepool.

The French merchant shipping law is not as yet operating against English shipbuilders. It seems that their own yards, with their limited resources, are already full for two or three years to come. Consequently, the best orders are being placed in this country, and largely on the northeast coast. Not less than twenty to thirty

placed in this country, and largely on the north-east coast. Not less than twenty to thirty vessels are now being built here on French

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

At the Church-lane and Higham Collieries, belonging to the Silkstone and Dodworth Coal and Iron Company, Limited, the works are now permanently set down. The affairs of the company have been for some time in liquidation, and the court recently discharged receiver and manager, on the ground that there was nothing to manage. Only a few years ago the company was floated with a capital of £225,000, and other capital has been created. Over 100 men are thus thrown out of employment.

There is very little change to report in the general state of the coal and iron trades. I see it mentioned that iron is firmer, but in this district there is little evidence of any improvement. As for coal, stocking is proceeding very vigorously, and this is the surest possible sign that the supply of coal is in excess of the demand. Householders who order coal at night can have it delivered next morning—another significant indication that there is abundance of coal at the pit-bank.

In the crucible steel trade there is a good deal of briskness, and in the rail, armour-plate, and ship and boiler-plate mills there is abundance of work. Cutlery, of the better classes, is in active demand for the States and other markets, and makers for the French districts are pouring in goods prior to the operation of the proposed new tarift, which will have an almost prohibitory effect. Edge tools are more freely asked for, and some capital orders for sheep-shears have recently been received.

The silver and electro-plated trades continue very dull. Two houses are fairly well off for (From our own Correspondent.)

The silver and electro-plated trades continue very dull. Two houses are fairly well off for shipping orders, but generally business is very languid. Files are more freely inquired for, and the improvement already noted in agricultural implements continues.

implements continues.

Messrs. Wm. Cooke, and Co., Limited, Messrs. Wm. Cooke, and Co., Limited, held their annual meeting at the works last Friday. In moving the adoption of the report—which showed a loss of over £600 on the year—the chairman stated that considering the very unsatisfactory state of trade during the previous twelve months he and his co-directors hoped the shareholders would be satisfied with the result. He had pleasure in stating that the company had between 4000 and 5000 tons of orders on the books, the greater part of which were steel rods and wire. One of the directors—Mr. George Fisher—stated that he had known the iron trade for forty years, and never, in his experience, had for forty years, and never, in his experience, had such a sudden inflation as that which took place at the latter end of 1879 been followed by so sudden a relapse.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

(From our own Correspondent.)

I AM more than ever convinced that when Swansea has its new dock, and also a connection with Rhondda, it will run Cardiff hard. I have this week examined a quantity of coals such as are exported from Swansea, and they are not to be named in the same day with the Cardiff coals. The Ocean, Therllwyr Vale, Penrhaiwceiber, Harris Navigation, Plymouth, Cyfarthfa, and Dowlais best samples, to say nothing of the fine Clydach and Werfa, constitute an assemblage of coals such as Swansea from its own locality cannot produce. With regard to engineering difficulties to connect the Rhondda with Swansea, there are none, and the failure arises from the simplest of technical blunders, which can easily be avoided. I find, too, from a visit to the district of Swansea, that the sail to France is nearly a difference of twenty-four hours on the side of Swansea, and thus cost of fuel and labour for that time is alone a substantial consideration.

The demand for coal is well kept up, and prices are quite as firm as they have been for the past month or two. The average selling price of best kinds of Welsh steam coal is from 10s. to 10s. 6d., colliery screened f.o.b. Good samples are, it must be noted, obtainable at from 9s. 3d. to

month or two. The average selling price of best kinds of Welsh steam coal is from 10s. to 10s. 6d., colliery screened f.o.b. Good samples are, it must be noted, obtainable at from 9s. 3d. to 9s. 9d. per ton. Prices are, of course, still governable by special circumstances of contract, and variations of 3d. and even 6d. are common. House coals are dull; patent fuel is in fair inquiry at from 9s. to 9s. 6d.

Renewed attention is being directed towards the special character of Welsh steam coal for steamers, and lately I have had practical evidence afforded, steamers coasting, on going out into the Atlantic, showing scarcely the slightest smoke, while others using bituminous coal leave long trails of smoke behind.

Certain high naval authorities have made a careful inspection of the coast defences of the Bristol Channel lately, evidently in view of Irish troubles and Fenian possibilities.

The Welsh iron trade is kept up vigorously, and a good inquiry for vessels to carry large quantities of rails speaks well. The total iron and steel shipments of the week from Cardiff and Newport were about 5000 tons.

The little difficulty pending between the forgemen and employers at Cymbwrla and Upper Forest Tin-plate Works has been adjusted, the men returning to work at the masters' prices. The Cwmavon puddlers, who have been out for five months, have also given way, and there is active preparation going on to start the furnaces. There is no movement as yet at Cyfarthfa, nor is it publicly stated that engineering and other appliances are getting ready, but such I have no doubt is the case, and a few weeks only will witness, I imagine, a beginning in some form or other.

I am glad to report a public exhibition of feeling on the colliers' part in favour of the sliding

or other.

I am glad to report a public exhibition of feeling on the colliers' part in favour of the sliding scale. At an influential gathering this week in the Rhondda, Mr. Abraham presiding, the meeting expressed itself by certain resolutions in favour of adhering to the sliding scale, and further to try by organisation and subscription to maintain it. There was also an expression of feeling against there being more than one scale, and it is obvious by this that the scale used by the Ocean Colliery and that by Messrs, Danes, the Ocean Colliery and that by Messrs. Danes, Blaengwaur, were pointed at.

The Hafod and Coedacre difficulty remains un-settled

No improvement can be reported in the tin-

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

*** It has come to our notice that some applicants of the Patent-office Sales Department, for Patent Specifications, have caused much unnecessary trouble and annoyance both to themselves and to the Patent-office officials by giving the number of the page of THE ENGINEER at which the Specification they require is referred to, instead of giving the proper number of the Specification. The mistake has been made by looking at THE ENGINEER Index and giving the numbers there found, which only refer to pages, in place of turning to those pages and inding the numbers of the Specification.

Applications for Letters Patent,

*** When patents have been "communicated" the
name and address of the communicating party are printed in italics.

7th June, 1881.

2469. SEWING MACHINES, C. Pieper.—(E. Bruncker,

2469. SEWING MACHINES, C. Pieper.—(E. Bruncker, Prussia.)
2470. DISHES, C. RUSSEll, Garforth.
2471. CUTTING STRAW, J. M. GORham, Lincoln.
2472. CHECKING the ARRIVAL, &c., of EMPLOYES, W. M. Llewellin, Bristol.
2473. VELVET, &c., J. W. Hall & B. Cooper, Manchester.
2474. BOILERS, A. J. T., and R. Anderton, Accrington.
2475. FASTENER, F. Reddaway, Pendleton.
2476. MOUTH-PIECES, W. R. Lake.—(P. Thomsen, U.S.)
2477. BELT CLASP, A. M. Clark.—(W. M. Whiting, U.S.)
2478. OBTAINING, &c., AIR, W. Hume, Buenos Ayres.
2479. STIPPLING ON LITHOGRAPHIC STONES, W. R. Lake.
—(J. Gast, Brooklyn, U.S.)

2418. Shiffing on Inhographic Sioses, W. R. Lare. — (J. Gast, Brooklyn, U.S.)
2480. Turbines, W. R. Lare. — (W. F. Jobbins, G. E. Raymond, and I. Scherck, New York, U.S.)
2481. Spinning, W. R. Lare. — (E. & A. W. Harris, U.S.)
2482. Magneto, &c., Machines, E. G. Brewer. — (T. A. Edison, Mento Park, U.S.)

8th June, 1881.

2483. Feeding Apparatus for Thrashing Machines, A. C. Henderson.—(J. A. Demoney-Minelle, France.) 2484. Neutralisation of Electric Currents, W. P. Thompson.—(F. Van Rysselberge, Brussels.) 2485. Spinning, &c., P. Smith & S. Ambler, Keighley. 2486. Employing Gases from Wood in Fuenaces, M. Bauer.—(A. C. d' Alma and F. Girot, Paris.) 2487. Mowing Machines, J. A. Carles, France. 2488. Explosive Compounds, C. D. Abel.—(M. E. Sanlawille and R. Ladignant, Paris.) 2489. Fishing, W. Loughrin, Polperro. 2490. Removing Hairs from Skins, W. R. Lake.—(D. Mueller, New York, U.S.) 2491. Tin-Plate, W. Elmore, London. 2492. Electric Lamps, P. Jensen.—(T. A. Edison, U.S.) 2493. Horesender, J. Howard, North Hyde. 2494. White Compounds of Lead, A. French, Morriston. 2495. Electric Arc Signals, E. G. Brewer.—(T. A. Edison, Menlo Park, U.S.) 2490. Oils and Fars, A. Fenwick, Hampstead. 2497. Provision Cases, W. Rallason, London. 2498. Motor Engines, W. R. Lake.—(M. Arzberger, Vienna, and A. Oblasser, Trieste.) 2499. Retorts, W. Grice, Birmingham. 2500. Pumping Engines, A. M. Clark.—(E. Shortt, U.S.) 2501. Fixing Looking-classes, W. J. Hinde, London. 2502. Grain Driers, A. M. Clark.—(H. Cutler, U.S.)

9th June, 1881.

2503. GRINDING APPARATUS, P. M. Justice.—(J. E. Holmes, Washington, U.S.)
2504. GAS MOTORS, C. W. Siemens, Westminster.
2505. STEERING VESSELS, H. A. Bonneville.—(L. Planus,

2504. Gas Motors, C. W. Siemens, Westminster.
2505. Steering Vessels, H. A. Bonneville.—(L. Planus,
Paris.)
2506. Tube Expanders, J. Hall and S. Thompson,
Sunderland.
2507. Trusses, J. Mayer, Marylebone, London.
2508. Removal of Hairs from Seal Skins, Sir C. M.
Lampson, Queen Victoria-street, London.
2509. Roses of Watering Cans, J. Ludlow, Birmingham.
2510. Filling Bottles, R. Bardsley, Manchester.
2511. Horse-rakes, J. Huxtable, Brayford.
2512. Bottle Wrappers, H. Haddan.—(B. Marks, U.S.)
2513. Bottle Wrappers, H. Haddan.—(B. Marks, U.S.)
2514. Hatchway Doors, H. Haddan.—(B. Eames, U.S.)
2515. Taps, A. Pullan and J. R. Meihé, London.
2516. Jacquard, J. Brentnall, Mansfield.
2517. Winding Tape, J. Imray.—(La Société les Fils de
Curtier Bresson, Paris.)
2518. Pumps, W. Beijerinck & M. Stuart, Amsterdam.
2519. Packages, R. R. Gray, Liverpool.
2520. Buoyant Articles, J. Sexton, London.
2521. Boots and Shoes, J. Keats, Bagnal.
2522. Chains, J. Imray.—(E. Oury, Cherbowrg, France.)
2523. Lifeboat, A. Clark.—(W. M. Van Wagenen, U.S.) 10th June, 1881.

10th June, 1881.
2524. Gas, J. Johnson.—(A. Fézenes du Monteel, Paris.)
2525. Glazing Paper, T. R. Johnston, Edinburgh.
2526. Taking Negatives, C. J. B. Holroyde, Warley.
2527. Printing Surfaces, W. B. Woodbury, London.
2528. Gas, J. Dixon, Richmond.
2529. Dressing Flour, H. M. Lucas, Aldenham Mills.
2530. Drilling, &c., Rock, &c., G. F. Wynne, Minera.
2531. Breech-loading Small-arms, E. James, Birmingham.

2531. Breech-loading Small-arms, E. James, Birmingham.
2532. Electric Cables, G. E. Gouraud.—(P. B. Delaney and E. H. Johnson, New York.)
2533. Leather, J. Hall, Leeds.
2534. Section Knives, T. Heiffor, Sheffield.
2535. Gas Condensers, H. Cockey & F. Cockey, Frome.
2536. Drying Ceramic Products, L. Beck, Duffel.
2537. Metallic Alloys, G. A. Dick, London.
2538. Electric Brakes, M. R. Ward, London.
2539. Chimner Top or Cowt, M. Delmard, Kent.
2540. Crushing Machinery, C. E. Hall, Sheffield.
2541. Spade Rifle, J. F. Fuller, Dublin.

11th June, 1881.

11th June, 1881.

2542. ELECTRICAL INSULTATED WIRES, S. Mackie, London. 2548. Soap, A. J. Boult.—(C. S. Higgins, U.S.)

2544. Preventing Corrosion, J. Hannay, Glasgow. 2545. Frames, F. Wirth.—(F. Roeder, Germany.)

2546. Sewing Machine Gearing, H. J. Haddan.—(M. I. Lecœur, France.)

2547. Thrashing Machinery, H. J. Haddan.—(T. Martin, France.)

2548. Tea-pot, J. A. Gilbert, Clerkenwell, London. 2549. Finishing Felt Hats, J. Eaton, Stockport. 2550. Type-writing Machines, A. D. Furse.—(La Société Clavigraphique Maggie et Cie., Rome.)

2551. Strafs, H. Studdy, Waddeton Court, Devon. 2552. Wood Pulp, F. Wirth.—(The Society for the Manufacture of Wood Pulp at Grellingen, Switzerland.)

253. Felt Hats, W. R. Lake.—(C. P. Marin, Spain.)

13th June, 1881.

2554. RECEIVING SIGNALS, A. F. St. George, London. 2555. WATER TAPS, A. HARVEY, Glasgow. 2556. COMBING MACHINES, J. Carroll, Bradford. 2567. VARIABLE EXPANSION GEAR, T. English, Hawley,

Invention Protected for Six Months on deposit of Complete Specifications.

2500. DIRECT-ACTING PUMPING ENGINES, A. M. Clark, Chancery-lane, London.—A communication from E. G. Shortt, Carthage, New York, U.S.—8th June, 1881

Patents on which the Stamp Duty of £50 has been paid.

28th June, 1878. 2727. RAILWAY WHEELS, W. H. Kitson, Leeds.—8th

Patents on which the Stamp Duty of £100 has been paid.

£100 has been paid.

1992. Working Gas Purifiers, W. T. Walker, Highgate, London.—Sth June, 1874.
2005. Printing Machines, H. M. Nicholls, Great Portland-street, London.—9th June, 1874.
2018. Sulphates, J. Hargreaves and T. Robinson, Widnes.—10th June, 1874.
2062. Explosive Compounds, S. J. Mackie, Westminster, and C. A. Faure and G. French, Faversham.—13th June, 1874.
2194. Buttons and Fastenings, G. T. Bousfield, Sutton.—24th June, 1874.
2017. Taps or Valves, H. W. Heale and E. D. Gowan, London.—10th June, 1874.
2074. Iron Telegraph Poles, J. Muirhead, jun., Wimbledon.—15th June, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 1st July, 1881.

Applications.

Last day for filing opposition, 1st July, 1881.

