

RAILWAY MATTERS.

THE Taff Vale Railway general meeting will take place next week. The project for carrying a branch from South to East Dock will soon be in hand.

A NEW map of metropolitan railways, tramways, and miscellaneous improvements deposited at the Private Bill office, November 30th, 1885, for Session 1886, has just been published by Mr. E. Stanford, Charing-cross.

ON Tuesday night about 150 yards of railway between Shincliffe and Sunderland were washed away by a burn which overflowed and forced its way through the embankment, making several gaps. Fortunately the signalman observed the water break through, and signalled what had happened, thus preventing the train being sent through.

THE last number of the *Scientific American* gives a telling illustration of a locomotive and a long car of a train down an embankment, where it had been thrown by coming into contact with the station platform, which had been lifted from its place and deposited on the permanent way by the wind. This may be properly called an accident.

MESSRS. SHARP, STEWART, AND CO. are at present executing an order for forty bogie side tank engines for the Lancashire and Yorkshire Railway, commencing No. 906; about half are delivered. They are of the same type as those built by Kitson, Dillo, and Neilsons, 1878-9, viz., four-coupled leading wheels 5ft. 8in. in diameter, and a four-wheeled trailing bogie, wheels 3ft. diameter, inside cylinders and inside frames.

UNLESS the Tipton Local Board should be, our Birmingham correspondent writes, a little more reasonable and a little less peremptory, the South Staffordshire Tramway Company will have to abandon a line which it is constructing in that locality. Owing to particular circumstances the company has failed to fulfil a part of its agreement, and it needs a little concession of time on the part of the board to enable the undertaking to be satisfactorily completed. The board, however, threaten not to extend the time.

A ST. PETERSBURG telegram says:—A letter from Merv states that the Transcaspian Railway is being laid down with unexampled rapidity. The locomotive already runs twenty-five versts beyond Askabad, and the first train is expected at Merv in the early part of next April. Great activity in building and accomplishing general improvements is perceptible at Merv, six new streets after the European fashion being already completed. At the fortress of Koshut Khan Kali another Russian town is being formed, beginning with some large buildings to be used as railway offices.

OUR Birmingham correspondent writes:—"For the present, at least, there seems no likelihood that the construction of new steam tramway lines in Birmingham will be sanctioned. An opinion has obtained some hold in Birmingham that steam cars are not only a nuisance, but that they are dangerous and ugly. The Public Works Committee, apparently influenced by the memorials which they have received on the subject, have now decided to refuse to authorise the construction of new lines until experience has demonstrated the superiority or otherwise of the cable system over steam. If the cable should prove impracticable, a return will possibly be made to horse power."

At the meeting of the Leicester Tramways Company, to be held at Leicester, on Thursday next, the directors will recommend the declaration of a dividend at the rate of £10 per cent. per annum, free from income-tax, for the past half-year, payable on the 4th day of February next, which will absorb £3500, and leave a balance of £492 3s. 5d. to be carried forward to the next account, but they propose to make a call of £1 per share upon the new £4 paid up shares, payable on the 31st day of March next. The capital account is increased by the sum of £3731 12s. 2d. expended in the purchase of sixty-two additional horses, eight tramcars, five omnibuses, and five wagonettes.

THE accidents on American railways last November are classed as to their nature and causes as follows by the *Railroad Gazette*:—Collisions: Rear, 25; butting, 8; crossing, 2. Derailments: Broken rail, 5; broken switch-rod, 1; broken bridge, 2; spreading of rails, 5; broken wheel, 5; broken axle, 4; broken truck, 4; broken brake beam, 2; accidental obstruction, 5; cattle on track, 3; wash-out, 4; land slide, 1; misplaced switch, 4; open draw, 2; rail removed for repairs, 1; malicious obstruction, 1; purposely misplaced switch, 2; unexplained, 6. Other accidents: Broken parallel-rod, 2; broken wheel not causing derailment, 1; cars burned while running, 1. Total number of accidents, 96.

ON American railways last November six collisions were caused by misplaced switches, four by trains breaking in two, two by cars blown out of sidings upon the main track, and one by a mistake in orders. One of the broken bridges failed because of the washing out of an abutment by a freshet. A general classification of these accidents is made as follows:—

	Collisions.	Derailments.	Other.	Total.
Defects of road	.. .. .	13	.. .. .	13
Defects of equipment	.. .. .	15	.. .. .	32
Negligence in operating	.. .. .	29	.. .. .	86
Unforeseen obstructions	.. .. .	2	.. .. .	16
Maliciously caused	.. .. .	1	.. .. .	3
Unexplained	.. .. .	6	.. .. .	6
Total	.. .. .	35	.. .. .	96

Negligence in operating is thus charged with 37 per cent. of all the accidents, defects of road with 13½, and defects of equipment with 23 per cent.

A WORK of considerable engineering importance, involving the diversion of the Spey, was completed on Tuesday, in connection with a new line along the coast of Banff and Elgin. The Great Northern Railway Company of Scotland found it necessary to construct a bridge across the river about two miles from the mouth. The contractors had to construct the bridge at a point which rendered it necessary to divert the course of the river. It was done by opening a new bed to the left of the old one. Into this bed the water burst on Saturday rather unexpectedly. A great body of water still flowed in the old course, and to prevent this it was decided to form a huge dyke. Bags filled with sand were piled high up across the bed, but these were swept away, as the river narrowed, and the water cut a course 10ft. where previously it had only been 4ft. deep. The sand bags were then chained together in twenties and dropped into the water. After continuous labour for a week, the work was completed on Tuesday, and the whole body of water now flows under the new bridge.

A COMPANY was incorporated at Albany on the 28th ult. to be known as the New York District Railway Company. The company proposes to build an underground railroad from the Battery up Broadway to Central Park, New York City. There will also be various sub-divisions, making in all about thirteen miles of railway. The new company proposes to construct two express tracks, forming a through standard gauge, rapid transit road and two-way tracks for the more frequent stations. Continuous galleries will be constructed for the existing water, gas, pneumatic and steam tubes; also tubes for the electric light and telegraph wires, now above ground. A great deal of attention has been paid to the matter of construction of the tunnels. The street will be excavated to the line of the vaults and a continuous line of cement made for the railway sleepers. Two tunnels and five galleries will be constructed, the walls being made of the new patent material fer-flax, which is made of a netting of iron filled in with non-resonant fibrous material. The cars will be of the same material with a deflecting rail provided along the upper part of the tunnel in such a way that the car can slide along in case of accident without injury to passengers. The drawings published exhibit some want of knowledge as to the requirements of the tunnel side walls.

NOTES AND MEMORANDA.

IN London, during the week ending the 16th inst., 2695 births and 1902 deaths were registered.

GOLD-BEARING quartz has been discovered in the commune of Miousze (Puy-de-Dome) and the mining district of Pontgibaud.

ALLOYS of cobalt and copper have many useful applications. The alloy with 5 per cent. of cobalt is particularly useful. It is as inoxidisable and malleable as copper, as tenacious and ductile as iron, and is suitable for rivets and fire-boxes.

IN London, last week, 2667 births and 1738 deaths were registered. The annual death-rate per 1000 from all causes, which had been 22.4 and 23.9 in the two preceding weeks, declined last week to 21.9. In Greater London 3499 births and 2169 deaths were registered, corresponding to annual rates of 34.4 and 21.3 per 1000 of the population.

THE deaths registered during the week ending January 16th in twenty-eight great towns of England and Wales corresponded to an annual rate of 23.8 per 1000 of their aggregate population, which is estimated at 9,093,817 persons in the middle of this year. The six healthiest places were Hull, Sunderland, Sheffield, Birkenhead, Oldham, and Leicester.

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UPPER BURMAH receives, or used to receive, most of its copper from China and Yunnan. Copper ores are found in Momein and the Shan States, and are, to some extent, smelted; but further information regarding their abundance is wanted. The export trade of copper from Rangoon consists merely of worn-out copper vessels originally brought from China.

THE eight needle and pin manufactories of Iserlohn, Germany, alone consumed in 1882 no less than 600 tons of wire, employing also a working force of some 800 male and 700 female and juvenile operators, besides seven steam engines and four water wheels of 230-horse power. The consumption is now much more. The industry is a very important one, and is growing in Germany.

MOST of the gold used in Burmah is imported from China. The local production is derived from washings in the Upper Irrawaddy, the Hukung, the Kyendwen, and their respective tributaries. The amount so obtained appears to be not very considerable. Platinum occurs with the gold in several of these localities, and is said to be well-known to the Burmese, who call it by a name signifying white gold.

DURING the present rainy season in Jamaica, which has succeeded a period of serious drought, there was recorded at the Government Cinchona Plantations, on December 21st last, a fall of 11.80in. in twenty-four hours, while the gauge, the readings of which are taken at 7 a.m. daily, was full and overflowing. On the crest of the Blue Mountain range, on the same plantations, the record was 31.50in. for one week, of which period three days were fine.

TAKING the greatest depth of the ocean as five miles and the height of the highest mountain as five miles above the level of the sea, and remembering the globe itself has a diameter of 8000 miles, the comparative insignificance of all the surface inequalities of the earth is at once forced on our attention, but it is better seen if we take a circle 66ft. in diameter having on its surface a depression of 1in., or a globe 1ft. in diameter with a groove on its surface one-sixtieth of an inch in depth, which would represent on a true scale the greatest inequality of mountain height and ocean deep on the surface of the earth.

IRON ores from rocks of the tertiary age have long been worked in Burmah, the principal locality being at Puppa, lat. 20 56, long. 95 45. There, it would seem, the small furnaces are built in an exposed position, the blast being naturally supplied by the wind. There are various localities in the Shan States where iron is made. In China and the regions bordering Upper Burmah it is not uncommon to see iron employed for suspension bridges. Some attempts were made by the King of Burmah, about the year 1873, to introduce the manufacture of iron on the English principle, probably with no great success.

COAL is known to exist, and is even worked to some extent, at Thungadaw, on the Irrawaddy, seventy miles above Mandalay; at Shuaygu, below Bhamo; at Membaloung, in the Shan States east of Mandalay; in the Yaw district, south-west of Mandalay, &c. It is found also at Pagan and Shimpagah. So far as is known, the coal of these several localities is of tertiary or cretaceous ages. It is of a somewhat light and resinous character; but where not too impure constitutes a valuable fuel. A report as to the superior quality of the Membaloung coal requires confirmation, but it is quite probable that the navigation of the Irrawaddy may in time be wholly carried on by means of this coal.

THE litigation which has been pending for the last six years between Jacob Reese and other claimants in regard to the priority of the basic steel process patents, is, the *Cleveland Iron Trade Review* says, "now rapidly drawing to a close. There have been about fifteen decisions, all in favour of Mr. Reese, and now, after a tedious and expensive trial of years, the Commissioner of Patents has decided that in the case 'Reese v. Thomas—Basic Furnace Linings,' the question of priority of invention is in favour of Jacob Reese, the decision being dated December 16th, 1885. This gives Mr. Reese entire control of the basic process in this country for the next seventeen years, and annuls the Thomas patent, which he sold to the Bessemer Steel Company."

PROFESSOR CORFIELD, the medical officer of health of St. George's, Hanover-square, has presented to the governing body of the district—which includes Belgravia, Mayfair, and the central parish of St. George's—an interesting account of matters relating to health in that part of London. In the completed twelve months under notice, while the death rate of London as a whole stood at 20.3, and of twenty-eight large towns in England at 21.6 per 1000 of population, the rate of all St. George's stood at the low figure of 16.30. The low death rate of St. George's is not only in strong contrast with the rates in other parts of London, but also with some of the large English, Scotch, and Irish towns. Preston, in Lancashire, has the largest death rate of the English towns, standing at 27.3 per 1000 of the population, and is closely run by Manchester, with 26.4, which is again closely run by Liverpool, with 25.2. Glasgow had a death rate in 1884 of 26.9, and Dublin 27.5. There were only five towns in England which had a lower death rate than St. George's.

THE Minot's Ledge lighthouse near Boston, U.S., harbour, is a solid granite structure 200ft. high, and in a recent gale was severely tried. The keeper of the lighthouse says:—"The gale increased constantly, and on Wednesday night we could not sleep on account of the noise. Everything placed against the walls rattled and the thunder of the sea was terrific. Thursday morning, I was in the watch-room, just below the lantern, when a sea struck, breaking heavily against the solid granite wall, and dashed its spray and foam 40ft. to 50ft. above the pinnacle. The spray from nearly every wave broke over the tower, but none seemed to have a force equal to this. We thought it the heaviest gale at that time the lighthouse had ever experienced, but still the winds went on increasing and the shocks were of greater power. At 2.30 o'clock, and just about high tide, another tremendous wave struck it, still heavier than the one in the night, starting the paint from between the cracks in the ceiling of the watch-room and moving about in all directions. This was the last great effort to beat down the structure, and soon after the gale began to abate."

MISCELLANEA.

A DUPLICATE cable between Victoria and Tasmania has been completed.

THE latest advertising dodge in America is an electric window tapper for attracting attention to shop windows.

AN international exhibition, similar to that held at Antwerp last year, is planned by the city of Geneva for 1887.

THE *Colonies and India* says the Timaru Harbour Board has decided to place a loan of £100,000 on the London market.

IN the article on "A Batch of Catalogues," published in our last impression, the address of Mr. W. Günther should have been Oldham instead of Nottingham.

AT a council meeting of the Bath and West of England Society, held at Bristol, on Tuesday, a report was read from the steward of the works (Mr. R. Neville), stating that the showyard arrangements for the Bristol meeting were progressing satisfactorily, and that the necessary contracts had been entered into.

REDUCTIONS in the wages of the men at the Spittlegate Iron-works, Grantham, of Messrs. Hornsby and Sons, have, it is said, during the past few years been repeatedly made, and another attempt to reduce piecework wages 10 per cent. has resulted in a strike of the whole of the men, numbering over a thousand.

THE first number of a new well-printed journal, entitled the *Irish Textile Journal*, has been published by Mr. F. W. Smith in Belfast. A diagram showing average prices of Irish flax and minimum prices of 100s. line weft and 25s. tow weft yarn from 1852 to 1885, with average Bank Rate each year is a feature in the present number.

THE programme for the session January to June, 1886, of the Junior Engineering Society has been issued. This is the fourth session of a society which does much to increase the knowledge of the members, by papers, discussions, and visits to works. The President is Professor A. B. Kennedy; the hon. secretary is Mr. W. T. Dunn, 64, Reedworth-street, Kennington-road.

PUBLISHED as a supplement to the *Journal of the Society of Arts* of last week is a plate giving a facsimile of the certificate of award of a gold medal for articles exhibited at the recent Inventions Exhibition. About 80 per cent. of the whole of the design represents music and art, mechanics and engineering, which comprised about 80 per cent. of the Exhibition, being represented by a man with a sledge hammer about to begin work with a naked foot on an anvil which is about one-third the proper height.

M. DE LESSEPS, and a party including engineering experts from different continental towns, left Southampton on Thursday in the Royal Mail Company's steamship *Medway* for Colon. The object of the trip is to complete all the arrangements connected with the opening up of the Isthmus of Panama by the canal now in course of construction, and to enable the representatives of the various nationalities to inspect the present state and progress of the works. All the published names of the party are, however, of Frenchmen.

A SECOND course of eight free lectures to artisans and others connected with the building trade is announced to be given on Wednesday evening at eight o'clock at the Carpenters' Hall, London Wall, on "Matters connected with Building." The first of the course will be given on February 17th, by T. Blashill, Esq., F.R.I.B.A., when the subject will be "Timber, its Growth, Seasoning, and Preparation for Use." Tickets admitting to the course and naming the subjects may be obtained at the hall after February 2nd.

SPEAKING of the depreciation in the value of coal land in the last ten years in Pittsburgh, a correspondent of an American paper says:—"Land that I got 1500 dols. per acre for eight years ago I can't get 50 dols. for to-day. I sold 2200 acres up the West Penn road last week for 30 dols. per acre. Natural gas has caused the decline in value. It has supplanted coal, and worked changes of various kinds. But while coal lands have so decreased in value, natural gas territory has increased in value in proportion. There are some men who believe that in ten or fifteen years from now natural gas will have played out, and coal will be in demand again. With this end in view, a Westmoreland county man whom I know has just bought several hundred acres of good coal land at 80 dols. per acre. If he can sell it in ten years for 1000 dols. an acre, he will have made good interest on his money."