470. AIR COMPRESSORS, C. T. Owen, Chesterfield.—4th February, 1881.

510. Steam Boilers, H. Lake, London.—A com. from D. Renshaw and H. Litchfield.—7th February, 1881.

511. GLOVE FASTENER, E. Horsepool, Wood-street, Cheapside, London.—7th February, 1881.

518. SIGNAL APPARATUS, H. Botten, Canrobert-street, London.—7th February, 1881.

520. Looms for Weaving, G. Lendrum, T. Beardsell, and S. Mitchell, Thongsbridge.—7th February, 1881.

522. Looms for Weaving, J. Hollingworth, Dobeross.—7th February, 1881.

524. Water-closers, A. Clark, New-cross, London.—7th February, 1881.

525. Cutting Stone, &c., J. C. Vanlohe, London.—A communication from P. Gay.—7th February, 1881.

524. Dressing Fabrics, W. E. Gaine, Hammersmith, London.—8th February, 1881.

525. Pen-Holders, E. Fischer, Halle-upon-Saale, Germany.—9th February, 1881.

526. Pen-Holders, E. Fischer, Halle-upon-Saale, Germany.—9th February, 1881.

527. Water-Chooler, 1881.

528. Perparation of Soup, S. Pitt, Sutton.—A communication from J. F. Tyrrell.—10th February, 1881.

529. Spring Beds, E. P. Alexander, London.—A communication from A. Herbet.—12th February, 1881.

649. Steam Engine Governors, R. Schmitz-Werotte, Finborough-road, London.—15th February, 1881.

649. Steam Engine Governors, R. Schmitz-Werotte, Finborough-road, London.—15th February, 1881.

649. Steam Engine Governors, R. Schmitz-Werotte, Finborough-road, London.—15th February, 1881.

641. Aunching Life-Buoys, E. T. Jones, Southampton—15th March, 1881.

143. Scouring Grain, L. Gathmann, Chicago, U.S.—15th April, 1881.

1448. Scouring Grain, L. Gathmann, Chicago, U.S.—15th April, 1881.

1591. Laminated Springs, J. W. Spencer, Mewburn.—12th April, 1881.

1592. Perearation of Flannel, &c., W. Schofield, Rochdale.—14th May, 1881.

2394. Electric Circuits, S. Pitt, Sutton.—A communication from P. Herdic.—31st May, 1881.

2395. Wheeleed Vehicles, S. Pitt, Sutton.—A communication from P. Herdic.—31st May, 1881.

2396. Directory Circuits

Last day for filing opposition, 5th July, 1881. 546. DINITROBENZOLE, J. A. Kendall, London. -9th Feb-

546. DINITROBENZOLE, J. A. Kendall, London. – 9th February, 1881.
547. REGISTERING APPARATUS, H. Kendall, London. – A com. from C. Wilson-Bunster. — 9th February, 1881.
548. CONNECTING LINK, J. Walker, Derby. — 9th February, 1881.
560. SUGAR, J. H. Johnson, London. — A com. from Messrs. Brissonneau Bros. & Co. — 9th February, 1881.
575. ABSORBENT FABRIC, R. H. Smithett, Hengrove, near Margate. — 10th February, 1881.
576. SPINNING COTTON, G. Bodden, Oldham. — 10th February, 1881.

ruary, 1881. 580. Safety Hooks, W. Hewitt, Nostell.—10th Feb

ruary, 1881. 582. Glass Holders, I. Sherwood, Birmingham.—10th

582. Glass House, February, 1881.
586. Steering Gear, G. D. Davis, Stepney, London.—
—10th February, 1881.
587. Hydraulic Cranes, F. W. Walker, Leeds.—10th

587. HYDRAULIC CRANES, F. W. Walker, Leeds.—10th February, 1881.
589. MANGLING MACHINES, N. Tupholme, Sheffield.—10th February, 1881.
591. CONVERTIBLE TABLE, W. R. Lake, London.—A comfrom A. F. Mauchain.—10th February, 1881.
601. BRACELETS, &c., W. West, Birmingham.—11th February, 1881.
607. TELEGRAPHIC COMMUNICATION, P. M. Justice, London.—A communication from J. Bartelous.—11th February, 1881.
636. PRESERVING POTATOES, &c., G. L. Laird, Douglas.—15th February, 1881.

TRESERVING FOTATOES, &C., G. L. Lard, Douglas, —15th February, 1881.
 PACKAGES, W. E. Gedge, Lendon.—A com. from R. S. Jennings.—15th February, 1881.
 UMBRELLAS, J. Jarman and J. Sambrook, Birmingham.—15th February, 1881.

2500. COMBING MACHINES, Carlot Braidor, T. English, Hawley, and D. Greig, Leeds. 2557. Variable Expansion Gear, T. English, Hawley, and D. Greig, Leeds. 2558. Centrifugal Machines, W. Shears, Bankside. 2559. Drilling Rock, G. F. Wynne, Minera. 2560. Utilising Volatile Liquids, W. R. Lake.—(I. L. Landis, Lancaster, U.S.) 2561. Bars, C. H. Pennycook, Glasgow. 2562. Extinguishing Fires, J. Braddock, Ashton. 2563. Electric Lamps, G. G. André, Dorking. 2564. Locomotive Engires, J. R. Wigham, Dublin. 2566. Tricycles, E. J. Lewis, Reading. 2566. Boot Sole Edge Setting Machines, C. H. Trask, Lynn, U.S. 2567. Regulating the Speed of Engines, E. P. Alexander.—(C. J. A. Ziegler, Paris.) 2568. Regulating the Patterns in Braiding Machines, F. E. A. Büsche, Westphalia.

662. Handles for Rackets, O. E. Woodhouse, Kensington, London.—16th February, 1881.
664. Painting upon Fabrics, J. Mewburn, London.—A com. from A. Gutmann.—16th February, 1881.
700. Trough Water-closets, H. B. Scott and H. V. R. Read, Westminster.—17th February, 1881.
831. Stockings, R. P. Robertson, Leytonstone.—26th February, 1881.
831. Stockings, R. P. Robertson, Leytonstone.—26th February, 1881.
832. Open Links, &c., for Chains, W. A. Ingalls, Sackville-street, London.—1st March, 1881.
911. Velocipedes, J. Challis and C. E. Challis, Homerton, London.—3rd March, 1881.
911. Velocipedes, J. Challis and C. E. Challis, Homerton, London.—3rd March, 1881.
1332. Regulation of Heart in Kilns, A. Tomkins, F. Courage, and F. Cracknall, London.—2sth March, 1881.
1460. Controlling the Rakes of Hanvesters, G. E. Vaughan, London.—A communication from the Johnstone Harvester Company.—2nd April, 1881.
1778. Bleaching Cotton, &c., W. Mather, Manchester.—25th April, 1881.
1876. Brushes, G. W. von Nawrocki, Berlin.—A comfrom T. B. Günzberg.—2nd May, 1881.
1886. Washing Clothes, A. Cooper, Clerkenwell, London.—2nd May, 1881.
1894. Separating Solid Particles from Air Escaping from Midding, &c., L. Fiechter, Liverpool.—A comfrom Christian Brothers and Co.—4th May, 1881.
1971. Lacing Hooks and Studs, H. Haddan, London.—A comfrom G. W. Prentice.—6th May, 1881.
2078. Air-testing Instruments, F. Engel, Hamburg.—A comfrom W. Klinkerfues.—12th May, 1881.
2078. Air-testing Instruments, F. Engel, Hamburg.—A comfrom W. Klinkerfues.—12th May, 1881.
2167. Trunks or Boxes, W. R. Lake, London.—A communication from F. H. Ransom.—17th May, 1881.
2187. Marine Engines, W. Allan, Sunderland.—19th May, 1881.
2277. Supplying Gas to Engines, F. W. Crossley, Manchester.—21st May, 1881.
2247. Carpets, &c., A. Webb, Worcester.—23rd May, 1881.

1881.
2257. STANDS for BOOKS, J. S. RHWELL,

May, 1881.
2262. RAILWAY SWITCHES, W. R. Lake, London.—
Com. from W. P. Martien.—24th May, 1881.
2264. CABLES, W. C. Barney, Bernard-street, London.—24th May, 1881.

2273. PROPULSION of VEHICLES, E. C. Healey, London.

—24th May, 1881.
2273. PROPULSION of VEHICLES, E. C. Healey, London.
—24th May, 1881.
2305. Weavers' Harness, W. R. Lake, London.—A
communication from the Kendrick Loom Harness
Company.—25th May, 1881.
2329. Fastenings for Laces of Boots, &c., T. Green,
Northampton.—27th May, 1881.
2500. Direct-acting Pumping Engines, A. M. Clark,
London.—Com, from E. G. Shortt.—8th June, 1881.

Patents Sealed

(List of Letters Patent which passed the Great Seal on the 10th June, 1881.)

5187. Washing Machines, J. Summerscales, Keighley.
—11th December, 1880.
5202. STUFFING BOXES, C. E. Hæger, High Holborn,
London.—13th December, 1880.
5203. Wood Pulp, C. E. Hæger, High Holborn, London.—13th December, 1880.
5204. Evingen with J. P. Picken, London.—18th December, 1880.

don.—13th December, 1880. 20. Fire-grates, J. R. Pickard, Leeds.—13th Decem-

don.—13th December, 1880.
5220. Fire-Grates, J. R. Pickard, Leeds.—13th December, 1880.
5229. CUTTING TENONS, E. Cory, Porteous-road, London.—14th December, 1880.
5237. BRAIDING, &c., TELEGRAPH WIRES, W. T. Glover and G. F. James, Salford.—14th December, 1880.
5248. Bats for Lawn Tennis, S. W. Trimmings, London.—14th December, 1880.
5257. BURNERS, &c., J. L. Corbett, Glasgow.—15th December, 1880.
5264. BOTTLES, F. Trotman, Albert House, London.—15th December, 1880.
5279. DRYING, &c., YARN, T. P. Miller, Lanarkshire.—16th December, 1880.
5290. PAVING ROADS, B. J. B. Mills, London.—17th December, 1880.
5290. PAVING ROADS, B. J. B. Mills, London.—17th December, 1880.
5461. ROPE-MAKING MACHINERY, A. M. Clark, London.—28th December, 1880.
529. RECEFTACLES, &c., F. C. Glaser, Berlin.—4th January, 1881.
182. METALLIC COMPOUNDS, H. Hutchinson, East Dulwich.—14th January, 1881.
809. VELVET, I. Bamford, Oldham.—25th February, 1881.

1881.
1253. Substitute for Coffee, J. Challinor, Liverpool.—
22nd March, 1881.
1453. Interlocking Railway Signals, &c., C. Hodgson, London.—2nd April, 1881.
1655. COTTON GINS, A. M. Clark, London.—14th April,
1881.

List of Letters Patent which passed the Great Seal on the 14th June, 1881.)
5064. REGULATING the FLOW of GAS, T. Thorp, Whitefield, and R. Tasker, Prestwich.—4th December, 1880. 5255. Spinning Woot, J. B. Farrar, Halifax, and W. Lumb, Mytholmroyd.—15th December, 1880. 5292. Pumps, R. G. Abercrombie, Alloa.—17th December, 1880.

ber, 1880.
5303. Ventilating Sewers, T. Rowan, Ryde.—17th

ber, 1880.
5303. Ventilating Sewers, T. Rowan, Ryde.—17th
December, 1880.
5306. SHEET METAL, H. R. Minns', London.—17th
December, 1880.
5306. PREVENTING WASTE of WATER, T. H. Goodson,
London.—17th December, 1880.
5308. CLIPS for GUTTER SPOUTING, J. Wiley, Darlaston.
18th December, 1880.
5321. SECURING KNOTS of BRISTLES, E. Wright, Lower
Sydenham.—18th December, 1880.
5329. JACQUARD APPARATUS, J. Irving, Barnsley.—20th
December, 1880.
5333. VALVES, &C., C. R. Stevens, Lewisham.—20th
December, 1880.
5340. TELEPHONE SIGNAL APPARATUS, W. MorganBrown, London.—20th December, 1880.
5381. BARRELS, W. Morgan-Brown, London.—22nd
December, 1880.
5402. SYRUPING AERATED BEVERAGES, J. McEwen and
S. Spencer, Manchester.—23rd December, 1880.
5404. LOCKING, &C., RAILWAY SIGNALS, M. C. Denne,
Eastbourne, and T. J. Denne, Redhill.—23rd December, 1880.
5445. VALVES, &C., T. Meacock and A. W. C. Ward,
Chester.—28th December, 1880.

Eastbourne, and T. J. Denne, Redhill.—23rd December, 1880.

5445. VALVES, &c., T. Meacock and A. W. C. Ward, Chester.—28th December, 1880.

5463. STAINING WOOD, E. A. Brydges, Upton.—28th December, 1880.

5467. DESTRUCTION OF FIELD MICE, H. A. Bonneville, London.—29th December, 1880.

5513. Gas, P. J. Wates, Brooklands, Balham.—31st December, 1880.

5514. TORPEDOES, C. A. McEvoy, Adelphi, London.—31st December, 1880.

11. COMPRESSING AIR, F. Wirth, Frankfort-on-the-Maine.—1st January, 1881.

10. BOOTS, Colonel E. Harnett, Aldershot.—3rd January, 1881.

49. CLOTH-STRETCHING MACHINES, W. R. Lake, London.—4th January, 1881.

186. WOOD SCREWS, A. M. Clark, London.—14th January, 1881.

299. ROTARY ENGINES, J. Matthews, London.—22nd January, 1881.

January, 1881, 25. Brass Hisses, C. H. Brampton and F. W. Bramp-ton, Birmingham.—25th January, 1881. 36. REFINING SUGAR, A. Sauvée, London.—21st Feb-

ruary, 1881. 1365. Looms, E. Smethurst, Manchester.—28th March

1881. 1506. Pencils, W. R. Lake, Southampten-buildings, London.—6th April, 1881.

1549. Raising Nap on Woven Fabrics, J. Worrall, Ordsall.—8th April, 1881.

List of Specifications published during the week ending June 11th, 1881.

522*, 4d.; 3193, 6d.; 3428, 2d.; 3898, 2d.; 3923, 2d.; 4078, 6d.; 4188, 2d.; 4199, 2d.; 4812, 6d.; 4315, 8d.; 4316, 6d.; 4379, 1s.; 4393, 6d.; 4398, 6d.; 4401, 6d.; 4410, 6d.; 4410, 8d.; 4428, 8d.; 4449, 8d.; 4448, 8d.; 4449, 8d.; 4448, 8d.; 4447, 6d.; 4477, 6d.; 4477, 6d.; 4478, 6d.; 4477, 6d.; 4477, 6d.; 4478, 6d.; 4504, 6d.; 4508, 6d.; 4608, 6d.; 460

*** Specifications will be forwarded by post from the Patent-office on receipt of the amount of price and postage. Sums exceeding 1s. must be remitted by Post-office order, made payable at the Post-office, 5, High Holborn, to Mr. H. Reader Lack, her Majesty's Patent-office, Southampton-buildings, Chancery-lane, London.

ABSTRACTS OF SPECIFICATIONS.

Prepared by ourselves expressly for The Engineer at the office of Her Majesty's Commissioners of Patents.

3193. Looms, R. Hindle and G. Greenwood.—Dated 4th August, 1880. 6d.

This relates to apparatus to be used in combination with the weighting ropes, and consists of a hook the shank of which is enlarged near its end and serrated. An open slot is formed in the back of the shank, and receives one end of a link. The end of a rope is passed through the link, and the weight on the hook causes the serrated part to bind the rope between the shank and the inner portion or eye of the link, holding it securely without any knot or other appliance.

3428. WATER-CLOSET VALVES, &c., J. J. Day.—Dated 24th August, 1880.—(Not proceeded with.) 2d.

A loose quadrant-working lever is used to actuate the valve, and is controlled by the float lever with excentric as described in patent No. 2024, a.D. 1877, so as to cut off the flush at the required time. Water waste preventer valves are fitted with a diaphragm with a telescopic or bellows action.

3898. TREATING SEWAGE, &c., C. Dickinson.—Dated

With a telescopic or bellows action.

3898. Treating Sewage, &c., C. Dickinson,—Dated 25th September, 1880.—(Not proceeded with.) 2d. A series of tanks are used placed one over the other, the first containing lime, and being fitted with a mechanical stirrer, the second forming a settling tank, also fitted with a mechanical stirrer, from which the liquid flows successively to the other tanks in the series until all the solid portions are deposited, finally passing to a filtering tank.

3923. Hose F. G. Hamsond - Dated 22th Scattering.

3923. Hose, F. G. Henvood.—Dated 28th September, 1880.—(Void.) 2d.
This relates to lining seamless woven hose, and consists in placing an india-rubber "proofed" cloth inside the hose with its rubber surface inwards.

inside the hose with its rubber surface inwards.

4078. Looms for Weaving, G. P. Hardley, jun.—Dated 7th October, 1880. Gd.

This relates more particularly to the weaving of lenos, and is designed to allow more time and greater freedom of action to those warp threads that require to cross over and pass the loop of the dupe heald. This is effected by means of a shaft with levers, the ends of which are connected by cords to the heald, through the eyes of which the warp threads pass. The levers may be actuated from the crank arm, and will cause the warp threads to be raised higher than usual at the time of crossing, so as to clear the loop of the dupe.

4138. Stoppering Flasks, Canisters, &c., C. M. Westfield.—Dated 12th October, 1880.—(Void.) 2d. A neck and cover or stopper are pressed out of brass or other metal, the neck being formed so as to be applied and fixed to the flask or other vessel by pressure only without soldering, and the cover or stopper screws into the neck.

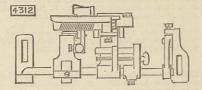
4199. COUPLING AND UNCOUPLING RAILWAY WAGONS, C. Kaye.—Dated 15th October, 1880.—(Not proceeded with.) 2d.

This consists of a lever with three prongs or arms, by means of which the links are lifted over the end of the hooks.

4312. Temples for Looms, J. Parkinson. - Dated 22nd

Getober, 1880. 6d.

This consists in mounting two "dogs," grips, or ratchets between the temple and breast beam of the loom, so arranged that whilst one of the "dogs,"



grips, or ratchets draws the fabric through the temple the other "dog," grip, or ratchet retains the piece in position on the return of the going part of the loom.

4815. Knitting Machinery, N. Marshall. - Dated 22nd October, 1880. 8d.

This relates to the production of spots, checks, and diaper patterns in one or more colours by circular knitting machines, and consists mainly in the use of a compound wheel which will "mispress" selected needles, or press all the needles as desired, so as to break up into parts the circular stripes and thus form break up into parts the circular stripes and thus form a pattern. The thread carriers are depressed by means of an endless chain of tappets so as to present the required threads to the needles.

4316. Twisting or Forming and Laying Strands, Cords, &c., S. Wilson.—Dated 22nd October, 1880.

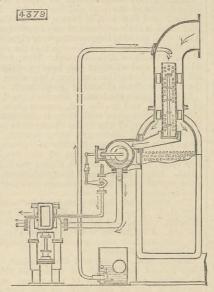
This relates to a novel arrangement for giving a positive take-up to the reel upon which the strand is wound, when twisted, so that a regular twist is obtained and a rope of uniform thickness is produced. The reel is carried in a flyer at right angles to its axis, and is connected by gearing to a bevel wheel at the opposite end of the flyer to where the strand is admitted, and the revolution of the flyer round this wheel actuates the reel. The speed of the bevel wheel varies as the diameter of the reel increases, this being effected by an arrangement of spur gearing which gives a positive change.

4416. Spi Stott.

Steam Bollers, &c., G. and J. Weir.—Dated 27th October, 1880. 1s.

This consists, First, in the system of feeding steam bollers by means of a pump or injector worked by steam, the supply of which is controlled by a float, piston, or diaphragm, acted on by the feed-water;

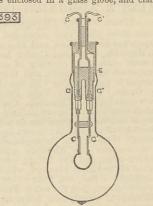
Secondly, the combination with a steam boiler feed Secondly, the combination with a steam boiler feed pump worked by the main engines or otherwise of a by-pass valve controlled by a float, piston, or diaphragm, acted on by the feed-water; Thirdly, the application to a steam boiler feed pump of apparatus for altering its effective lengths of stroke, such apparatus being controlled by a float, piston, or diaphragm, acted on by the feed-water; Fourthly, the fitting of corrosion-detecting apparatus in connection with a steam boiler, or in connection with any part through which the feed-water passes; Fifthly, the employment of zinc to yield hydrogen, for the prevention of corrosion in steam boilers, the zinc being heated with hot water or steam in vessels separate from the boilers, or being introduced into the boilers in small quantities at regulated intervals: Sixthly, the appli-



cation of steam jet apparatus for giving a suitable head or pressure to water drawn from a condenser, to enable it to open the foot valve or valves of a pump or pumps, and thereby avoid the necessity of placing such pump or pumps at an inconveniently low level. The drawing is a sectional elevation of one modification of the apparatus constructed to avoid the drawing in of air along with water by the pumps used for feeding a steam boiler.

4898. Improvements in Electric Lighting Apparatus, W. R. Lake.—Dated 27th October, 1880.—(A communication from H. S. Maxim.) 6d.

The object of this invention is so to construct the globe used in incandescent lighting, that it may be readily taken apart for the insertion of new carbons, and that the joints may be perfectly air tight. The carbon is enclosed in a glass globe, and clamped to

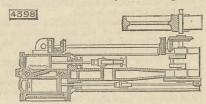


the conducting wires C Cl, the neck of the globe being wide enough to permit free passage for carbon and connections. E is a hollow ground glass stopper, air tight with globe neck. G Gl are tubular extensions of E, sealed directly to the conducting wires. When the carbon is of low resistance each conducting wire is divided into a number of branches, where it passes through the glass as shown in figure.

4398. Gas Motor Engines, J. C. Rodes, W. Good-brand, and T. E. Holland.—Dated 28th October, 1880. 6d.

1880. 6d.

One modification consists in two cylinders, each with a double-acting piston and rod, which rods are jointed with connecting rods that work upon cranks upon the same crank shaft, the crank for one piston being set more or less in advance of the crank or excentric for the other piston. One of the cylinders is termed the compression cylinder, and the other the explosion cylinder. The piston for the compression cylinder is a solid or hollow cylinder with ports and



passages in it on one side, one passage from each end terminating in a port about the middle of one side of the piston cylinder, and these ports come opposite ports and passages leading to the explosion cylinder when the compression piston arrives near the end of its stroke, so that the compressed air and gases will pass through these ports and passages into the explosion cylinder when the piston in the latter has begun or is about to begin its stroke. The drawing is a plan sectional view of one arrangement.

4401. WHEELS POR RAILWAYS, &c., A. C. Uljée and J. Cleminson.—Dated 28th September, 1880. 6d. So as to secure tires on the wheel bodies to obviate So as to secure three on the wheel bodies to obviance the unequal stresses which often occur in tires heated and laid on by shrinking, the periphery of the body is formed conical, and the inner surface of the tire has a corresponding shape, and is forced on cold by pressure. Disc wheels are formed so that the tire may be removed without disconnecting the discs.

4409. Screens, T. Davids and C. Weiss.—Dated 28th October, 1880. 6d.

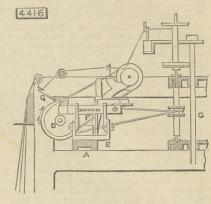
The screen, which is for affording protection from draughts, consists of a series of narrow wooden laths, articulated together so as to allow the screen to be placed in an angular, curved, or straight form, without leaving openings between the laths.

leaving openings between the laths.

4416. SPINNING MACHINES, E. Whalley and J. H. Stott.—Dated 29th October, 1880. 6d.

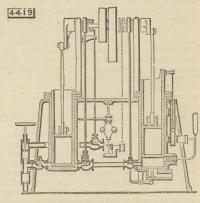
This relates to an improved combination of mechanism for doubling and winding, and is shown in the drawing as applied to a double-sided machine, only one spindle being shown and the mechanism connected with it on one side of the machine. The vertical sliding-rod C carrying the

traverse rail is actuated as usual. A beam A passes from end to end of the frame, there being one beam on each side. A shaft also passes from end to end of the machine. For each spindle there is a bracket E on beam A having bearings for a T-slide F, the cross part of which has heles to receive drop wires, the eye



of each drop wire passing upon wire detector levers G oscillating on a fulcrum rod on the T-slide. When the threads break, their levers and drop-wires fall, and the lower ends of the wires come in contact with a rotating ribbed boss D, which moves the T-slide and stops the winding.

4419. Gas Engines, M. Benson.—Dated 29th October, 1880.—(A communication from A. K. Rider.) 8d. This consists essentially of a gas engine provided with compression and power cylinders each connected to cranks on the main shaft of the engine, the cylinders of said pistons being connected by a



tube or conduit for transferring compressed air and gas directly from the compression to the power cylinder, and an igniter for igniting the charge at proper intervals of time in the power cylinder. The drawing represents partly a vertical section and partly a side elevation of the improved gas motor.

a side elevation of the improved gas 44.25. Manufacture and Adaptation of Pulp from Woody and other Fibres, J. Chase.—Dated 29th October, 1880. 8d.

The woody material is first crushed between a pair

The woody material is first crushed between a pair of grooved or scored cylindrical rollers, and is then reduced to pulp between a pair of stones, the face of one stone being made flat and the other concaved, so that the space between the two diminishes towards the edges. The pulp thus obtained may be used to produce articles of hollowware, leather-board, plasterings for walls, &c., for coating roofs, machine pulleys, and various other purposes.

4432. Velocipedes, W. Hillman .- Dated 29th October,

4432. Velocifedes, W. Hillman.—Dated 29th October, 1880. Sd.

This relates, First, to springs for supporting the saddle, and according to one arrangement such spring is made in the form of a double bow, the top and bottom plates being united at their ends by bending them one over the other round pins. The bottom plate is slotted and the backbone projects through such slot; Secondly, in providing an adjustable step to bicycles; Thirdly, in constructing a ball bearing with a bush divided longitudinally into two halves, and provided with end plates to keep out dust; Fourthly, to a device for securing the cranks; and Fifthly, to increasing the length of the neck which works in the top centre.

works in the top centre.

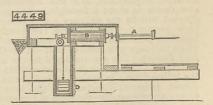
4433. Converting Refuse and Infectious Animal Matter into Gas, &c., B. J. B. Mills.—Dated 30th October, 1880.—(A communication from L. E. E. C. D. T. Anthony.) Sd.

When the animal matters contain more than 20 to 25 per cent. of liquid parts, they are first treated in a press, the water running into a tank, where it is treated with lime and then passes to a filter. Matters containing more grease than that required to supply light for the works have the grease separated from them in a boiler around which hot gases are caused to circulate. The vapours from the boiler pass to retorts placed in a furnace and containing fron filings or carbon, and are thereby converted into combustible gases.

gases.
4448. FIRE-GRATES, E. R. Holland,—Dated 30th October, 1880. 8d.
So as to obtain more perfect combination the fresh fuel is supplied to the grate beneath the ignited fuel already therein. For this purpose the grate has a movable bottom, which, when fresh fuel is to be supplied, falls away from the upper part of the grate, and at the same time advances into position to allow the fresh charge to be put into it, a set of rake-like bars moving into position to support and raise the ignited fuel, and withdrawing when the movable bottom moves back under the grate.
4449. RAILWAY BUFFER STOPS, A. A. Langley.—Dated

moves back under the grace.

4449. Railway Buffer Stops, A. A. Langley.—Dated
30th October, 1880. 8d.
This relates to hydraulic buffer stops arranged at the
end of a siding or line of railway, and consists of a
pair of hydraulic cylinders B, within which work



loosely pistons attached to rods Λ having buffer heads on one end. To the other ends of the piston rods are attached weights D by means of chains passing over pulleys. The cylinders are bored tapering towards the back, so as to offer a constant resistance as the velocity of the carriage diminishes.

4468. Furnaces for Calcining Carbonate of Soda, &c., W. Black and T. Larkin.—Dated 2nd November, 1880. 6d.

This consists essentially in applying heat both to the top and bottom surfaces of the substances to be calcined, so that they may be more evenly, rapidly, and effectively worked.

4472. Machine for Utilisation of Steel Rail Ends, C. and J. D. Jones.—Dated 2nd November,

ENDS, C. and J. D. Jones.—Dated 2nd November, 1880, 4d.

The rail crop ends immediately after being sawn off re passed continuously through a series of rolls, which radually cause them to assume any desired shape, as ant of a flat homogeneous bar of steel without crack rflaw.

4473. PRINTING MACHINERY, A. Sauvée.—Dated 2nd

A473. Printing Machinery, A. Sauvée.—Dated 2nd November, 1880. 6d.

This relates to an arrangement for cutting reels of paper into various sizes of sheets before printing, and also for feeding the sheets square from one set of tapes to the set of tapes which convey them to the printing cylinder. A special pair of cutting cylinders are used for each different size of sheet, and the rollers which draw the paper from the reel are driven so as to run at the same speed as the circumference of the cutting cylinders. A set of shapes or excentrics, whose outer circumferences travel at the same speed as the printing cylinders, catch hold of the sheet as it passes to the tapes which convey it to the latter, so as to feed it squarely forward and prevent it puckering, their axes being movable, so as to adjust their action to suit the size of sheet.

4475. Fences, &c., D. Rowell.—Dated 2nd November,

4475. Fences, &c., D. Rowell.—Dated 2nd November

1880. 6d.

So as to strengthen and reduce the cost of production of wire fencing, the wire is secured to the metal standards by means of encircling staples. The standards consist of two metal sides connected by a web. The invention further relates to apparatus for straining the wires, and to H or T-shaped foundation sockets to receive the standards.

screening the wires, and to H or I shaped foundation sockets to receive the standards.

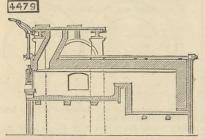
4477. Forming Junctions with Railways of Branch Lines, &c., R. P. Williams.—Dated 2nd November, 1880. 6d.

The junctions are formed without breaking or interfering with the main line either at the switch or at the crossing, so that main line trains can pass the junction at the same speed as over other portions of the line. The fixed rails of the branch line where the train enters upon the branch are laid somewhat higher than the main line, and movable rails or pieces are provided, which can be brought into position to form inclines leading from the main line rails to the branch. The movable rails forming the junction are each in two lengths, so that there are in all four movable rails, two constituting the incline, being mounted one on each side outside the main line, and are laid over the latter when required to divert a train on to the branch or receive it therefrom.

4479. Pudding Furnaces, &c., W. Griffiths.—Dated

4479. Pudding Furnaces, &c., W. Grifiths.—Dated 2nd November, 1880. 6d.

This consists in the construction of puddling furnaces and heating and balling furnaces, in which the neck and ordinary flue (and in a puddling furnace the flue bridge also) are entirely dispensed with, and the flue is carried up through the crown of the puddling



chamber or the heating or balling chamber at or near the end where the flue usually occurs, the said end of the puddling chamber or heating or balling chamber being closed in by plates and brickwork, with a door arranged therein, or not, as required. The drawing is a longitudinal section of a treble-handed puddling furnace constructed according to this invention.