IN the House of Commons on Monday Sir C. Dilke asked the Under-Secretary of State for Foreign Affairs whether he could inform the House what was the present position of the question pending between the Egyptian Government and the Suez Canal Company as to the consent of Egypt to the widening of the canal; and Mr. Bourke in reply said the Suez Canal Company having applied to the Egyptian Government for their consent to an alteration of their statutes in connection with the loan of £4,000,000 which they wish to contract for the purposes of the new works of improvement, the Egyptian Government have refused on the ground that the project involves the widening of the canal beyond the dimensions authorised by the original concession, and that the consent of the Khedive must be obtained to this feature of the plan. The company holds that, as the works are to be executed within the limits of the land belonging to them, there is no legal or equitable ground for this contention. Her Majesty's Government are taking legal advice upon the question.

ABOUT a week ago, the strap on a large fly-wheel driving the machinery at Messrs. Pring's wire works, Sandbach Junction, failed, and the fly-wheel of the engine, which ran away, flew into pieces, parts weighing several hundredweight being sent flying over the premises. One portion of the wheel, weighing about five hundredweight, was whirled through one floor into the air, and falling through the roof of another portion of the works, fell into a yard. Two men had a narrow escape. The damage to the machinery and premises is considerable, and a number of hands will be stopped work through the damage. In an adjoining column the *Leeds Mercury*, from which we take the above, records another and similar costly accident, due apparently to the want of a good governor and mode of driving it. It says the accident occurred at the Albion Mill, Great Harwood, worked by the Albion Mill Company. "The spur wheel gave way and disconnected the other machinery, causing the engine to smash to pieces. The operatives, 200 in number, rushed out of the shed. They had scarcely escaped when the building came down with a terrible crash, everything being wrecked, and the looms buried in the debris."

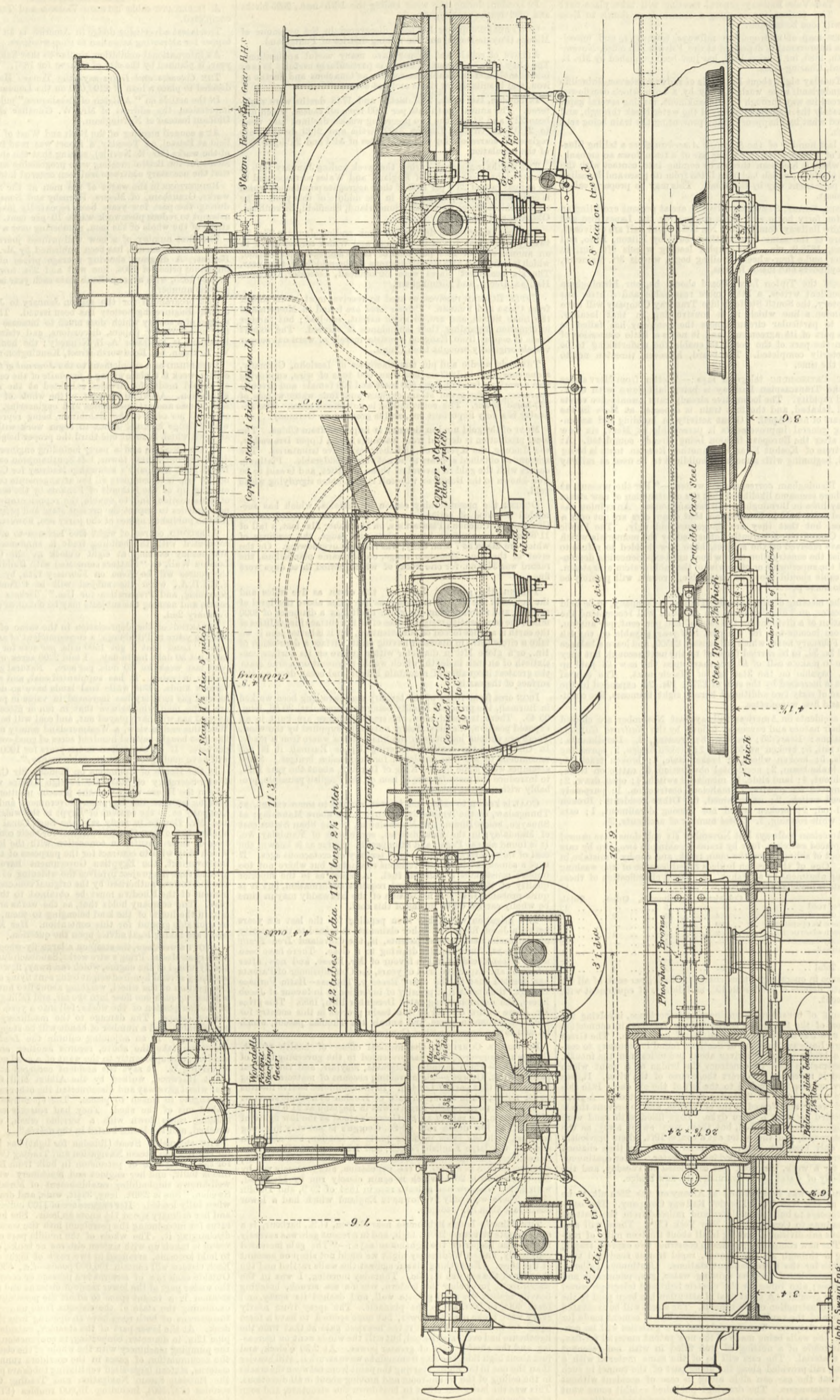
THE steamship *Sveat* (Russian for light) has been constructed for the Russian Steam Navigation and Trading Company expressly for the conveyance of petroleum in bulk from Bahkoo to Odessa. She is built, and her engines and machinery were made, at the well-known shipbuilding establishment of Motala, Goteburg, in Sweden. She is 286ft. long, 36½ft. wide, and draws 18ft. of water when fully loaded. Her engines are of 1100 indicated horse-power, and her ordinary speed 11½ knots an hour. She has pumping apparatus for introducing the petroleum into the vessel and afterwards discharging it. The whole of the middle part of the body of the vessel is taken up with sixteen cisterns or tanks, expressly adapted to hold kerosine, arranged in two rows of eight cisterns in a row. Each cistern will contain 106,000 poods—i.e., 530,000 gals. about. Outside each row of cisterns is a passage or corridor, and between the under part of the lower range of cisterns and the bottom of the steamer is a vacant space to admit the possibility of at all times examining the state of the cisterns from underneath them. All the cisterns of both rows have an opening into them on the upper deck. At the lower part of the steamer, outside the cisterns, is a pipe 12in. in diameter, connecting, in conjunction with other pipes, the pumping machinery with the whole of the cisterns. To prevent the accumulation of gases in the corridors running alongside the cisterns, sixteen large-sized ventilating tubes are provided. She cost the Russian Steam Navigation and Trading Company 375,000 roubles (£37,500), including 15,000 roubles (£1500) for Russian Customs duties.



OUTSIDE CYLINDER COMPOUND LOCOMOTIVE.

DESIGNED BY MR. F. C. BURGESS, ENGINEER, MANCHESTER.

(For description see page 91.)



John Swain Eng.



LETTERS TO THE EDITOR.

[We do not hold ourselves responsible for the opinions of our Correspondents.]

COMPOUND LOCOMOTIVES.

SIR,—I send you for publication if you think fit a design which I have got out for a compound locomotive. In designing it I have wished to try only to put your ideas given in your able leading articles, especially the one on page 312 of THE ENGINEER for October 23rd, 1885, into practical form; therefore I have taken two cylinders, one 26½ in. diameter, the other 19 in. diameter by 2ft. stroke, and put them outside the frames in the ordinary way, not being able to get them inside. I have also shown on the drawing four auxiliary ports, 1½ in. diameter, placed at such a distance that they cannot be uncovered at the same time by the slide valves, as I quite agree with you that it is a simple way of getting out of the difficulty of backing when one of the cranks stops on the dead centre, and also obliging the driver to cut off at half stroke, allowing the proper amount of expansion. The bogie is in this case necessary, though I do not see why the two cylinders should not be placed between the leading and driving wheels, the leading wheels then placed well to the front, and the connecting-rod taking hold of the trailing wheels, which are coupled to the drivers in the ordinary way. This, however, looks to me awkward, and would not, perhaps, be such a good running machine as the one shown. The boiler is high pitched to get it well above the wheels, and to get a deep fire-box and thoroughly mix the combustible gases to generate steam quickly. The regulator is outside, on the American pattern, which can be easily got at if anything goes wrong. The drawing shows clearly the arrangement of the valve motion and the balanced valves. In conclusion, I have simply drawn out an engine with outside cylinders compounded, arranged to have as little altered as possible from the ordinary type, and I do not see why a goods engine constructed on the same pattern, only with six coupled wheels, should not be tried with equally good results.