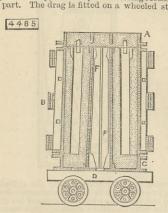
furnace constructed according to this invention.

4481. Wire Ropes, F. W. Scott.—Dated 3rd November, 1880. 6d.

The object of this invention is to so form the strands that when finished the wires which are twisted round them will be in nearly a perfect circle. For this purpose round the core strand are twisted as many cords or yarns of hemp or other fibrous material as there are wires, in such manner that one cord or yarn will come into the space between each wire, so that the surface of the core strand will be cylindrical, and the outer wires can then be laid on in the same direction as the core wires are twisted in a perfectly uniform manner. manner.

4485. Ingor Moulds, D. McKechnie. Dated 3rd November, 1880. 6d.

The mould consists of a top part A, a mid part B, and bottom part or drag C, fitted together by pins or by snugs on the top, and mid parts entering recesses in the mid part. The drag is fitted on a wheeled stove car-



riage D, on which the pattern of the mould is built up. The casing of the mid part is made in halves secured together by pins. The pattern may also be divided longitudinally and is hollowed internally to the shape of the core. The core bar F is fixed to the centre of the drag, and may be divided longitudinally and made collarsible.

4486. Boors, Shoes, &c., J. Sharp and S. Austin.—
Dated 3rd November, 1880. 6d.
This relates to apparatus for "lasting" or stretching
the "vamps" or upper leather of boots and shoes,
which is placed on a last and then inserted in the
machine, where suitable clams act upon it so as to
stretch it as required.

stretch it as required.

4491. PREVENTION OF EXPLOSIONS IN COAL MINES,
T. Canning and W. E. Thomas.—Dated 3rd November, 1880. Sd.

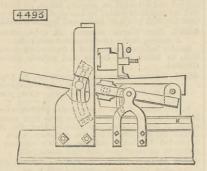
Above the pithead framing is fixed a roof, the covering of which is a conductor of electricity, such as a wrought iron roof, insulated or not, and fitted with a lightning rod and conductor. The wire ropes or rods,* or any metallic communication with the mine, are caused to pass through a metallic sleeve formed with a number of internal points, which, if electricity of high tension be on the rope or rod, draw it off, a series of sparks passing.

4493. METAL PLANING MACHINES. H. Olrick.—Dated.

4493. Metal Planing Machines, H. Olrick.—Dated 3rd November, 1880.—(A communication from J. H. Greenwood.) 6d.

To the reciprocating bed K of a planing machine is attached a rotary rocking chuck, which holds the work and carries the same under the planing tool 0,

giving it at each point of its progress the proper inclination to ensure its being planed either with a convex or concave curve, or with a plane or angular surface, as may be required; the action of the chuck being controlled by an adjustable guide bar, whose angle with the bed-plate can be regulated at pleasure, and governs the movements of the work or object to



be placed relatively to the tool, so that the particular effect desired shall be produced by the horizontal movement of the sliding bed of the planing machine in combination with the movement or fixed position of the chuck.

4497. RAILWAY CARRIAGE COUPLINGS, W. Th 4497. RAILWAY CARRIAGE COUPLINGS, W. Thomas.—

Bated 3rd November, 1880.—(Not proceeded with.) 2d.

The draw bars are extended as far as the buffers will admit without allowing the opposite hooks to come into collision with one another. At the end of each draw bar is a draw bar hook. From the shackle bolt hole of each draw bar, and at right angles to the latter, and attached thereto, depends a vertical bar of proportionate and suitable length. A screw turning in bearings, one in draw bar and one in vertical bar, is placed diagonally between the two at an angle as obtuse as possible.

obtuse as possible.

4499. REGISTERING TAP FOR CHECKING THE SALE OF SPIRITS, &c., J. A. Muller.—Dated 3rd November, 1880.—(Not proceeded with.) 2d.
A cylinder, piston, and slide is employed, which cylinder is of the capacity, say, of a gill or other unit. The motion is communicated to the piston by means of two excentrics and joints, and the motion of the excentric spindle is shown on two separate dials by ordinary counting mechanism, and a ratchet wheel and catch is provided to ensure that the spindle be only turned in a forward direction.

4500. SASH FASTENERS, R. H. and A. S. Rishon.—

turned in a forward direction.

4500. Sash Fasteners, R. H. and A. S. Bishop.—

Dated 3rd November, 1880.—(Not proceeded with.) 2d.

To the bottom rail of the upper sash is fixed a plate, which is provided with a pair of lugs placed transversely of the plate. To these lugs is pivotted a slotted lever, which is capable of being maintained in a vertical position by means of a spring coiled round the pivot and bearing one end against the plate, and the other against the underside of the lever. Upon the top rail of the bottom sash is fixed a small box to receive a spring bolt, to the inner end of which is secured a segment piece with two or more catches thereon. This segment piece projects upwards through the top of the box, which is slotted to permit the same, and is so arranged that it will enter the slot in the lever when this latter is drawn down towards a horizontal position for the purpose of securing the window.

window.

4501. Smoke-consuming Stoves, Grates, &c., J. H.

Bourlay.—Dated 3rd November, 1880.—(Not proceeded with.) 2d.

The bottom of the fire-grate is a solid surface, except for a certain space under the centre of the fire, where bars are used. Immediately beneath these bars is a box open to the bars, but excluding access of air from below. This box is divided into two portions, one of which is supplied with air by a flue or flues, rising on the side or sides of a register door communicating with the chimney.

4502. FLESH GLOVES AND RUBBERS, J. Livermore.— Dated 3rd November, 1880. 4d. The flesh gloves and rubbers for the bath are made with a roughened surface.

4503. Holder for Unbound Periodicals, &c., J. MacCunn. — Dated 4th November, 1880.—(Not proceeded with.) 3d.

The binding clip consists of a tubular shell, somewhat like a penholder, cut away longitudinally to leave little more than a semi-cylinder in cross section for the greater part of its length, and rounded or curved at the end.

to the greater part of its length, and rounded or curved at the end.

4504. FIRE-PLACES, &c., A. Jennings.—Dated 4th November, 1880. 6d.

This relates to the construction of fire-places so as to economise fuel, utilise a large portion of the heat which usually escapes up the chimney, and also to effect a strong up draught through the fire, and prevent a down draught. The bottom and back of the fire-place are made of curved bricks in semicircular form, projecting outwards at the upper edge, and perforated or cut to form ribs beneath. Ordinary bars retain the fuel in the hollow of the fire-bricks. The products of combustion flow into a short flue pipe inside the chimney, and curved downwards to prevent down draught. The upper part of the grate has a jacket through which air from the apartment circulates. A shutter is provided to close over the top of the grate when required to create a good up draught.

4505. CHIMMEN COWL, A. Thompson and R. Anderson.
—Dated 4th November, 1880.—(Not proceeded with.) 2d.

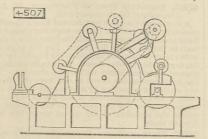
The cowl is formed in two parts, the lower of which

2d.

The cowl is formed in two parts, the lower of which resembles an ordinary plain chimney can. The upper part is fitted with a hood or top piece, open at top and bottom, and attached to the top of the can portion by a fixed or movable sliding ring, with transverse or radial feathers or webs. In the top piece there is fitted a movable conical deflector.

4506. Shirts, &c., G. Taylor,—Dated 4th November, 1\$80.—(Not proceeded with.) 2d.
This consists in providing the shirt with a front protector, so that it may be worn for "dress" or "undress."

4507. Carding Engines, &c., G. and E. Ashworth.—
Dated 4th November, 1880. Sd.
A revolving emery wheel is employed to cut the
edges of each carding cylinder and roller during its
revolution, so that true edges are produced. A Second
part consists in employing solid emery or abrading
wheels to cut down the longer wires in flat cards, in



order to produce a more uniform surface preparatory to the ordinary grinding, having for its object to sharpen the cards. A Third part consists in coiling wire or metal ribands around the roller or cylinder so that each coil shall lie in the bottom of the space between two rows of card dents. A Fourth part consists in employing a rapidly-revolving grinding wheel

to enter between the rows of dents so as to sharpen the dents, which are held apart for the entrance and operation of the wheel by means of a plough or tool which runs in the space between the rows. The drawing is a side view of a carding engine, and is illustrative of the application of the apparatus used when carrying into effect the first part of the invention.

when carrying into effect the first part of the invention.

4508. Machinery for Nailing Boxes, B. J. B.

Mills.—Dated 4th November, 1880.—(A communication from J. H. Swift.—(Not proceeded with.) 2d.

The nails are fed through nail tubes leading from the top of the machine to nail guides or ways forming a part of a number of nail die-holders. The die within the die-holders each consists of two parts, held together by springs placed between the sections of the dies and the die-holders. Above the dies within the die-holders are plungers adapted to slide down in the die-holders are plungers adapted to slide down in the die-holders and drive the nails through them into the box, the dies being opened by the nails.

4509. Supplying Disinfectants to Water-Closets, &c., E. Warner.—Dated 4th November, 1880. 6d.

A reservoir is provided with a filling opening capable of being closed air-tight by means of a suitable cover or stopper, such reservoir serving to contain the disinfecting fluid. The reservoir communicates with a lower cistern by means of one or more tubes, which reach nearly to the bottom of the eistern. A syphon is provided, one end of which passes into the lower reservoir, and extends a certain distance below one or all of the tubes, the other end of the syphon opening into the supply pipe to the water-closet.

4511. Funnaces for Chemical Processes, J. Macter and the supply and the passes and the loss of the tubes.

all of the tubes, the other end of the syphon opening into the supply pipe to the water-closet.

4511. Furnaces for Chemical Processes, J. Mactear.—Dated 4th November, 1880. 10d.

This relates to improvements on patent No. 4870, dated 28th November, 1879. According to one modification the rotating furnace bottom or hearth is made with a flat or nearly flat upper surface, and with or without a central depression or pot or compartment formed by a low circular rib or partition wall to receive the materials on their first introduction into the furnace from an inlet arranged at or near a point above the centre of the rotating hearth. Circular or spiral partition walls between the central part and the outer edge or rim are dispensed with.

4512. Grinding Dyrmods, Myrabolas, &c., T. J. Pickles, S. Smithson, and C. H. Pickles.—Dated 4th November, 1880. 4d.

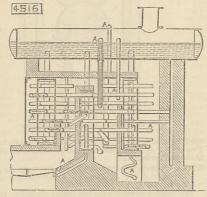
This relates to machines in which revolving arms or beaters pulverise the material by crushing it against the teeth or ribs of a circular grate. The case is formed larger than usual, so as to leave several inches between the inside and the grate. Round this space the sides of the case are cut away, and the openings covered with wire gauze covered by a box, into which the pulverised material is forced. The beaters are made angular and the grates correspond therewith.

4514. Manufacture of Sugar, &c., from Cellulose of Ligneous Materials, W. F. Nost.—Dated 4th November, 1880.—(A communication from A. C. D. Pochez.) 4d.

This is based upon the fact that cellulose or ligneous materials are convertible, by treatment with sulphuric acid first into gum or dextrine, and afterwards into glucose or other sugar.

4516. Transmitting Heat to the Contents of Steam Boilers, &c., W. L. Wise.—Dated 4th November, 1880.—(A communication from B. Roeber.) 1s. 10d.

This consists in the creation of currents of heat in vessels or pipes by certain arrangements, the vessels being partly situated within the material to be heated



and filled with fluids. The currents of heat are conducted within the vessels, so as to pass through a counter current. In the pipes A an inner tube is fixed, and when filled with fluid the pipe is closed, one end being heated by the furnace, and the other projecting into the material to be heated; the inner tube causing the fluid to circulate therein.

4518. Disinfecting Closer Pans, &c., II. Sevard.—

Dated 4th November, 1880. 6d.

This consists in the continuous application of the vapour of carbolic acid and other volatile disinfectants, without the direct application of the liquid itself.

without the direct application of the liquid itself.
4520. APPARATUS FOR DISTILLING AMMONIACAL LIQUOR, J. S. Stevenson.—Deted 4th November, 1880.—(Not proceeded with.) 2d.
This consists in the construction of a semi eggshaped boiler to be used as an auxiliary to the ordinary boiler in which the liquor is distilled, and having a chamber in the upper part surmounted by a hopper.
4521. RIVETTING SHIPS, &c., R. H. Tweddell.—Dated 4th November, 1880.—(Not proceeded with.) 2d.
This relates to the employment of a dynamo-electric or magneto-electric machine for the purpose of putting in motion a spring hammer.
4522. ECONOMISING THE NITROUS PRODUCTS IN THE

4522. ECONOMISING THE NITROUS PRODUCTS IN THE MANUFACTURE OF SULPHURIC ACID, J. Impay.—
Dated 4th November, 1880.—(A communication from F. Benker and H. Lasne.) 4d.
This consists in mixing sulphurous acid gas with the gases which enter the Gay Lussac tower.

gases which enter the Gay Lussac tower.

4523. Breech-Loading Mechanism for Fire-arms,
T. Nordenjelt.—Dated 4th November, 1880.—(A communication from H. Palmerantz.) 8d.

This consists, First, in the combination of the breech
block, the wedge, the striking apparatus within the
wedge, the extractor, and the lever handle actuating
these parts; Secondly, the combination of the breech
block, the wedge, the striking apparatus within the
wedge, and the lever handle in such a manner that by
one movement of the handle the breech block is turned
into position to close the breech, the wedge is inserted
behind the breech block, and the striking apparatus
is released.

4524. TILTING CASKS, &c., P. J. Catterall and J. S. Crowley.—Dated 4th November, 1880. 4d.

A worm wheel and a sprocket wheel are cast on a shaft, and over the sprocket wheel passes a chain, the other end of which carries a hook to hook under the end of the cask. The worm wheel is driven by a worm actuated by a crank handle.

4525. Embroidering by Machinery, and Orna-Menting Fabrics, A. Heaven.—Dated 4th Novem-ber, 1880. 6d.

ber, 1880. 6d.

The inventor claims placing pieces of velvet or other naterial of the exact size required on the needles of membroidering machine.

4527. Fusing Iron Ores, &c., R. Lancaster and E. S. Samuell.—Dated 4th November, 1880.—(Not proceeded with.) 2d.

Iron and steel are manufactured direct from the ores by treating them with ordinary or highly superheated steam.

4528, Increasing the Illuminating Power of Coal Gas, J. Macdonald.—Dated 4th November, 1880.—(Not proceeded with.) 2d.
This consists in causing coal gas to be enriched by passing it through or over a carburetting material in such a manner as to allow only a small portion of the carburetting material to be exposed to the action of the gas at a time.

the gas at a time.

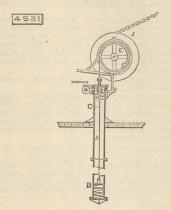
4580. Steering Vessels Propelled by Paddle-Wheels, A. Porecky.—Dated 5th November, 1880.—
(Not proceeded with.) 2d.

This consists in effecting the steerage of ships and other vessels propelled by paddle-wheels, by means of semi-cylindrical boxes or troughs, each encasing the half of a paddle-wheel and actuated by a separate shaft fitted with proper gear working in corresponding gear attached to each box or trough at the side next the ship to turn them round the paddle-wheels.

4531. Steam Hoists, T. Archer, jun.—Dated 5th November, 1880. 6d.

November, 1880. 6d.