33, St. Bee's-street, Denmark-road, F. C. BURGESS.  
Manchester, January, 1886.

[Mr. Burgess' design will be found on page 82.—ED. E.]

TRADES UNIONS AND TRADE.

SIR,—Will you allow me to protest—and in so doing I hope I shall have a large part of your readers with me—against the unfair way in which your correspondent, writing the trade report for the North of England in your last issue, takes advantage of the prominent position which he occupies in your columns to make a most unfair attack on British operatives, to the effect that it is through them and their Trades Unions—because they will not always take the wages and work the number of hours which their employers would like them to—that our present industrial depression is caused. To quote your correspondent's words: "They (the operatives) aim always at more play, and higher wages during work-time, to compensate for inactivity during play-time," and that, "With longer hours workmen are able to take lower wages, and with lower wages are able to work longer hours. With longer hours and lower wages they have less opportunity of spending money in frivolities and sensualities, and less chance of taking part in those agitations which, on the whole, affect detrimentally the interests of all concerned." The first statement is a gross libel, and if your correspondent had mixed amongst workmen with his eyes unblinded by prejudice, he would have known better than to publish such a palpable fallacy. The workmen's contention is, not that they are too idle and careless to work longer hours—which your correspondent insinuates—but that manufacturers are so eager to be rich, and so reckless in their ways of making money, that if the workmen by their Trades Unions were not to take some action in the matter, and endeavour to limit the working hours per day, manufacturers would so take advantage of weak-kneed workmen to multiply hours of labour and increase production where it was not wanted, that the supply, already too great for the demand, would result in a glut of markets, and a state of affairs worse than the present.

Manufacturers themselves complain of the present over-production—witness the efforts of the Steel Rail Ring to curtail that branch of the industry—and yet, if workmen try to curtail production, no words are strong enough with which to stigmatise their conduct; and the Trades Union's effort is, in view of the increasing number of operatives without a corresponding increase of trade, to limit the hours of labour per day, so that, for a certain amount of wages, two men shall not work as many hours as three might do, or the third man would be thrown out of work, and it is better that each of the three should have less wage and less work than that one of them should starve, or have to live on charity. Workmen must have proof that longer hours and lower wages—with a corresponding greatly increased output, which at the present time capitalists are seeking to curtail—will bring more trade and create a demand, before they will consent to work each man longer hours for the same money.

It seems very strange to me, Sir, that Unions amongst workmen should be so universally condemned, but that Employers' Associations and Rings amongst capitalists seem to meet with nothing but approval from journalists and others who profess to have an interest in working men. Workmen—who spend so much time in frivolities and sensualities—would like to know how it is that some concerns—limited companies—can at the present time pay from 7 to 15 per cent. on subscribed capital, and that after paying management expenses and solicitor's charges, always much higher than with private firms. Is it only through careful management and a turn-out of good work? as it seems to be usually those firms who do not believe in cheap and nasty labour, who pay good wages to their workmen, thereby attracting good men and turning out good work. These firms, as your Manchester correspondent says, are not the first to agitate for a reduction in wages, but the firms that do this are those who belong to the Masters' Union—I beg pardon—Employers' Association.

Will your Northern correspondent, who says the long hours and low wages of our continental rivals' workmen enable them to beat Englishmen out of every market, also explain how it is that Germans, French, Russians, and every other continental nation are, in spite of protective duties, long hours of work, and low wages to their operatives, crying out about their trade depression? Also how it is that American makers, with their much higher paid operatives—and, therefore, according to your correspondent, much greater cost of production—are able to beat English makers in our own colonies, and that where no hostile tariffs are in operation; one instance, the account in your issue of November 27th, 1885, of the Baldwin Locomotive Works securing an order for locomotive engines for the New Zealand Government against English makers, and at a much lower figure than English firms would quote. With regard to the second statement which I have quoted of your correspondent's, it is much to be regretted, and no one is blind to the fact, that numbers of my fellow-workmen are spendthrifts and sensualists, as bad, in proportion to their incomes, as any class in the community; but when they are subjected to such wholesale condemnation, one cannot help wondering if your correspondent ever heard the old fable of the saucepan and kettle; it would make his word more reliable if he gave some well-authenticated statistics to show which class spend most money and time in gambling, drinking, and immorality. Is it those who with long hours of labour, and incomes seldom now more than enough to keep body and soul together, or those who live in idleness and luxury on the fruit of other men's labours, and do not have to earn their daily bread?

In conclusion, let me remind your correspondent that there is a great deal of humanity in all men, and that workmen have as much right to obtain the highest price they can get for their labour as capitalists have to obtain the most interest for their money, and perhaps the workmen get their profits, which are their wages, in quite as honest a way as capitalists obtain theirs, to judge from the way Stock Exchange companies and money-lending societies

flourish. It is hardly fair that of the three things which go to make up cost of production, viz., cost of raw material, capitalists' profits, and workmen's wages, your correspondent should attack the one of all others which would make least difference in cost of production, and yet bears hardest on the largest section of the community engaged; and the man who thus totally ignores two-thirds of a great social problem can scarcely set himself up as a leader in political economy.

Sheffield, January 20th.

MOMENTUM AND INERTIA.

SIR,—I quite agree with "Φ. Π." that we may drop all reference to Dr. Lodge. Your readers must decide for themselves which of the two it is that writes funny letters. "Φ. Π." has again expressed his views as to the nature of my studies and attainments, and I feel very much gratified by the high estimate he has formed of the last. *Gavisus sum laudari a te laudato viro.* I should equally be satisfied with the converse proposition—would the converse in this case in the system of polars be the reciprocal? I regret that from sheer ignorance of any knowledge of "Φ. Π.'s" identity I cannot return the compliment.

I have not re-read my letters, but feel sure that "Φ. Π." cannot find a single passage which justifies his entertaining the belief that I have attributed to himself the authorship of the definition of momentum as quantity of motion. When Gregory and the other authorities referred to speak of "quantity of motion," or "momentum," it is clear that they regard momentum and motion as synonymous terms. I still adhere to what I said, viz., that if either the definition of motion given by myself or that given by Dr. Lodge is correct, to define momentum as quantity of motion is simply absurd. Motion in accordance with either definition is a purely kinetic term. The definitions simply state that if a body is at one instant at one place and subsequently at another, it must have undergone motion, and do not make the slightest reference to the dynamic state of the body.

I am glad that "Φ. Π." has at length answered one question candidly and explicitly. With your permission, I will use his own arguments to show that he is utterly in error:—"Does 'Φ. Π.'," says Mr. Donaldson, "still maintain that the accelerations produced in different bodies by a given force acting during a given time vary as the masses of those bodies?" Of course I do. So did Newton. (1) Equal forces applied to equal masses produce equal velocities in equal times. (2) If we halve the forces, the masses and times remaining constant, the velocities acquired will also be halved. (3) If we double the forces, the masses and times remaining constant, we shall double the velocities, and so on. In other words, the force required to generate a given velocity in a given time varies as the mass, or as it is commonly written in text books,  $F = m \cdot f$ .

How can the accelerations produced in different bodies by a given force in a given time vary as the masses of those bodies, if statements (1), (2), and (3) are correct? In the equation  $F = m \cdot f$ ,  $f$  is the acceleration produced in a unit of time by the force  $F$  acting on the mass  $m$ , and the equation states that  $f = \frac{F}{m}$ ;

in other words, the acceleration produced does not vary directly, but inversely as the mass, the force remaining constant. Is it possible that "Φ. Π." does not understand the difference between the acceleration and the moving force by which it has been produced? I feel sure that a careful study of his own arguments will convince "Φ. Π." that he must no longer maintain that the acceleration produced varies as the mass, the moving force remaining constant. Newton certainly never did. If he should be so convinced, will his views as to the appropriateness of the definition of inertia as "capacity for motion" be at all modified?

"Φ. Π." asserts that we can as completely empty all the motion out of two masses into one mass, for example, as we can empty the contents of two small jugs into one large one. Suppose such a thing were possible, would it not be better to say that the whole of the momentum of two bodies can be imparted to a third body? It is not, however, in my opinion, possible to do this, and I shall be glad if "Φ. Π." will show by a practical illustration how it can be done.

If inertia opposes no resistance to motion or change of motion, what is the work done by the moving force, which either starts a body from rest or alters its direction of motion, if in motion?

There is a problem relating to momentum in connection with pile driving which I have not been able to solve myself, and shall therefore, be glad if "Φ. Π." or any of your readers would assist me in arriving at its solution. What is the maximum momentum which a pile of given length and given sectional area can stand without receiving permanent injury? If  $v$   $m$   $W$  be the velocity of impact, mass, and weight of the monkey, and  $H$  the weight due to the velocity  $v$ , the four quantities are connected by the following equation of relation:—

$$m v = \frac{W}{g} v = W \sqrt{\frac{2H}{g}}$$

Is the load which the pile has to support as a pillar at the instant of impact simply equal to the weight of the monkey plus the weight  $W \sqrt{\frac{2H}{g}}$ , or  $= W (1 + \sqrt{\frac{2H}{g}})$ ? If a load is applied at once, but without initial momentum, to an elastic string, the extension of the string will be double what it would be if the load were applied gradually. May we, reasoning from analogy, conclude that the maximum load the pile would have to support as a pillar would be equal to  $2 W (1 + \sqrt{\frac{2H}{g}})$ ?

I do not know how to calculate the initial momentum imparted to the pile; but if this be set against the downward moving force of the weight of the pile, the work done by the monkey will be equal to the work done by the resistance of the earth. If, therefore,  $R$  be the mean value of this resistance, and  $S$  the depth driven by a single blow, we shall have  $RS = W (H + S)$ .

Is  $R$  the mean load which the pile has to support as a pillar? If not, how is the force necessary to overcome this resistance transmitted from the monkey through the pile?

WILLIAM DONALDSON,  
2, Westminster-chambers, January 25th.

THE RIVER LEA.

SIR,—Perhaps the best way to remove the nuisance that exists in connection with this river, would be to convert the present navigation into a shipping canal to Ware, continued to Hertford, with a branch to Bishop Stortford. The extensive malt manufacturers of these towns would be placed in direct communication with the whole world. The river, from its peculiar position, would be extensively used both for business and pleasure. Yacht clubs, summer steam excursions, regattas, and rowing matches would be well supported, and dockyards for shipbuilding at Hertford would give that town a definite trade of its own, which it is much in need of as a provincial capital. Such portions of the natural river as do not conduct tributaries to the navigation might be filled up, and then, if the bed and walls were properly constructed, its purity could be maintained, and would assist in promoting that of the Thames.

North-street, Colchester, January 16th. W. SCARGILL.

THE VENTILATION OF THE MERSEY TUNNEL.

SIR,—As the description of our ventilating fans in your paper refers to our new regulating shutter, to which the noiseless action of the fans is due, and also their freedom from vibration, will you kindly permit us to state, to prevent any misunderstanding on the part of your readers, that this improvement is patented by us both in England and many foreign countries.

Pagefield Ironworks, Wigan, WALKER BROTHERS.  
January 25th.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE, CHANCERY DIVISION.

Before Mr. JUSTICE PEARSON.

OTTO v. STEEL.

IN concluding his remarks on Dr. Otto's patent of 1876, Mr. MOULTON said he wanted to call his lordship's attention to the claims—the first claim, which is the real one—the second one entirely depends on Beau de Rochas; and he was not going to touch it: "Admitting to the cylinder a mixture of combustible gas or vapour with air separate from a charge of air or incombustible gas so that the development of heat and the expansion or increase of pressure produced by the combustion are rendered gradual." What is Mr. Imray's evidence here? That the great advantage of Otto is you get the catch at the beginning; you get the rise of pressure not gradual, and therefore get it at the early part of your stroke. Now, he would show when he came to read the judgment, that Mr. Imray's evidence exactly supported this claim, when he was dealing with the previous case. The point was that the rise of pressure was gradual. The point now is that by this wonderful arrangement the rise of the pressure is quick, so that you get your pressure on early. He says: "The expansion or increase of pressure produced by the combustion are rendered gradual." Now you can understand how it was that the Court of Appeal associated the evidence of shock with Otto's patent. It would avoid shock if the increase of pressure was rendered gradual. That is just the very thing which does stop shock. It is just the very thing which you do not find in the Otto engine, which is very vastly more explosive, and very vastly more rapid in increase of pressure, as Mr. Imray says, than the previous ones. He might unhesitatingly say he should show that the increase of pressure, instead of being more gradual, was four times as rapid. Certainty of ignition is not even hinted at in the patent. Now he was going to deal with the judgment of the Court of Appeal, which judgment is of exceeding importance at this stage of the case, because it would show what it was that the Court of Appeal thought was claimed by this patent, what it was that they thought was proved by the evidence, and what the case launched by the plaintiff was in that case. He had read this judgment through and through many times, and he confessed that, standing here now, having heard the plaintiff's case, he was perfectly astonished at the evidence which had been given. He could not understand how men like Mr. Imray and Sir Frederick Bramwell would be able to support, under cross-examination, such evidence as was clearly relied upon here. But they had not; they had abandoned it; they had given evidence diametrically opposite to it. Certainly they avoided difficulties that they would have been in if they had given evidence like this. But they had got into just as bad difficulties, because, if a thing is false in science, it does not matter; it can be shown to be wrong however you put it; and therefore, though he did not know at all which horn of a dilemma he should impale them upon, he was perfectly certain he should have impaled them upon one. They apparently thought that the one on which they would have been impaled, had they followed the line of the previous action, was the more uncomfortable of the two. He trusted to show them that the other was equally uncomfortable. Mr. MOULTON then dealt at great length with the judgment, criticising in detail the remarks of the late Master of the Rolls, Lord Justice Brett, and Lord Justice Holker, as well as the evidence given by Sir Frederick Bramwell and Mr. Imray in *Otto v. Linford*, which he compared with their evidence in the present case. As this judgment has lately been given in full in THE ENGINEER, it will be unnecessary to follow this part of the learned Counsel's address. Having gone through the judgment, all he wished to call attention to was this: The judgment is based on two questions of fact. First, it is based on a certain interpretation of the patent, which is this—that it is a claim for a cushion of air next to the piston, which makes the combustion gradual, and the increase of pressure gradual, and that the patent shows sufficient means of obtaining that cushion, and that through that gradual character of the explosion shock is avoided. That was the interpretation of the patent. He would call attention now to a most important point with regard to Sir Frederick Bramwell's evidence. Mr. Imray, who was of opinion before that there was a gradual rise of pressure, now puts it that the rise of pressure is quick, but it is sustained afterwards. Sir Frederick Bramwell, with all due respect to him, seems to have changed front just as completely. He has taken a definition of explosion which was quite a wrong definition. He says it is not an explosion if, after you get to the maximum pressure, there is still combustion. He says: My idea of explosion is that the whole ignites at once, and you have all your combustion before the maximum pressure. If when you get to the maximum pressure there is still combustion to go on, it is not explosion. That is the sense in which he uses the word "explosion."

Mr. JUSTICE PEARSON: Then I suppose, if you adopt that definition of "explosion," Lenoir's is not an explosive engine?