This relates to hoists in which a long cylinder and piston with flexible piston rod are used. A is the cylinder; B, the piston; and C, the ribbon rod attached to the latter, and also to drum E, on which



it coils itself. J is the lifting drum on which a chain is coiled the reverse way to the ribbon rod on E. Buffer springs are fitted to each end of the cylinder.

4532. FIRE-GRATES, G. K. Hannay.—Dated 5th November, 1880.—(Not proceeded with.) 2d.

The "basket" part is formed of bars, and is provided with pivots mounted in bearings in a carrier or framing, so as to admit of its being in a vertical turned plane upon these pivots.

4533. Metal Joints, &c., E. Ward and W. Bevis.—Dated 5th November, 1880.—(Not proceeded with. 2d.

This consists First in the use of a conserval was as the second of the second of

2d. This consists, First, in the use of a concaved or convexed metal spring to act upon the plug of all metal gas joints, &c.; Secondly, in the use of a guide pin fixed in the plug, and of a groove made in the barrel of all metal joints, &c., for the guard pin to work in; Thirdly, in the use of a metal flange or a metal washer for the concaved or convexed spring to press upon or work against.

work against.

4534. CHAMFERING THE ENDS OF LEATHER BELTING,
J. M. J. Tecken.—Dated 5th November, 1880. 6d.
This consists, First, in the employment of rollers arranged upon a movable table, by which they are moved and arranged under a cutting blade or knife; Secondly, in the combination with the rollers, of springs acting like fingers for keeping the leather belting in contact with the upper roller.

4535. FEEDING BOTTLES, G. Wheeler and J. Webb.— Dated 5th November, 1880.—(Not proceeded with.)

2d.

This relates to means for preventing the feed...g bottle rolling over and so twisting the supply pipe.

4586. TIPPING WAGONS AND VANS, A. G. Margetson and W. S. Hek.—Dated 5th November, 1880. Sd.

The wagon is constructed so that the slight backing of the horse will tip up the body of wagon without manual labour, or as an alternative plan the wagon is fitted with a windlass and chains, by means of which the wagon body can be tipped.

4537. Bracelets, &c., J. West.—Dated 5th November, 1880.—(Not proceeded with.) 2d. The bracelet is made in two parts, which are connected together by means of springs.

4538. Alphabetical Binder for Letters, &c., J. W. Cochrane.—Dated 5th November, 1880.—(Not proceeded with.) 2d.

This comprises an outer cover consisting of one or two sheets of cardboard or stiff paper. Pages of stiff paper, cut and marked on the outer edge with the letters of the alphabet in the form of an ordinary ledger index, are inserted within the cover. The whole is sewn together with an elastic cord or ribbon at or near the back.

4539. Targets and Butts, R. Neilson.—Dated 5th November, 1880. 4d.

The object of the target is to obviate the necessity of a marker, and it consists of a disc mounted so that when struck it will recede, and by means of a battery or mechanical apparatus transmit its movement to an indicator placed where desired.

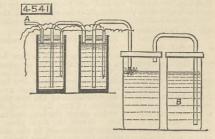
4540. DETECTING THE ESCAPE OF NOXIOUS GASES FROM DRAINS, R. H. Reeves.—Dated 5th November,

1880. 6d.

A tube is attached to the drain, the amount of pressure being indicated by a column of liquid, composed of a chemical re-agent, which on contact with the air from the drain will at once detect the presence of noxious gas, and show on an indicator the amount of pressure and at what period there is an escape of gas.

4541. Purification of Alcohol, W. A. Barlow .-

4941. Purification of Alcohol, W. A. Burlow.—
Dated 5th November, 1889.—(A communication from
L. Naudin and J. Schneider.) 6d.
The object of the invention is to separate the
alcohol from the matters giving bad taste to it. To
effect this the alcohol is put into contact with a
metallic couple, formed by chemically precipitating
one of two metals on the other. The water in the
alcohol is decomposed, nascent hydrogen, so formed



then transforms the odorous matters which soil the alcohol into other bodies of inodorous and tasteless kind, easily separable from the ethylic alcohol by means of distillation. The figure represents the apparatus. The alcohol to be treated enters by the pipe A, in the left-hand corner. The alcohol is finally recovered from the cylinder B, which is full of water, by distillation.

4542. Steam Heating Apparatus, &c., L. W. Leeds.
—Dated 5th November, 1880. 6d.
This relates to apparatus for automatically regulating and maintaining any given amount of steam

required for heating rooms, &c., and also the arrangement of parts by which such steam is utilised. To effect the thorough combustion of the fuel in the furnace which heats the boiler, the fire-box is lined with fireclay, and above it is hung a firebrick or mass of refractory material, with which the products of combustion come in contact and are consumed. A pipe admits air on to the top of the brick. The draught is supplied and the generation of steam regulated by an air pipe or box with three openings, one leading beneath the grate bars, another to the top of the suspended firebrick, and the third opening into the smoke-box. The ports of the air pipe or box are closed and opened by a slide connected to a weighted lever operated by a piston, whose motion is governed by the steam pressure in the boiler.

4543. Jacquard Needles or Cross Wires, W.

4543. JACQUARD NEEDLES OR CROSS WIRES, W. Martin and J. Hind.—Dated 5th November, 1880.

Marin and J. Hina.—Dates the November, 1880.

4d.

This consists in the manufacture and introduction of single wires with slots punched or pressed in the centre of a solid wire for cotter pins, and used withor without spiral springs, and known as selecting needles or cross wires in Jacquard looms.

4544. FURNACES OR FIREPLACES FOR THE COMBUSTION OF FUEL WITHOUT SMOKE, H. H. Lake.—Dated 5th November, 1880.—(A communication from La Societé Nessi Frères.) 6d.

The main feature of this invention consists in eeding the fuel through an opening arranged above the grate and above the ordinary door, an inclined feed throat being provided, on which the fuel forms, in front, a heap having sufficient slope to cause it to fall unaided upon the second part of the grate where the combustion takes place.

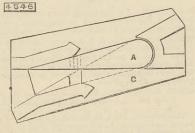
4545. Pipe Coullings, &c., W. Stainton.—Dated 6th

combustion takes place.

4545. PIPE COUPLINGS, &c., W. Stainton.—Dated 6th
November, 1880. 4d.
In order to prevent the slipping of the tongs or
wrenches employed to screw up the sockets and back
nuts in pipe couplings, their outer surfaces are formed
with serrations or channels running in the direction
of their axis. The back nuts are made round instead
of square or hexagonal.

4546. RAILWAY SWITCHES AND CROSSINGS, C. W. Hartley.—Dated 6th November, 1880. 6d.

The object of the invention is to form a continuous rail at junctions of lines, and consists in placing a movable switch at the angles where the rails of the main and branch lines join, such switch when set for



the passage of a train forming a continuous rail over the crossing from one line to the other. A is the switch, the underside of which has a projection entering a socket in the bed-plate C. Another projection on the underside of the switch is connected by levers with signal-box.

levers with signal-box.

4547. Gas Engine, T. D. Magiarlane.—Dated 6th November, 1880.—(Not proceeded with.) 2d.

The engine consists of a cylinder closed at one end, and open at the other. The cylinder is provided with a piston and piston rod, the outer end of the latter passing through a guide on the engine framing. The connecting rod is coupled to the piston rod as close as convenient to the piston itself. At the closed end of the cylinder valves are provided for admitting air and gas in the right proportions for forming an explosive mixture, and for discharging the exhaust or burnt gas, another valve being also provided for opening the communication between the gaseous mixture inside the cylinder and the pilot or igniting burner. he gaseous mixture r igniting burner.

4549. DRIVING BELTS, J. Heap .- Dated 6th November,

1880. Old.
This relates to improvements on patent No. 1199, A.D. 1880, in which strips of leather were rivetted to corrugated bands of metal, and consists in so connecting the leather to the metal as that there is no rigid attachment which would prevent the metal moving at a rate of speed differing from that of the leather. According to one method, the piece of leather has another piece secured down the centre on each side of it. Over these strips are placed other covering strips of leather overhanging the central strip on both sides and the outer strips on the inner side thereof. These strips are then rivetted to the piece of leather, and a number of them threaded on to two metal ribands by passing the latter through the channels formed by the application of the strips.

4550. FASTENINGS FOR BOOTS, SHOES, &c., M. L.

4550. Fastenings for Boots, Shoes, &c., M. L. Multer.—Dated 6th November, 1880.—(Not proceeded with.) 2d.

This consists in a fastening for dispensing with button holes, laces, &c.

4551. Pickers, T. S. Scarborough and J. Moore.
—Dated 6th November, 1880.—(Not proceeded with.) 2d.

—Dated 6th November, 1880.—(Not proceeded with.) 2d.

The pickers are made of iron, and packed with buffalo hide or sizing.

4552. Brakes, T. Coltmann.—Dated 6th November, 1880.—(Not proceeded with.) 2d.

The brake is automatically applied to the wheels of each carriage when the speed is suddenly checked, and although the wheels are prevented from running forwards they can run backwards, and when power is again applied the brake is automatically removed. The brake can also be reversed, so as to allow the carriage to run in the opposite direction.

4556. Drying or Desicating Substances with Heated Air, C. D. Abel.—Dated 6th November, 1880.—(A communication from E. Langen.) 6d.

The substance is caused to travel firstly through a passage, flue, or chamber, through which a current of heated air passes in the opposite direction, and then through a passage, in which a current of heated air, is made to pass in the opposite direction, so that the substances first have the moisture evaporated from them by the heated air and are then cooled by the cold air, which at the same time takes up, and thus utilises the heat on its way to the heating apparatus.

4557. Fastening for Lockers and Watches, F. Veletti.—Dated 6th November, 1880.—(Not morceeted)

4557. Fastening for Lockets and Watches, Velati.—Dated 6th November, 1880.—(Not procee

vitil.) 2d.
Upon the top of the rim is formed a hollow box with the front removed, and over the sides is sprung a forked piece of metal, the inner sides of which have projections entering recesses in the sides of the box. Two screws pass through the fork-piece and move freely in two holes through the sides of the box piece and project into the interior. Upon the top of the other case is a piece which closes the box, and into which the screws enter. When the fork piece is turned the projections leave the recesses in the sides of the box, and so withdraw the screws from the piece which enters the box.

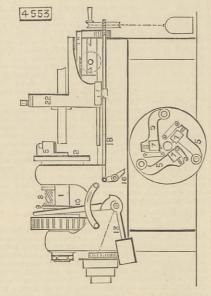
which enters the box.

4553. Turning, Screwing, and Drilling Machines,

W. W. Hudse. - Dated 6th November, 1880. 8d.

This relates, First, to machines in which cutters which converge toward acentral axis, and which may, when cutting, rotate or remain stationary, are simultaneously withdrawn from the cutting position and restored to it again; and Secondly, to apparatus whereby the progressive motion of the cutting tools relative to the rotation may be regulated, so as to suit

different speeds of turning, pitches of screws, and rates of progression without employing change wheels. The mandril 1 is tubular and carries at its front end a disc 2, in which the tool holders 5 are pivotted. Excentric ends on the screwed spindles 8 take into grooves in the ends of the tool holders and cause them to rotate round their axis, while the other ends of the screwed spindles enter nuts on the ring 9,



which can move to and fro on the mandril by means of the levers 10. On the shaft of lever 10 is a weighted lever 13 with a heel and stop. A detent 16 is actuated by a lever and rod 18 carrying a fixed and an adjustable stop, acted upon by a block on the sliding vice or chuck 22.

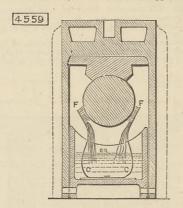
chuck 22.

4558. Looms, T. S. Scarborough and J. More.—Dated 6th November, 1880.—(Not proceeded with.) 2d.

An iron picking box is used instead of the ordinary picker packed with size to form a butt for the shuttle. This box is worked on a slide top and bottom of the going part of the loom. To one side of the box a chain band is attached, and passes over a pulley fixed to the shuttle box, down to a lever centred on a stud on the end of the loom, and which is continued down to be actuated by a tappet on the low shaft. To the opposite side of the box is attached an elastic band secured to the centre of the going part.

4559. Lubricating the Axles of Railway Rolling Stock, &c., W. S. Laycock.—Dated 6th November, 1880. 6d.

This relates chiefly to the method of supporting and



applying the pads which are charged with the lubricant. Two pads F are used, one secured to each arm of the U-shaped springs C.

4560. PEEPARING AND SPINNING COTTON, &c., R. Curtis and W. H. Rhodes.—Dated 6th November, 1880. 6d.

This relates to means for imparting variations in the speed of the bobbins of slubbing, intermediate, roving, and jack frames, and it consists of the shaft B placed near to and parallel with the driving shaft, and carrying at one end a spur wheel gearing with the ordinary large carrier wheel, and at the other end a flanged

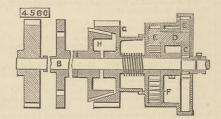
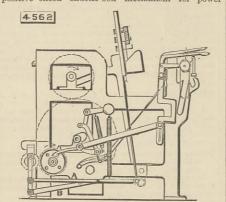


plate C on which is a bearing for a short shaft D. On either end of this shaft is fixed a pinion E, one on each side of the plate, the outer one gearing with a pinion driven from the rack shaft, and the inner one gearing with the internal wheel F loose on the shaft B. To the wheel F is attached a hollow spur-wheel G gearing with the ordinary wheel for imparting motion to the bobbins. The wheel G is pressed by a spring on to a "helper" friction pulley H keyed on the shaft on which the internal wheel F revolves.

4562. Looms, P. Young and J. Mathieson.—Dated 6th November, 1880. 10d.

This relates to a special arrangement of parts of positive check shuttle-box mechanism for power



looms, that is, for shifting and setting any one shuttle and its box of a set of from two to eight of the raising and lowering, or vertical reciprocating shuttle boxes of a loom, in line with the race of the lath, ready for

picking or throwing the shuttle through the shed of the warp or cloth, and also in improved arrangements of pattern mechanism for controlling the said positive motion shuttle-box moving mechanism; and the nature of the first part consists in the use of differen-tial or compound levers A and B, having one arm connected with the lower end of the spear of the reciprocating multiple shuttle-box, the levers being carried and actuated on moving fulcra at their ends and intermediate centre by means of cranks or excen-trics through pawls or hooks and tapped wheels. 4563. Hor Water Boilers, R. Coles.—Dated 6th

4563. Hot Water Boilers, R. Coles.—Dated 6th November, 1880.—(Not proceeded with.) 2d. Saddle boilers are made of a framework of channel iron, to which the inside and outside plates are rivetted.

1970 Hermometers or Barometers, E. Edmonds.

—Dated 6th November, 1880.—(A communication from 0. Koch and A. Eichhorn.—(Not proceeded with.) 2d.

In the scale of the thermometer plating wires are inserted in such a way that the ends just enter the inside of the thermometer tube, so that the plating comes in contact with the mercury when it is expanded by heat, and an electric current then passes to an electro-magnet with alarm bell.

4569. Machine Gins T. Kirmma — Parkel 6th No.

passes to an electro-magnet with alarm bell.

4569. Machine Guns, T. Kierman.—Dated 6th November, 1880.—(Not proceeded with.) 2d.

A number of barrels are placed side by side, and each one has a breech-piece with a spring case and firing needle. The rear ends of the breech-pieces are fastened to a horizontal travelling bar which is moved to and fro to open and close the breeches. The hammers are released simultaneously.

4572. Manual Coal and Stone-cutting Machine, H. Richardson. Dated 8th November, 1880.—(Not proceeded with.) 2d.

A bed is fixed to the floor of the mine, and carries a sliding block worked by a screw and fitted with a mandril armed with teeth and caused to revolve by a winch handle.

4573. Recovering Indigo from Certain Materials, F. A. Gatty.—Dated 8th November, 1880. 2d. This consists in treating woollen materials dyed with indigo with an alkali which dissolves the wool and sets the indigo at liberty, which is then available for dyein.

4574. UMBRELLAS, W. R. Lake.—Dated 8th November, 1880.—(A communication from F. Hartmann.)—(Not proceeded with.) 2d.

The handle into which the stick penetrates is perforated, and its upper end enlarged to receive a spring which bears against a disc on the stick and a shoulder in the handle. The end of the stick is recessed to receive the ribs.

4575. Velocified fig. 7. Butler.—Dated 8th November, 1880.—(Not proceeded with.) 2d.
This relates to improved means for communicating to the driving wheels of a tricycle the motion of the crank shaft.

crank shaft.
4576. PRODUCING DESIGNS IN COLOURS ON PAPER, &c., W. L. Wise.—Dated 8th November, 1880.—(A communication from H. Gmeiner.) 4d.

The patterns are produced on paper and other materials by hollow cylinders of india-rubber, the peripheries of which are provided with the patterns by pressure by the process of vulcanising in moulds. Any seams on the cylinders are removed by cutting with the graver and the cylinders are then expanded by blowing air into them.

4577. BLOCKS OF CONCRETE AND CEMENT FOF BUILD-ING, &c., H. Faija.—Dated 8th November, 1880.— (Not proceeded with.) 2d.

The concrete or cement is placed in a chamber to which free steam is admitted, so as to act on the material, which is thus hardened.

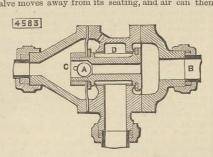
4578. Uniting the Ends of Machine Driving Belts, W. R. Lake.—Dated 8th November, 1880.—
(A communication from M. Schulze.)—(Not proceeded with.) 2d.

The ends of belts are united so that the seams on the inner side are covered, and are thus not liable to

4579. COMBINED SHADES AND REFLECTORS FOR GAS LAMPS, J. S. Goldsmith.—Dated 8th November, 1880. —(Not proceeded vith.) 2d. The combined shade and reflector is of glass and of triangular shape, so that there are a number of inclined

surfaces.
4582. Puddling Furnace, J. Jones.—Dated 9th November, 1880.—(Not proceeded with.) 2d.
The furnace is formed so that three puddlers can work at the same time. It is preferably oblong, with two corners cut off to better enable the puddlers to work their metal, and prevent a portion thereof becoming wedged in the sharp corners. The stack or flue is built on top of the furnace, and one puddler works at the front end and one on each side of the furnace.

4583. Vacuum Brake Apparatus, J. Grèsham.—
Dated 9th November, 1880. 8d.
This relates to improvements on patent No. 4801,
A.D. 1878, and consists in forming the main valves D
with a hole through the axis of the connecting stem or
guide, such hole being small at one end and formed
with a seating so as to be closed by a ball valve A when
atmospheric pressure is admitted to the train pipe C.
When a partial vacuum is formed in this pipe the ball
valve moves away from its seating, and air can then



be admitted to the vacuum chamber through the branch B. The patent further relates to means to enable automatic vacuum brake apparatus to be worked as a simple vacuum brake; also in a tell-tale or pressure gauge to indicate when the brakes are not in proper working order, to the cock or valve for putting the brakes on or off, and to couplings for vacuum brakes.

4585. Supplying Fuel to Fireplaces, W. S. Mel-

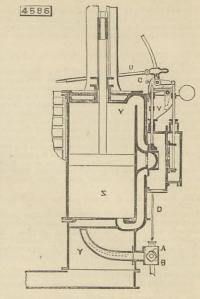
4585. Supplying Fuel to Fireplaces, W. S. Melville.—Dated 9th November, 1880. 6d.

A shovel has the after part formed into a chamber to receive the fuel, its front part having a flap hinged to the front part of the chamber, while the front edge of the flap rests in the bottom of the shovel. The flap is provided with alever connected to a slide on the handle, by which the flap can be raised or closed. The handle receives the stem of a piston sliding within the chamber. When the front part of the shovel is slid into the fireplace and at its lower portion by a backward motion of the slide, a forward projection of the piston made simultaneously raises the flap and ejects the fuel contained within the chamber of the shovel under the incandescent mass.

4586. REGULATING AND GOVERNING THE SUPPLY OF INJECTION WATER TO JET CONDENSING STEAM ENGINES, J. Griffiths.— Dated 9th November, 1880.

oid. This relates to governing the supply of injection water to jet condensers by the action of some moving part of the engines. According to one method a cut-off valve A is attached to the injection cock B on the

condenser Y, and is actuated by the gear C, D, worked from and controlled by the expansion valve gear U of



the main engine Z, or by the slide valve gear V if expansion valves are not fitted to the engines.

expansion valves are not fitted to the engines.

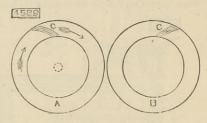
4587. Melanging, W. D. Thornton. — Dated 9th November, 1880. — (Not proceeded with.) 2d.

This relates to the blending of a variety of shades of colour in yarn in such a manner that when woven into the piece the same will not appear streaky. For this purpose the fibre whilst in the sliver is passed through a melanging machine, whereby one colour is printed thereon, after which it passes to an apparatus arranged with colour distributing and furnishing rollers, the same as in the ordinary process of melanging, but instead of a top or printing roller a stamper or impression plate is used, and is so arranged that type of different sizes can be secured therein.

4589. Grinding Mills, J. Higginbottom.—Dated 9th November, 1880. 6d.

November, 1880. 6d.

Both the revolving grinding face A and the stationary grinding face B are formed with spiral ribs and grooves



C on them instead of the circular or angular lands and urrows commonly used.

4590. Boots and Shoes, P. G. Acres and W. Freeman.

—Dated 9th November, 1880.—(Not proceeded with.)

2d.

This relates to a combined machine in which the two operations of sewing and stitching the soles of boots and shoes iseffected, and also to produce double lock stitches.

4591. FLEXIBLE INK OR COLOUR COMPOUNDS FOR PRINTING, L. B. Bertram.—Dated 9th November, 1880.

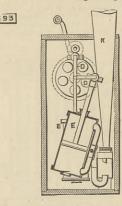
2d.

This relates to compounds suitable for ink or colour pads for rubber type, &c., and consists of 4 parts uniline powder mixed in 12 parts water; to which is added 1 part glucose; 2 parts acetic acid; and 8 parts glue or gelatine; after which 12 parts water are added, and 64 parts glycerine.

and 64 parts glycerme.

4593. Fog Horns, A. L. Wharton and S. J. Dobson.—
Dated 9th November, 1880. 6d.

This relates to obtaining a continuous sound by hand or engine power, and consists in the use of two double-acting air cylinders E driven by a crank shaft D actuated by hand or engine power, each cylinder having an air inlet with suction valve at top and bottom, and an outlet leading through an air passage



to a valve chamber placed along the cylinder and having two discharge valves, one communicating with the top and the other with the bottom of the cylinder. From the valve chamber a discharge pipe leads to the pedestal of the fog horn K which can turn thereon so as to emit the sound in any direction.

4594. Hats, F. Wirth.—Dated 9th November, 1880.—
(A communication from L. F. Rousselot.)—(Not proceeded with.) 2d.

In order to render hats light, soft, and waterproof, a piece of silk, thin felt, or chip has all folds ironed out, and round the corners a strip of cloth impregnated with gutta-percha. Thin felt, previously blocked, is then drawn over it, and the whole steamed and ironed.

4596. Hygienic Compound, W. R. Lake.—Dated 9th

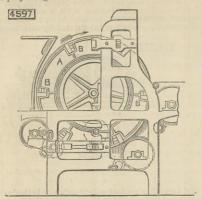
4596. Hygienic Compound, W. R. Lake.—Dated 9th November, 1880.—(A communication from T. S. Lambert and J. S. Huyler.)—(Not proceeded with.)

2d.

The compound consists of sugar, glutinous cereal meal, and water, and possesses great nutritive value and anti-aperient properties.

and anti-aperient properties.
4597. Silk-dressing Machinery, A. Greenwood.—
Dated 9th November, 1880. 8d.
This relates to improvements on patent No. 1452,
A.D. 1866, and consists in improvements in gripping
the "books" of silk upon the periphery of a rotating
cylinder previous to the silk being submitted to a
dressing action, and of releasing them after such
action has taken place. The periphery of the skeleton
cylinder A is divided by transverse division plates
into presses for the reception of the books of silk. B
are wedges to impart pressure to the books of silk, and
they act on inclines on plates. The outer ends of the
pairs of wedges have anti-friction bowls to receive
the pressure of hinged cam pieces attached to

bracket pieces made fast to the side frames. On stud pins projecting from the brackets are bell-crank levers,



rom one end of which depend weights, the other limb bearing against the hinged cam pieces.

4598. SRATES, R. H. Bishop and H. F. Hailes.—Dated 9th November, 1880.—(Not proceeded with.) 2d.

The sole of the boot rests on a movable plate having a socket to receive the toe of the boot, and connected to the blade by two pairs of rocking links, by which the plate receives a backward and forward motion, so as to cause a sliding plate on the rear end fitted with teeth to enter the front portion of the heel of the boot.

4600. CUT PILE FABRICS, R. Atherton.—Dated 9th November, 1880. Gas and when cut the pile is raised by brushing, so as to bring it to the front.

4601. Toy Money-Box, W. R. Lake.—Dated 9th November, 1880.—(A communication from J. E. Walter.) 6d.

A box is surmounted by a dog or other animal with a passage through it into the box, and spring mechanism is applied to the animal, so that when a coin is placed in its mouth motion will be imparted to it and cause it to close its jaws and spring forward.

4603. TREATING ANIMAL OR VEGETABLE SUBSTANCES, J. H. Johnson.—Dated 9th November, 1880.—(A communication from A. J. Huet.) 4d.

In order to prevent putrefaction, and also to destroy putrid or morbid germs, and also animal or vegetable germs, animal or vegetable substances are treated with different descriptions of lava, which have undergone a preliminary transformation by means of sulphuric or hydrochloric acid, the lava being them mixed with a product resulting from the oxidation of heavy oils of tar by the action of atmospheric agents with the intervention of hydrate of lime, and also by the addition of alurnite calcined in the presence of chloride of potassium.

4605. Sewing Machines, A. M. Clark.—Dated 9th November, 1880.—(A communication from G. F.

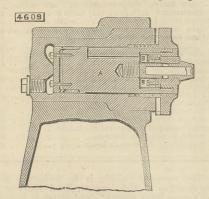
potassium.

4605. Sewing Machines, A. M. Clark.—Dated 9th November, 1880.—(A communication from G. F. Newall.—(Not proceeded with.) 4d.

This relates, First, to a noiseless mechanical device having an even and positive motion for operating the needle lever and shuttle driver of sewing machines; Secondly, to the feed devices; Thirdly, to the needle bar and devices for clamping the needle: Fourthly, to the tension device for the upper thread; Fifthly, to the combination of a bobbin winder with the driving wheel and a clutch to throw the latter out of gear with the machine by the same movement that throws the disc on the bobbin winder into gear with the driving wheel. driving wheel.

O9. DIRECT-ACTING HYDRAULIC MACHINES FOR RIVETTING, PUNCHING, &c., R. H. Tweddell, J. Platt and J. Fielding.—Dated 10th November, 1880.

This relates to apparatus for adjusting hydraulic rivetting machines to their work, the object being to render them readily applicable to the various kinds of work they have to perform. In order to press the plates closely together, in front of the plunger A is fitted an annular plunger B carrying a pressing tool,



the space in which plunger B works communicating with an annular space round plunger A, which is also in communication with the supply of working fluid. When the plunger A is actuated, the pressing tool is thus brought to bear on one of the plates and press the two plates together while the rivetting tool advances and upsets the rivet. Different arrangements are shown for adjusting the machine to its work and also for rivetting in a straight line or in a circle.

4611. Properling Boats, &c., R. Hall.—Dated 10th November, 1880.—(Not proceeded with.) 2d.

A cylinder is attached to both sides of the boat below the water line, and is fitted with a foot valve and piston valve like an ordinary pump. To the gunwale on both sides are attached curvilinear or rectilinear outrigger frames, to which are centred levers to be worked by the boatman, the piston rods of the pumps being attached thereto. Water is first drawn into the pumps and is then forced out, and by acting upon the outer water propels the boat.

4612. Shiri Fronts, S. Bowden.—Dated 10th Novem-

water propels the boat.

4612. Shirt Fronts, S. Bowden.—Dated 10th November, 1880.—(A communication from C. E. Krarup.)—(Not proceeded with.) 2d.

The front is fourfold, and so stitched together in the centre where the front opens as to form on the right-hand side of the opening two flaps, and on the lefthand side a pocket plait, consisting of two plaits stitched together at top and bottom so as to form a pocket extending the entire length of the front.

4613. Biovoles, J. Beale.—Dated 10th November, 1880.—(Not proceeded with.) 2d

This relates to adapting a bicycle to carry either one or two riders. In the first place the saddle is placed in the centre of the back bone, and in the latter case, one saddle is placed nearly over the front axle, and the other nearly over the back axle.

other nearly over the back axle.

4615. Cooling Brewers' Worts, '&c., H. H. W. Jaechel-Handwerck.—Dated 10th November, 1880. 6d. This relates to cooling worts or other liquids by the action of air currents, and by contact with surfaces cooled by the circulation of cold water. For this purpose a tower is built containing several open floors one above the other, on each of which is a shallow cooling tank, into which the wort is introduced. The sides of the tower are enclosed by louvre blades that can be opened to regulate the admission of external air. The tanks are made with double bottoms, through which

cold water circulates. A fan is placed over each tank and causes a rapid circulation of air over the surface of the wort or other liquid.

4616. Gunpowher, E. L. Beckwith and T. B. Lightfoot.

— Dated 10th November, 1880. 6d.

In order to ensure an uniform density of the compressed pieces, the punches instead of being attached rigidly to the table head or bar by which they are forced into the moulds, are made capable of moving as plungers through packing into a hollow formed in the table head or bar, in which any desired pressure of water or other liquid is maintained.

4617. MALT AND DEVING KILD. E. Walker — Dated.

water or other liquid is maintained.
4617. Malt and Drying Kiln, E. Walker.—Dated 10th November, 1880. 6d.

This relates to portable malt kilns to enable small quantities of malt to be made therein, and also to dry grain or other articles. A shell of galvanised iron is fitted with doors, and within it is a tank capable of steeping the requisite quantity of barley. Over the tank is an oblique plate to shield off dust. In the upper part is a perforated floor to dry the barley, and another for the barley to germinate upon after steeping. A movable fire-grate furnishes the heat to warm and also to dry the grain.
4618. ISSUING AND REGISTERING TICKETS OF CHECKS

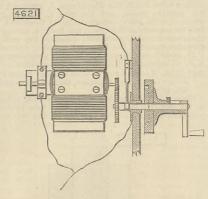
4618. Issuing and Registering Tickets or Checks to Passengers by Omnibuses, &c., J. Hodges.— Dated 10th November, 1880.—(Not proceeded with.)