Mr. MOULTON said that was just what he was going to say. Not only is Lenoir's not, but the most explosive mixture you can make, which is two of hydrogen and one of oxygen—the most intensely explosive mixture you can make will not explode; for a larger proportion of the heat there is developed after maximum pressure is attained than even in Lenoir and Otto. In the very mixture which he cited as an example of a terrific explosion, he should prove by witnesses who have actually tried it and calculated it, that more than half the heat is developed after the maximum pressure is attained, and the consequence is that it is not an explosion. That is the first complete answer. But he might put another answer to the evidence, which was of a more philosophic character. Sir Frederick Bramwell puts that meaning on the word "explosive," and here in Court, if he tells you that is the meaning that he attaches to the word "explosive," I have no reason to grumble. We understand what he means when he says that a thing is or is not an explosion. All that we want in the language of a witness is that it shall be clear and unmistakable, and if he lays that down and adheres to that, well then he was perfectly willing to allow him to do so. But he must not say that Barnett used it in that sense; he must not say that is my definition of an explosion, and I say Otto's is not explosive and Lenoir's is, and then go to a man who wrote forty years ago and say, I assume that because he says his engine works with an explosive mixture, it works with an explosive mixture, using my definition of explosion. The real definition of explosion is a sudden pressure of an intense character suddenly coming on. That is the true explosion. That is the sense in which it is always used, because it is always connected with shock. That is the sense in which Barnett used it. Sir Frederick Bramwell put himself into another of the numerous dilemmas which the plaintiff's witnesses cannot help being in in this case. He told us that the combustion was more gradual in a given mixture, if it were uniformly dilute, than if it were irregular. Where does the maximum pressure come in a uniformly dilute mixture? If it comes early, then, since the whole time of combustion is longer than in the previous case, there must be a lot of combustion after the maximum pressure. If it comes late, then the rise of pressure to it must be more gradual, and therefore there is much less shock. You cannot get out of the dilemma. The whole combustion takes longer. Put the maximum pressure where you like. Either it must be that it took longer to get up to it, or if it is early there must be a greater proportion of combustion afterwards. In one case the rise of pressure is more gradual and therefore there is less shock, in the other case, according to Sir Frederick Bramwell's definition, it must be a much less explosive action. Once admit that the action is more gradual when you have uniform dilution than when you have irregular dilution, and you cannot possibly get out of its being less explosive. He proposed now very shortly to refer his lordship to one or two of the anticipations, and then he purposed to point out the distinct



issues of fact that he intended to prove, and just indicate the nature of the evidence, which he should put before his lordship with confidence. The first he would call attention to is Wright's specification—patent No. 6525, of 1833. Wright's is an extremely ingenious engine—for drawings see THE ENGINEER of January 1st, 1886. The intention of the inventor was that the explosive charge, the proportions of which would vary according to the speed of the engine, should enter into the spheres marked W W, be exploded, and then the expansion of the gases there would drive the piston down when the explosion was at the top, and up when the explosion was at the bottom. The hollow spheres are in communication by passages with a very long cylinder. Those passages would, of course, be always full of residuum. There would be residuum in the hollow sphere which would only be compressed, but not driven away by the entering charge, which was intended to enter under compression. Well now, supposing you had sufficient compression, a sufficient charge would force itself in there to explode, and then there would be lots of residuum between it and the piston. He suggests that a pressure of one or two pounds above the atmosphere would be sufficient to drive his charge in. But it would not, for this reason. Supposing it was, we will say half as much again as an atmosphere, then he would only be able to compress slightly the residuum which would be in *w* and in those passages, and with the dimensions given here it is probable his charge would only just slightly enter the spheres instead of practically filling them. The consequence is with that proportion the engine would not work. But that is a defect which a man reading the specification at that day would know just as well as a man reading it to-day. The law has been known a good hundred years. If it had been, as I cannot help thinking he intended, two atmospheres, instead of two pounds above the atmosphere, it might have made a great difference. Anyone reading this specification would see the mistake at once. It is no new knowledge that enables Sir Frederick Bramwell and Mr. Inray to say that that would not work. It is this old law which has been known 100 years. Anybody reading that over would have said, the man has made a mistake. He must have a higher pressure if he wants to get his charge as far as that. It is quite parallel to Otto's case, in which Otto by his drawings and by his descriptions clearly points to something which will not work. Wright contemplates residuum being in the passages from the sphere to the cylinder, and he actually, in one arrangement, has a valve cutting off his charge from going into the passage which led to the cylinder, then the explosion opens the valve, and heats and drives forward the residuum. Although he did not give the pressure necessary to carry out his ideas, he did distinctly contemplate residuum being there. Now, he wished to call attention to a specification of very different merit, and that is Barnett's, No. 7615 of 1838. While he looked upon Wright's as an extremely ingenious suggestion, which a person reading might get very great advantage from, and practically a complete suggestion of a gas engine, he looked upon Barnett's as one of the most remarkable specifications of an invention that he had ever seen. In 1838 he designs three forms of engine with three varieties to each, and he should put a gentleman before his lordship with confidence, as probably the most experienced man in gas engines at the present day, and he would say that not only would every one of those work, but that they have in them the type of engine which has the greatest advantage of any type known at the present time. (The drawing of the third modification of Barnett's engine is given in THE ENGINEER of January 1st). He put to his lordship with confidence, and he would support it by evidence, that the engine in Sheet 3 would work very well and would be a compression engine. The witnesses called for the plaintiff appeared to treat it as a matter to be laughed at, because when the piston was going down they showed that after a certain time no more charge could come underneath, and they said it did not make any matter that it came up above, because it was not wanted there. It was not wanted there that stroke, but it would be wanted the next.

In answer to a question from his lordship, Mr. MOULTON said that the gas would be entering at a time when there was access to the atmosphere in the cylinder. That very principle of allowing the gas to enter while the cylinder is open to the atmosphere is actually a feature of the Clerk engine, and that engine works with a very slightly greater, if any greater, expenditure of gas per horsepower than the Otto. So that he thought his witnesses would show that, properly arranged, the loss would not be so tremendous, if there would be any loss at all. What his witnesses would prove is this, that, taking the machine as there described, about two-thirds enters as he says—that is, enters under the piston as it goes down; about one-third of the charge enters as he does not say—that is, enters a stroke before. So that he gets his charge mainly as he describes it. But suppose he has made an error, it is a direct consequence. The action is all right. He perhaps did not know exactly the circumstances under which the charge would come in, but the charge would come in all right, and an engine like that could be made to work, and would work satisfactorily. In fact, he thought Mr. Clerk would convince his lordship that he has really worked what is substantially a Barnett engine extremely well. There was the admission of a gas and air charge into a cylinder with lots of residuum in it. Some residuum will, fortunately for Barnett, get out. But if residuum is an advantage, there would be abundance of residuum there. We have compression here also, and compression in the cylinder, and the most remarkable difference about this is, we have got compression in the cylinder, and we have not to sacrifice a stroke for it. The special merit of the Clerk engine, which has attracted attention as contrasted with the Otto, is that he gets compression without sacrificing the stroke, just as Barnett did. Here we have compression; we have our charge; we have residuum if it is necessary. Now he would pass on to the next, which in his mind was by far the most important of all—that is, Million's, No. 1840 of 1861. The main point which this inventor wanted to impress on the world was the great advantage of compression. On page 8 he says at the bottom: "In the engine above described the mixtures are introduced under pressure into the motive cylinder. This is one of the characteristic features of this invention, and I claim the exclusive right to the principle upon which this engine is constructed and operated, whatever may be the explosive mixtures employed, and whatever may be their pressure." He has got hold of the real advantage of compression. Then he shows how he can mix. He says he can mix between the pumps and the pressure reservoir. He does not compress in the cylinder. He has a pressure reservoir. Then he says, "It may be placed upon the pipe which conducts the gases to the motive cylinder near the induction valve." That is, he may have a reservoir of air under pressure, gas under pressure, and he may mix them in the passage. Then he says he may put his mixture at the point of aspiration—that is, where they enter the cylinder. All he says is, "I must have my mixed charge coming in under pressure." That is only pressure. He also gives practical methods of attaining to it. The mere idea of compression could not have been patented. If told whether it could have been patented or not, it would have been an immediate publication to the world of the idea of compression. On page 10 he gives a method of carrying it out. He says, "The motive cylinder might be made longer than necessary in order that the piston shall always leave between it and the end of the cylinder a greater or less space, according to the pleasure of the constructor, such as one-fourth or one-third more or less of the volume generated by the motive piston." He distinctly points out a very substantial space. One-fourth or one-third more or less of the volume generated by the motive piston. Take it at one-third. Then there would be one-third of the stroke of the piston; one-third of that length at each end. So there would be, say, 1ft. in the middle and 4in. on each side. He says, "This space is called by the inventor a cartridge. On opening the slide valve"—that is, opening a valve which connects the pressure reservoir with the cylinder—"the gases would be allowed to enter suddenly from the pressure reservoir into this cartridge towards the dead point." That is, at the beginning of the stroke, the dead point being the