2d. This consists in causing a ticket to be ejected from a locked box for each passenger, a certain number of such tickets being marked "free," and entitling the passenger to travel without payment, so that they shall have an interest in getting their tickets.

passenger to travel without payment, so that they shall have an interest in getting their tickets.

4621. Improvements in Magneto-electric Signal Apparatus, E. G. Brever.—Dated 10th November, 1880.—(A communication from E. H. Johnson and G. A. Edison.) 6d.

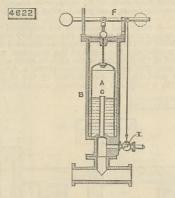
The object of the invention is to enable magneto-electric machines to be cut out of circuit when not in use, and also to enable two distinct signals to be given, as for instance a continuous ring and an intermittent ring. To accomplish the first of these objects a shunt circuit is formed round the magneto machine, a portion of which circuit is a contact spring taking against a contact point. The actuating handle is attached to a sleeve which is loose upon the main driving shaft, but secured thereto by a pin on the shaft. On the inner end of the sleeve is a disc which takes against a rod, whose other end beats against the contract spring, the force of which is used to normally hold the rod pushed against the disc, so that the sleeve is as far out on the shaft as the slot and pin permit, in which condition the spring impinges on the contact point, closing the shunt circuit, thus practi-



cally cutting the generator out of circuit. Upon rotation the sleeve turns loosely on the shaft till the outer end of the slot reaches the pin, when sleeve and shaft turn together; the slot being triangular causes the carrying inward of the sleeve and disc pushing the rod against the contact lever, causing it to leave the contact point, breaking thereby the shunt circuit, and compelling the current from the generator to traverse the main circuit. Upon cessation of use the parts return to their normal position. To effect two distinct signals, a modification of the above apparatus is used.

4622. STEAM REDUCING VALVES, J. Wright.—Dated 10th November, 1880. 4d.

An inverted vessel A is mounted in a chamber B, and its lower end dips in water. Through the bottom of the chamber B and extending up into the vessel A is a pipe C through which the steam enters. The



vessel A is connected by a rod with a weighted lever F, one arm of which is connected to a valve I in the steam-pipe. The weight on lever F can be adjusted to suit the reduced pressure of steam or vacuum

required.
4623. Casks, W. L. Wise.—Dated 10th November,
1880.—(A communication from A. de Muller.)—(Not
proceeded with.) 4d.
So as to strengthen the ends of casks they are fitted
with internal metal rings in addition to the usual
hoops, such rings being of angle iron rolled with a
sharp continuous bead along one side or edge, and
rivetted at their junctions.

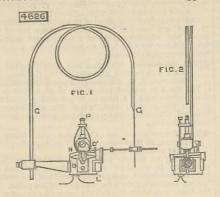
4624. FOUNTAIN OR RESERVOIR PENS, W. R. Lake.— Dated 10th November, 1880.—(A communication from

Dated 10th November, 1880.—(A communication from A. Tust.—(Not proceeded with.) 2d.
A tube is inserted in the penholder, and is filled with ink. In the tube is a suction device to facilitate the filling, and when in use it also acts as a pressure device, so that as soon as the ink does not flow freely a piston forming part thereof is pressed downwards towards the pen. vards the pen

towards the pen.

4626. IMPROVEMENTS IN APPARATUS FOR LIGHTING
AND DISTINGUISHING GAS BY MEANS OF ELECTRICITY,
W. R. Lake.—Dated 10th November, 1880.—(A communication from G. D. Bancroft.) 6d.
Fig. 1 is a front view of a gas burner, and the
apparatus for lighting it, and Fig. 2 is a side elevation
of same. To light the gas the operator sends a current
over the line wire Ll. The electro-magnet contained
in the box D overcoming the force of a spring
working in the U-shaped arms, pulls down the
armature H, and releases the shoulder Cl from a projection. The spring G being at the temperature of
the atmosphere forces inward the segmental arm,
thereby opening the cock at the same time. The
current passing through the platinum wire Pso heats
the same as to ignite the gas; when the operator then
breaks his circuit at his distant station, the projec-

tion flies up against the shoulder C!. After the gas has burned a few minutes the thermo-spring G will become so heated as to exert its force in the opposite



direction, and a single impulse of the electric current then sent over the line will release the shoulder Cl and close the cock.

and close the cock.

4627. METALLIC DOOR KNOBS, &c., A. and R. F.
Heath.—Dated 10th November, 1880.—(Not proceeded with.) 2d.

Two shells of thin sheet brass are formed by dies and pressure, one having nearly the figure of the neck of the knob, and somewhat more than half the body thereof. The other has nearly the figure of the other half of the knob. The widest end of the first part is somewhat larger than the other part, which is inserted therein, and the two parts secured by burnishing or spinning, in which the edge of the principal shell is turned over the edge of the front shell.

4628. Improvements in Step-by-step Type Printing

turned over the edge of the front shell.

4628. Improvements in Step-by-step Type Printing Telegraphs, G. F. H. W Higgins.—Dated 16th November, 1880. 6d.

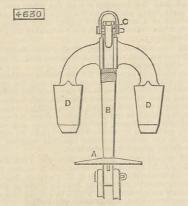
The printing is by this apparatus in parallel lines instead of in a continuous line. A step-by-step escapement rotates the type wheel, to which is geared the type axle, pivotted in and carried by a frame acting as a lever, the short end of which carries the armature of an electro-magnet. An auxiliary electromagnet ensures the sychronism of the sending and receiving instruments.

4630. Anchors. J. Wright.—Dated 11th November.

4630. Anchors, J. Wright .- Dated 11th November,

1880. Anothers, v. W. 1880. 6d.

This relates to improvements on Martin's anchors, and consists in making the stock A of a rectangular bar, tapering on one side from a short parallel part in the centre towards each end, and quite flat on the other side, and it may fit on the shank B either side



towards the head C; the ends are flat and cut level off, and the edges are planed slightly inclining towards the head to enable the stock to take the ground more freely. The total holding surface of the stock is approximately the same as that of the main flukes or palms D, so that the latter have the same resisting surface as the entire stock.

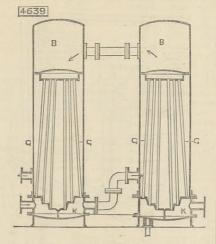
surface as the entire stock.

4633. Gas Moror Engines, H. N. Bickerton.—
Dated 11th November, 1880.—(Not proceeded with.)
2d.
A cylinder is used, one end of which is enlarged, and into this end the explosive mixture is drawn by the back stroke of the piston, the admission of air and gas being regulated by passing through a measuring apparatus. The piston is short, and its stroke is such that it is drawn out into the large diameter of the cylinder, whereby the charge is partially compressed until the piston leaves the small diameter of the cylinder, when the charge rushes past it, and is further compressed by the back stroke, after which it is fired.

4638. Beverages, E. W. Allen.—Dated 11th November, 1880. 2d.
This relates to an improved nitrogenous compound gaseous flavoured beverage, consisting of 1 dram lupuli, 30 minims dilute phosphoric acid, 25 minims dilute tartaric acid and cream of tartar, and 90 minims lime juice syrup to 5 oz. of water.

oa.

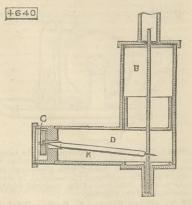
In any suitable position near the steam boiler are fitted two purifying apparatuses or heaters B, to the foundation plates of which are fixed tubes G extending upwards to nearly two-thirds the length of the casing,



the tops being secured to plates or chambers fitted with a cover. The bottom of each tube frame and each heater is made with a chamber K. The feedwater enters the casing of the heaters, and steam is passed through the pipes G, the condensed water passing back to the boilers.

4640. REGULATING AND MEASURING THE FLOW OF LIQUIDS, H. J. Haddan.—Dated 11th November, 1880.—(A communication from F. de P. I. y Fargas, P. G. y Coverer, and J. B. y Veciuna.) 4d.
This consists of a pump barrel B connected to tube

D, to which is fitted a compressor, consisting of a partition, which at its lower part gives access to a tube by which water is admitted. At the bottom of the tube are two orifices in the partition communicating with the inner receptacle of the compressor. Through a slit on the face of the partition passes the end of the



lever K, which supports a disc C, such disc serving to open or shut off communication between the compressor and tube D.

4643. Explosive Compounds, C. D. Abel.—Dated 11th November, 1880.—(A communication from E. Sanlaville and R. Laligant.) 4d.

This consists mainly in the combination of chlorates with cellulose or other analogous elastic or porous bodies.

4644. Mounting "Change Wheels" in Machinery,
W. Emmett.—Dated 11th November, 1880.—(Not
proceeded with.) 2d.
An enlarged part is formed on the shaft to receive
the change wheel, and is either square or hexagonal,
the eye of the wheel being similarly formed. The
change wheels are secured either by a set screw or a
nut screwed on the shaft.

4645. Harvesting Machines, W. G. Manwaring.— —Dated 11th November, 1880.—(Not proceeded with.)

The sheaves are tied with a knotted cord, and the The sheaves are tied with a knotted cord, and the string is held by a nipping apparatus at one end and a reel at the other, while the grain is forced against it by the progress of the apron, thus forming a bow. A needle then descends, carrying a sufficient quantity of string off the reel, and brings the string to the nipping apparatus, when both ends are laid hold of by a knotter, and the knot formed, the string being then severed by a cutter.

4648. Temples for Looms, R. Blackwood.—Dated 11th November, 1880.—(Not proceeded vith.) 2d.
This relates to temples for looms whereby the cloth is transversely stretched. Each temple consists of a number of small barrels provided with a cover shaped to hold the cloth down over each barrel, which is provided with rings having projecting points to seize the cloth, and are in a plane oblique to the axis of the plane of the axial line of the rollers, and are rotated as the drag on the cloth causes it to travel.

4651. Soap, &c., W. S. Somers.—Dated 11th November, 1880.—(Not proceeded with.) 2d.
A granulated soap is prepared from a petroleum or other crude oil base, and is compressed by means of moulding boxes and dies into bars or cakes with regular ridges and hollows running across their sides, so that when packed or ranged in stacks, the ridges bearing against each other form spaces for the free circulation of air, whereby the soap dries quickly.

4653. Velocifedes, T. Pritchard, jun.—Dated 11th

circulation of air, whereby the soap dries quickly.

4653. VELOCIPEDES, T. Pritchard, jun.—Dated 11th November, 1880. 6d.

This relates to velocipedes in which the driving wheels are allowed independent motion in turning, and consists in attaching to one side of the hub of the wheel an internal toothed wheel, the whole running loose on the shaft, on which is mounted concentrically with the internal wheel a toothed wheel gearing with a pinion, which also gears with the internal wheel. Differential chain gearing is used to obtain different speeds, each arrangement of gearing being put in and out of action by a clutch operated by a lever.

4654. Cutting Cloth, &c., F. W. Mondriaan.—Dated 11th November, 1880.—(Not proceeded with.)

24...
This consists of a pair of circular bevel edged shears mounted in adjustable bearings, in combination with a work table, upon which the work to be cut out is supported and presented to the action of the shears.

4655. Paints, J. Chapman and G. B. Bates.—Dated 11th November, 1880.—(Not proceeded vith.) 2d. This relates to the utilisation of dust and chippings of stone, and consists in reducing them to a fine powder, and boiling with water until reduced to a paste to which linseed oil is added, and the mixture thinned down by turps.

4657. Expanding Dress Stand, E. Eavestaff.—Dated 12th November, 1880. 2d.

The stand can be adapted to the shape of any human figure, and consists of an ordinary dress stand encased with an air-tight material, which can be inflated until it assumes the required size.

14 assumes the required size.

4659. Papering and Unpapering Woollen Fabrics, &c., T. Stead.—Dated 12th November, 1880.—(Not proceeded with.) 2d.

Three tables are used, the centre one for supporting the fabric during the "papering" and "unpapering" or "throwing out" processes, and the side tables for holding supplies of press paper, all three tables being mounted within a framework, so as to be capable of being raised or lowered by the attendants.

being raised or lowered by the attendants.

4660. Syphonic Apparatus for Closer Flushing, &c., H. E. Cooper.—Dated 12th November, 1880.—(Not proceeded with.) 2d.

This relates to apparatus to be fitted to closet cisterns, whereby a syphonic action for flushing purposes can be established by a pull down or a pull up of the ordinary chain or lever, or automatically on the water reaching a fixed level in a cistern.

4664. Gravelling and Hogging, E. J. Chaston.— Dated 12th November, 1880.—(Not proceeded with.)

Dated 12th November, 1880.—(Not proceeded with.) 2d.

To gravel roads or other surfaces an axle running on two road wheels carries gear wheels to drive circular brushes, above which is a hopper to receive the gravel, and which as it falls from the hopper is spread evenly by the brushes.

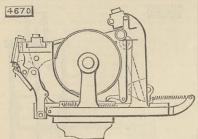
4667. Capsules for Bottles, &c., L. Gros.—Dated 12th November, 1880. (Not proceeded with.) 2d. A tubular piece surrounds the neck of the bottle, and into it fits a cap or head, the two parts preferably having slits so as to fit closely together, and being formed from blanks of paper, the cap is secured in the tubular piece by adhesive material.

4871. Cutting, Trimming, and Finishing Edges and Borders of Garden Beds, Lawns, &c., W. Clark.—Dated 13th November, 1880. 6d.

At the end of a handle is fixed an arrangement of cutter-plates, so constructed as to form between them horizontal and vertical or diagonal knives: the horizontal knife also forming a base-plate, and the vertical knife a cutter plate, the edge of which is curved. When forced along the knives take hold of the turf and grass and evenly and cleanly cut the edge of the garden bed.

4670. Sewing Machinery for Boots and Shoes, W. H. Dorman.—Dated 12th November, 1880. 6d. This relates to machines in which a curved needle is used, and which works with a single thread, and it

consists in providing mechanism to vary the length of the loop of thread drawn up by the needle in proportion to the thickness of the material being sewn. This is effected by providing means whereby the fulerum of the lever that gives motion to the needle may have a limited movement, so as to absorb a certain part of the motion that would otherwise be



imparted to the needle, this movement of the fulcrum being regulated by connecting the mechanism that determines the extent thereof, with a pressure piece in contact with the surface of the material, in such a manner that the thickness of the material regulates the movement of the fulcrum.

4674. Telegraph Cables, R. Kendal.—Dated 13th November, 1880.—(Not proceeded with.) 2d.

In order to preserve cables from boring marine animals they are surrounded by a zinc sheathing, which, when immersed in the sea, rapidly becomes coated with a dense deposit that is very difficult to pieces.

4676. PEN KNIVES AND POCKET KNIVES, H. J. Haddan.—Dated 13th November, 1880.—(A commu-nication from E. Prinat.)—(Not proceeded with.)

2d.

A hollow metallic cylinder is fastened on its sides and rounded at the ends, the part holding the blades being fixed to a solid frame, while one of the flat sides is pivotted at one end so as to form a cover, which can be opened to seize any of the blades.

be opened to seize any of the blades.

4677. TREATING AND UTILISING DATE FRUIT AND SEED FOR BEVERAGES, T. F. Henley.—Dated 13th Aovember, 1880. 2d.

The date fruit is subjected to a regulated amount of torrefaction in a close retort so as to convert the parenchyma or substance of the fruit into a high-diavoured bitter material. The vapours from the retort are condensed and form a bye-product in the form of a valuable essential oil, and also an acid liquor which can be used in place of vinegar. The dried dates are removed to a revolving drum or scrubbing machine with a wire gauze surface, through which the pulverised parenchyma of the fruit passes, leaving the seeds behind. The seeds are then roasted and ground, and mixed with the powdered fruit pulp.

4679. BREECH-LOADING FIRE-ARMS, C. Kesseler.—Dated

4679. Breech-loading Fire-Arms, C. Kesseler.—Dated 18th November, 1880.—(A communication from 0. Hecht.)—(Not proceeded with.) 4d.

This consists, First, of a middle piece with an interior cartridge extractor, a trigger plate, and triggers; Secondly, of the barrels and exterior cartridge extractor, hook, eye, and wedge or cotter; Thirdly, of the breech block or closing piece, with the firing pins, springs, and lock; and, Fourthly, of the stock and its locks.

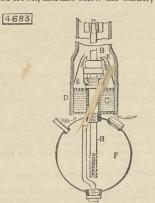
4681. APPLYING PRESERVATIVE COATINGS TO IRON AND STEEL PIPES, SHEETS, &c., N. Smith.—Dated 13th November, 1880.—(Not proceeded with.) 2d.

The pipe to be coated is first dipped in lime water or thin milk of lime before applying the bituminous or similar coating.

4683. Gas Lamps, C. W. Siemens.—Dated 13th November 1880. 6d.

ber, 1880. 6d.

This relates to heating the air supporting combustion by means of the products of combustion. In the centre of the burner is fixed a cylindrical stem B made of copper coated with platinum or other refractory substance, so as to act as a reflector. This stem extends above the burner, and has fixed on its upper end a starshaped crown, and also below the burner, where it is



bored out to form a passage for gas. Between a collar on the lower part of the stem and a nut are clamped a number of perforated copper discs C kept a certain distance apart and contained within a case D. Above the discs is fixed a deflecting cone E. The air passes up through the discs, and becoming heated is deflected on to the burner. The vessel F may contain a suitable hydrocarbon, through which the gas passes and is enriched.

4685. Manufacture of Paper for Producing Writing and Other Marks Thereon, A. Ford.—

Dated 13th November, 1880. 4d.

This consists in imparting to paper, by combining therewith suitable chemical agents, the property of producing or developing dark lines when and where there is passed over the surface of such paper a pen or instrument moistened with water, or other liquid not being a strong acid or alkali.

4682T. Fanny Elastic Varn. C. Crosser.—Intel 18th

being a strong acid or alkali.

4687. Fancy Elastic Yarn, C. Crosier.—Dated 13th November, 1880.—(Not proceeded with.) 2d.

This consists in twisting together threads of various kinds and colours, together with strands of indiarubber, the latter being at the time the threads are being twisted together stretched to their greatest length, so that when released the indiarubber contracts, and carries with it the threads, which are thus drawn into a series of small loops clustered round the central elastic strands, producing an effect resembling chenille.

chenille.

4688. CIGAR CLIPPER, F. H. F. Engel.—Dated 13th November, 1880.—(A communication from J. W. Wohlers.) 4d.

The clipper produces a wedge-like cut in the end of a cigar, and it consists of a stem with a metal chamber at one end to receive the end of the cigar, the lower end of the chamber having an opening in its wall at opposite sides, where the chamber is enlarged. A knife of angular shape corresponding to the sectional opening through the wall is hinged to the lower end of the stem, and is kept up by a spring. To clip the cigar the knife is depressed.

4689. Windlasses, J. Waters.—Dated 13th November,

cigar the knile is depressed.

4689. WINDLASSES, J. Waters.—Dated 13th November, 1880.—(Not proceeded with.) 2d.

In order to prevent the surging or fleeting of the cable when hauling in or paying out, the windlass barrel, instead of being entirely carried between the bits, a portion of it is placed outside of them, the supporting bit at each end being arranged between the

inner portion of the barrel which receives the chain from the hawse pipe, and the outer portion from which the chain is led to the locker.

which the chain is led to the locker.

4690. Poles for Lawn Tennis, H. Y. Dickinson.—
Dated 13th November, 1880.—(Complete.) 4d.

This relates to the method of tightening or loosening
the net, and consists in inserting in the top of the
pole a pin, which revolves in a socket, and carries a
hinged lever by which it is revolved, the net rope
being secured to the pin.

4692. STANDS OR HOLDERS FOR MATCH-BOXES, P.
Jensen.—Dated 13th November, 1880.—(A communication from E. A. Nilson.—(Not proceeded with.) 2d.
The stand is pressed out of tin plate, and is to be
hung on the wall. A tongue is cut and pressed out
of the lower part, and, when the match-box is
inserted, serves to push up the inner match containing
part of the box. part of the box.

part of the box.

4694. Registering or Checking the Issue of Tickers, E. Braubach.—Dated 13th November, 1880.
—(Not proceeded with.) 2d.

A string of tickets perforated at their points of severance is attached to two tapes, fastened at one end to a barrel, and passing round toothed wheels, having their other ends secured to a slitted piece. As the tapes pass along the tickets come in contact with a plate and are severed and ejected through a slot in the casing. casing.

the casing.

4695. Thermometer, H. H. Lake.—Dated 13th November, 1880.—(A communication from R. and H. Mathieu, fils, and J. A. Tremeschini.) 6d.

The thermometer is based on the well-known principle of the difference in the coefficient of expansion of metals, and is more particularly adapted for medical, surgical, and veterinary purposes.

4698. Grinding, Crushing, and Pullverising, E. J. Slackleton and G. J. Kemp.—Dated 15th November, 1880.—(Not proceeded with.) 2d.

This consists of a large pan with a smaller pan in the centre. In the larger pan are rollers caused to revolve on their axes by the motion of the pan, which is driven by suitable mechanism. In the smaller pan is also a roller, and in this pan chalk is placed, and as it is crushed is forced out into the larger pan, where it mixes with the clay mixes with the clay.

4700. PIANOFORTES, J. Kew.—Dated 15th November, 1880.—(Not proceeded with.) 2d.

This relates to pianos with a "vertical iron front" or frame, and consists in supporting the upper and lower parts against the strain of the strings by a stretcher bar, between which and the frame the belly is placed, the stretcher bar being screwed to the usual bracing and provided with projecting abutments, which pass through the belly and engage with squared parts of the frame, without projecting beyond it.

4702. Buttons or Fastenings for Gloves, &c., F.
H. F. Engel.—Dated 15th November, 1880.—(A communication from E. Loeventhal.) 4d.
A projecting pin on one part of the fastening is
pushed into the enlarged eye of the other part the
two parts being secured on the glove or other article
by means of a ring formed round their edges, and
which, when passed through the material of the glove,
is turned down.

is turned down.

4705. Combing Machines, E. de Pass.—Dated 15th November, 1880.—(A communication from J. Imbs.)—(Not proceeded with.) 2d.

This relates to apparatus for the double combing of fibrous material, and consists in causing the superposition or consolidation in the first combing machine to take place at very short intervals, and instead of obtaining a very thin carded sheet, which by passing through a funnel is converted into a sliver, a fleece of any desired thickness, perfectly regular, and which can be rolled for its whole width, so as to be carried direct to the second combing machine without any intervening operation, is obtained.

4720. Generating Heat by Burning Petroleum.

4720. GENERATING HEAT BY BURNING PETROLEUM, &c., J. M. Forbes, jun.—Dated 16th November, 1880.
—(A communication from B. N. Huestis.) 2d.
This consists in generating heat by burning petroleum over or in connection with a bed of calcium or of common lump lime.

common lump lime.

4763. Velocifedes, &c., C. G. Hawkins.—Dated 18th November, 1880. 6d.

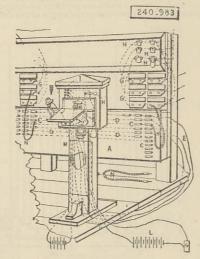
The two small wheels of a tricycle are placed on a rigid axle to the middle of which is jointed the backbone, and by guides or by adjusting the direction of the axis of the pivot the axle is made to swivel either in a plane parallel to the forward axle, or to incline to the forward axle, when the frame and fore part of the machine is leaned over to one side. The invention further relates to combined foot rests and brakes, to arm rests, and also to the driving gear.

SELECTED AMERICAN PATENTS.

From the United States Patent Office Official Gazette.

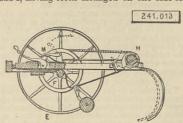
240,983. TELEPHONE CENTRAL OFFICE APPARATUS, T. Gardner Ellsworth, New York, N.Y.—Filed April 28th, 1880.

Brief.—The switching apparatus consists of a number of horizontal rows of metallic plates, all the plates in each row being connected by a wire at the back of the switch board, and each row being connected with an operating stand having the necessary apparatus for signalling and receiving orders. The subscribers lines pass to ground through annunciators, and may be connected by flexible conductors and plugs to the above-mentioned plates, connection being made by plugging to the same horizontal row. Claim.—(1) In a telephone central office system, the combination,



with the isolated stand M and the telephonic instruments, switches I, and call key H¹, placed thereon, of the annunciators H and switches G, connected as shown, the switch board A, having plates C, connected by wires D and provided with holes or sockets, the flexible switch cord N, having terminal plugs, and the wires E, which connect said switch board and the stand switches I, all as shown and described. (2) In a telephone system and apparatus, the hollow telephone stand M, constructed substantially as herein shown and described,

241.013. Sulky Revolving Rake, Henry Hitchcock, Lyons, Mich.—Filed January 3rd, 1881.
Claim.—The combination, with the traction wheels E, having the belt pulleys F secured thereto, and rake head I, having teeth arranged on one side only

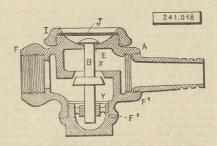


of said head, and carrying the belt pulleys H, of the bolts G, sliding boxes J, rock shaft L, having end cranks, lever M, spring, and connecting rods, sub-stantially as described.

stantially as described.

241,018. Self-closing Faucet, John C. G. Hupfell, New York, N. Y.—Filed February 26th, 1881.

Claim.—(1) The casing or body of a faucet provided with the recessed top wall, and the flexible imperforate diaphragm arranged over the same and adapted to be depressed by the thumb or finger, in combination with the loose sliding valve rod extending through the top wall of the casing and terminating below the diaphragm, substantially as and for the purpose described. (2) A faucet casing A, constructed with the inlet and outlet chambers, and having the exterior of its top wall provided with the concave recess, and the opening E, in combination with the

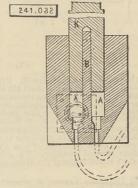


sliding valve rod B, the diaphragm J, arranged over the concave recess, and the ring I, retaining the diaphragm in place, substantially as described. (3) In a faucet such as described, the body A, having the chambers X and I, perforated concaved top wall, the threaded shoulder, the threaded coupling extensions F Fl, and F², and the exterior laterally projecting arms K K, all substantially as shown and described.

241,032. Machine for Making Curved Lead Pipe, Robert Layng, San Francisco, Cal.—Filed September

4th, 1880.

Claim.—In combination with the reservoir cylinder A, the partition B, dividing the same into two compartments, the straddling plunger K, and the escape

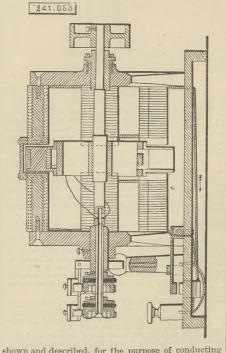


es leading from each compartment, opened and by suitable valves, as and for the purpose described.

241,053. DYNAMO-ELECTRIC MACHINE, Muller, New York, N.Y., assignor to himself and Alexander Levett, same place.—Filed November 9th,

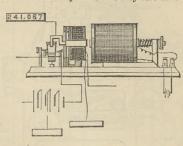
1880.

Brief.—A relay and resistance are combined with the secondary circuit to direct the secondary current through the field magnets in the same direction as the primary current. The arms of the armature wheel are broad in the direction of the axis, to serve as fans for cooling the bobbins. Claim.—(1) In a dynamo-electric machine, the combination of the negative wire with a relay and a resistance, substantially as



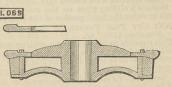
shown and described, for the purpose of conducting the secondary current through the field magnets in the same direction as the main current, and to regulate the permanent charge of the machine. (2) In a dynamo-electric machine, the rotating armature wheel, having open sides and a series of broad spokes arranged radially and severally parallel to its axis, and the broad periphery, having openings between each two spokes and between each two coils, all as shown and described, to operate as and for the purpose specified.

241,067. TELEGRAPHIC RELAY AND REPEATER, Charles A. Randall, New York, N.Y., assignor to Philip G. Randall, same place.—Filed March 11th, 1881.
Claim.—The combination with a confined elastic armature arranged for operation by an electro-magnet, of a metallic contact point carried by said armature,



and two other contact points either or both electrical, arranged to be operated by the action of the armature, and arranged to yield together, but to preserve a fixed distance from each other, substantially as described.

241,069. Car Wheel, James Rigby, Montreal, Quebec Canada.—Filed October 27th, 1880.
Claim.—(1) In combination with the body portion having the inner plate extending outward to hold the tire, the removable tire portion and flange portion, as



described. (2) The body portion having the inner and outer plates, the radial arms and the short arms, as described. (3) In combination with the body portion and tire having recesses, as described, the flange portion having the studs, as described.

CONTENTS.

THE ENGINEER, June 17th, 1881.

THE company which is to undertake the construction of the Newfoundland Railway is to receive 5000 acres of land for each mile of railway, or 1,700,000 acres for 340 miles of railway. This, the *Colonies and India* says, equals one-sixteenth of the entire area of the Colony.

SOUTH KENSINGTON MUSEUM. - WHITSUN SOUTH KENSINGTON MUSEUM. — WHITSUN WEEK.—Visitors during the week ending June 11th, 1881:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 29,633; mercantile marine, building materials, and other collections, 21,106. On Wednesday, Thursday, and Friday, free, from 10 a.m. till 6 p.m., Museum, 5676; mercantile marine, building materials, and other collections, 5334. Total, 61,749. Average of corresponding week in former years, 47,089. Total from the opening of the Museum, 20,062,722.

STRENGTH OF THE FRENCH ARMY.—The French STRENGTH OF THE FRENCH ARMY.—The French Minister of War has presented to the Chambers a report on the selections for military service since the passing of the new law of general compulsory service in 1872. It appears that at the end of 1879 there were—Legally liable to military service, 316,662; found to be unfit for service, 34,857; declared fit for service, 281,805; enrolled in the active army, 152,502; a total of 1,154,796. It appears, therefore, that since 1872 154,796 men have passed through the ranks of 1,154,796 men have passed through the ranks of the active army in France. But these men are of two categories. The "first portion," two-thirds of the whole, amounting to 769,864, have served with the colours an average time of about four years. The remaining third, or "second served with the colours an average time of about four years. The remaining third, or "second portion," amounting to 384,932 men, have served for about ten months only. Account would also have to be taken of the "one year volunteers," and of those who were originally declared to be (temporarily) unfit for service, and being subsequently pronounced fit were enrolled in either category of the active army. But the corresponding figures are not given. It would be interesting, says the Times, to know how many of the 1,100,000 category of the active army. But the corresponding figures are not given. It would be interesting, says the *Times*, to know how many of the 1,100,000 trained men are now alive and actually available for service if called upon.