point when the piston has got as far one way as it is going and is going to turn back again. "And this induction having ceased"—that is, as soon as your charge is in—"an electric spark would ignite the gases in the cartridge, by which the driving piston would be set in motion." It goes as far as it can go. Then there is the one-third just as it is there. Then you open the valve, and in rushes the charge. That cartridge is full of residuum, because, of course, it is residuum at the atmospheric pressure, just as it is in Otto. It is exactly the same arrangement as in Otto, only that Otto, in spite of having this space, still uses his piston to draw in the charge. Million wanted an explosion every stroke, so that when he had got this space he got a pressure on his gas, and drove it in compressing the residuum. Well, then, he had got his ready to explode and to go off. Otto does not. Otto uses the whole of his stroke for drawing in, and then compresses the second stroke, which has greater simplicity, because he does not want compression reservoirs; but then he misses his stroke. The consequence is, Otto claims merits of one kind and Million of another; but it never can be said that admitting a charge into a space at the end of a cylinder full of residuum is a peculiarity of Otto's. See how much more perfectly, if anything would do it, this would leave the residuum segregated. Otto churns his residuum and gas together by the violent action of his piston. Million simply lets the one charge rush into the presence of the other. If anything would segregate the residuum, it would segregate it in Million. One is fifteen years before the other, and Otto patents that, having a segregated charge of residuum, is a novelty in 1876, when in 1861 Million proposed an arrangement which was far more likely to obtain it. This was not before the Court of Appeal. This is new. On the question of novelty, could there be anything stronger than that? In answer to Mr. Justice Pearson, Mr. MOULTON said that in Otto the charge gets thoroughly mixed up. It is Lenoir over again. He had shown by Sir Frederick Bramwell's own evidence that as far as the proportion of inert gas is concerned, we have exactly the same in Otto as we had in Lenoir. The only thing that Otto can possibly rest upon is that he has got it segregated. Well, then, if he has got it segregated, Million had it segregated. There is no reason to say that Million's would be more explosive, because the explosiveness would be regulated by the proportions of the entering charge. If it were a segregated thing, and you add your charge, you would dilute it a little. Otto's is just the same as any where there is access of air. If he puts an 8 to 1 combustible charge, and draws 3 of air before that, and it gets mixed up, then there is 11 to 1. Where is the novelty? If segregation is the point, Million is as good for segregation as his is. Might he just read two lines of Otto's specification *à propos* of Million, page 5, line 23: "It will be evident that if the space *a* or a separate chamber, such as an air vessel, communicating therewith, be made sufficiently large to contain the whole quantity of incombustible fluid requisite for each charge, no fresh charge of air need be drawn in at the commencement of the stroke." Million's is actually one-third of the whole piston movement. It is full of this incombustible gas, the residuum. Into that you let a charge. His witnesses would say that even there you could not get segregation; it would mix up, but still it would have a better chance than in the churning of Otto. The whole merit on which this has been sustained is that you segregate the cushion of air, and do not have it mixed up uniformly. If there is any merit in that, Million had it in a far more complete way. He had read Million again and again, and he could not see how his learned friend, with all his ability, could attempt to show that this was not an anticipation of Otto. Here is the only suggestion that is made on the other side. Mind, he has claimed it for all pressures, and the time may come, and probably would come, when we would work with even higher pressures than we do now. In Otto's and in Sterne's what they work with now is about three atmospheres. The higher you can practically work compression—and, of course, practical difficulties come in then—the better it is, and if you could get rid of your residuum and start with your gases cool, it would be well to go to distinctly higher pressures, and no doubt we shall get on to do so. Million fully appreciated the importance of his gases being cool, so he says if you are going to have it, say, six atmospheres, you must first compress it to three and cool it, and then to six and cool that. You must not attempt to compress it to six at once, or you will have so much heat generated that you will be wasting an enormous amount of power. That contemplates as distinctly as possible working under six, with one pump working it up to three atmospheres. Supposing he worked up to three atmospheres, then he would have 1 part of residuum to 3 of charge. If he worked to two atmospheres, he would have 1 part of residuum to 2 of charge, which is the very one which has been worked with Otto at the present day; and this man says, "I claim pressure, whatever be the amount of pressure used." Now, how can they say that that is not a notable quantity, or whatever they like to call it, of residuum—a quantity which, if you work with a good practical pressure of two atmospheres or three atmospheres, would be one-half or one-third of the amount of charge. If you take four atmospheres, it would be a fourth of the amount of charge. He would next take Bisschop's, and he would give the reason why he put in Bisschop's as an anticipation. That is Newton of 1872, No. 1594. He only put that in because it is an instance of what was very common in the earlier gas engines, the admission of gas and air separately. Knowing that the pressure throughout a chamber containing gas must be the same everywhere, he had always wondered what they would say was the effect of a non-homogeneous mixture, which would, if they are right, be produced by gas and air entering separately. If gas and air enter separately, of course there will be a very great deal of mixing, but there will not be a complete mixing, and it did seem to him that there would be what they call stratification under those circumstances, and as he knew that Otto had suggested that you might have your residuum in a separate chamber, he wondered what they would make of a patent like this, where the gas and air only have the chance of mixing in the cylinder on account of their rushing in. Mr. Inray said that in the eudiometer gas is mixed slowly; but just fancy the slow way in which in the eudiometer you admit a certain amount of gas into a tube, and then you admit slowly a certain amount more gas. What is that to the violence of this gas rushing in when the piston is churning up and down as hard as it possibly can? If heterogeneity is an advantage there would be heterogeneity in this. Now, with regard to Lenoir's specification, that is Johnson of 1860, No. 335, which needs one preliminary remark. The Lenoir comes in in two ways—it comes in as a prior publication, just like an article in an encyclopedia would, and it comes in also as a prior user. The two things are quite distinct. We have in the Lenoir engines that are actually in use these most important facts shown. We have, first, considerable clearance spaces, which cause a quantity of residuum always to precede the charge, a quantity of about one-fourth the amount of the charge, and, therefore, if residuum was valuable it would be mixed up, no doubt, exactly as it was in Otto; but still it was under rather more favourable circumstances for stratification than in Otto. We have these engines working steadily without shock for twenty years. His witnesses would say that even last night they examined one of the engines made by the Reading Company, which has been quietly doing its work for seventeen years, and has not had to have its brasses changed—the brasses being those pieces of brass on which all the friction comes, and which are the things which wear out first in steam engines. It is working every day, steadily doing its work down in a cellar. He intended to call the man attending to it, who will say it works all right; that he leaves it working for hours, and there it goes on doing its work, a slightly-built engine, like they all were, because the pressures were not at all tremendous, and satisfactorily doing it without wearing out at all. The theory on which the Court of Appeal felt justified in taking a highly benevolent interpretation of the specification was that no engine before Otto's worked without shock. He should deal with the question of whether Otto's has any claim to be without shock by itself, but here are these engines working perfectly regularly and doing regular work. He did not

want to say a single word against Mr. Inray except what is quite fair, but a witness, even as experienced as Mr. Inray, may take an unconscious bias. Did not he seem to represent that that Petworth engine was a failure because they had some trouble in setting it to work? Well, trouble in setting a gas engine to work is not a new thing. His witnesses would say that gas engines are ticklish things. Here is this thing steadily working, and kept on working now. His witnesses will say that they went down to the Petworth engine, and there was no difficulty whatever. He was down there himself, but could not give evidence. He should show his lordship actual diagrams which were taken when it was doing ordinary work—when his witnesses were there, and it was working as smoothly as possible. Lord Justice Holker points out how Mr. Millar would have felt himself in clover if he could have shown that Otto was explosive. But he would feel himself also equally in clover if he could prove that others were not. The merit claimed is, I stop the explosive action. If you can show that the explosive action was not there to stop, in any sense in which it is absent now, all he could say is, you have not done what you told the public you had done. He put this forward with great confidence, that the Lenoir engine, though far inferior to Otto's because it had not compression, was a satisfactory working engine, which did its work thoroughly well. It had an electric ignition, which of course is ticklish. Applying electricity to such a rough usage as exploding in the midst of a cylinder at a tremendous temperature, every stroke, and working for hours and hours every day, there is no wonder that electric ignition gave trouble. Hugon's invention of his gas slide, which is taken by Otto, is an enormous advantage. Mr. Clerk's ignition, which is another type of gas ignition, is also a splendid thing. All those are great practical details with reference to modern engines; but as far as its behaviour as a gas engine goes, he was sure his lordship would feel that what the Judges of the Court of Appeal said, that no one had shown the existence of one of these engines working satisfactorily, was simply due to the fact that the proper evidence was not laid before the Court with regard to it. The Lenoir at South Kensington, the very one Mr. Inray saw, worked satisfactorily for years. Its career of usefulness was cut short, not because it failed in its duty, but because the company to which it belonged failed, and they were afraid the liquidator would seize it. It was nothing whatever to do with the engine that made them give it up. In the Hugon engine he should show that there was actually an amount of residuum going into the cylinder before the charge, amounting to one-third. Otto's present one is one-half—the residuum is one-half of the rest of the charge. If there was an advantage in the residuum, that had it. That is a notable quantity, beyond all possible doubt, and in his opinion it would have worked very much better if it had not had that residuum. If you could have cleared that out it would have been an advantage, because then you would have had your cooler gases; but in spite of that it worked on steadily and well, and it did its duty until it was replaced by an Otto, which, using compression, is a very much better engine. That worked with a gas slide, with a gas ignition; and the importance of that here is that the ignition was at the gas port, just as it is in Otto, where you have naturally and necessarily the richest portion, because you have it unmixed with residuum. There is more residuum, which would make an appreciable difference in the dilution of the Hugon. You lit it just at the point where it entered, just as you do in Otto, and in the same way you had the advantage of igniting at the richest part. If there is anything in the first claim, it is anticipated. His own opinion was that, excepting as inert gas, the residuum is no good. It is best when it is thoroughly mixed up and not segregated, as Otto boasts; and even then it is inferior to dilution by air, because the dilution by air leaves the gas cooler. He saw no advantage whatever in Otto's No. 1 modification. It was quite customary to draw in air separately from gas in the early engines; they did not say first air and then gas; they drew them in at two different ports. There is nothing novel in drawing in gas and air separately. There is not one atom of evidence that No. 1 Otto was a little better than Lenoir. It was the same thing excepting that the mixture was not so complete; it was not made outside. It would be better that it should be made outside. Mr. Otto does seem to give some evidence to the effect that even No. 1 would be better than Lenoir, and it is characteristic of the evidence in this case on behalf of the plaintiff. He says this:—"I took a Lenoir and I made a slide so that when I used that slide it drew in air first. I worked it as a Lenoir. I worked it drawing in air first. I found less shock when I drew in air first." This question was put to him:—"Did you use the same mixture in your combustible charge in both cases?—Yes I did." Then what was he comparing? He was comparing drawing in for the Lenoir simply a charge; using it the other way, he was diluting that charge with a lot of air. In other words, he was working with a more dilute mixture, and he says there was more shock in one case than in the other. What possible comparison is there? Everybody knows if you work with a dilute mixture you have less violent action than with a stronger one. That is the sort of evidence—the same sort of thing that Mr. Inray talked of using—an engine either with charge, or with residuum. He asked him how about the comparison. "Was not the mixture you used in the two cases the same? Yes." Very well then, in one he was using it diluted with inert gas and the residuum, and in the other he was using it undiluted. Of course there is more shock—who suggests there is not? That inert gas took up the heat, and therefore prevented the explosive action, was the A B C of all gas motor questions. That was always understood. Nobody thought when they were working with 10 and 11 to 1 in the Lenoir, there was not inert gas, and that inert gas was not valuable. They all knew that it prevented the combustion being so rapid. There is no little of evidence that No. 1 worked better than the Lenoir. It would not. It would probably work just about the same, because everything would be mixed up. All the evidence as to the excellence of working is as to the compression engine. Of course he was not going to suggest that a compression engine is not better than a non-compression engine. If Lenoir could have got a compression engine, he would have knocked his own out of the field. But the difficulties were very great. Now with regard to Lenoir. Lenoir also operates as a prior publication—not the engine, that of course is prior user—but the specification which describes the engine. The specification that describes the engine has one peculiarity in addition to those engines that his witnesses have seen in working. He had no doubt himself that engines were made exactly like the specification, but he was not prepared to say that he could prove conclusively, though he might be able to get evidence to prove that there were engines made in this country which had all the peculiarities of the Lenoir's specification. Lenoir's specification describes the peculiarity very clearly, and I think all those my witnesses have seen, worked without this peculiarity. But the specification distinctly proposes making engines with this peculiarity. Now, my lord, the user is one thing, the specification is another. I only want to show what Lenoir suggested to the public in the specification. The engine was very simple. It is really Wright's engine with all its complications cut away, and all questions of compression cut away. It is the simplest gas engine that can be imagined. Suppose the piston is at the bottom of the cylinder, then the slide opens, and as the piston rises it draws its charge in to about half way. Then the slide closes, an electric spark ignites the charge and drives the piston the rest of the way. Then the exhaust valve opens at the bottom, the piston begins to descend, driving the products of combustion out and drawing in the charge. When it has got half-way the charge explodes, and drives it down, and drives out the products of combustion. It does not go right to the bottom. When it begins to rise again it not only has the little residuum which was left at the bottom, but all the space between the cylinder and the face of the valve, which cuts off the gas supply, is full of residuum. As this rises, it begins to draw first that residuum in, and then as it goes on drawing, it draws the gas and air which come after it. There was always a residuum coming in first, and then the charge. It goes about one



half the stroke. Then there comes the electric spark again, and then it is driven from end to end. You admit the charge at each end, and blow the thing alternately one way and the other. It is a double-acting engine, and it worked admirably as a double-acting engine. Lenoir, in his specification, proposes a little modification of that. He says: I will make the slide so that it lets air come in before it lets the gas come in. The first thing is it opens, and the residuum is drawn in. Then a little air comes next, and then air and gas. As a consequence of that, the gas is cut off before the air, and then a lot of air comes in afterwards. That is what he proposes. The consequence of that would be that there would be a residuum at first, then a little air, then a charge, then a good deal of air. Now, if that were so, and ignition took place, then there would be segregation. There would be the air separate from the charge. It is suggested that there would not be ignition. The reason why they say there would not is this. They say he has shown his electric spark at the bottom of his cylinder, and there would be air following, and therefore it would be in the wrong place. He suggests it may be put at the side, and I believe we shall have evidence to show that they did sometimes put it at the side, and it worked better there, but that is a mere detail. He had very little doubt that the history of the matter is this:—Lenoir wanted to let in air first for a reason that was not at all a stupid one. The residuum is at a great temperature, and when the charge comes in it may be lit by that residuum, and, in fact, the difficulty of making big gas engines is that. Well, he let in a little, as he says, to neutralise the carbonic acid. He could not help thinking he meant to neutralise this heat, though he does not describe it. People found, however, that in those engines it was not necessary. It very likely gave rise to difficulties, whether it was the difficulty of ignition or something else, and they cut off gas and air together. They did all their dilution outside by regulating the gas cock, so that it worked properly. He had now been through the specification. He had shown what the claim is, and what it purports to do. He had dealt with the question of whether it does or does not do so, and read the judgment, and had shown what the interpretation put on the patent by the Court of Appeal was, and how far he said that was unsustained by fact. He had gone through the prior publications and the prior users, and had shown how they bear on the question. Now, in conclusion, he wanted to draw his lordship's attention to the issues of fact that he wanted to prove for the purposes of his case. The first thing is that an explosion is the rapid rise of pressure produced by the development of heat from combustion heating the total gas in the chamber, and that its explosiveness is measured by the extent to which the pressure rises and the time it takes to rise. With regard to that, it does not seem that there is really any controversy on that point. He should call Dr. Hopkinson, who has the advantage of being not only a most experienced mechanic, but one of our very best mathematicians, who is an authority on thermo-dynamics. The next thing is that in explosiveness, as defined in that way, Otto's engine far exceeds the practical engines that preceded it. By "practical" he meant the working engines that preceded it, namely, the Hugon and the Lenoir. Then he proposed to show that shock depends on the rapidity of rise of pressure. Then, to reduce the rapidity of the rise of pressure, you must use dilution, other circumstances being the same. He proposed next to show that the Otto indicator diagram is just what would be due to such resultant dilution as there is in that case. In other words, that there is nothing in the Otto diagram which points to anything more than dilution of the entering charge by the residuum. Next he proposed to prove that there is no special advantage in residuum beyond its being an inert gas, and there is a disadvantage that it is a hot one. Then, that the alleged cushion in Otto does not as a fact exist; and supposing the stratum—the segregation, if he might so call it—did exist, it would not be advantageous; it would not prevent shock, and it would not be new. He should then prove that if Sir Frederick Bramwell's definition of explosion be taken, none of these mixtures are explosive. If there is combustion after the maximum pressure it is not an explosion; then all engines are on a par, and continuous combustion is the property of all explosive gases. The learned counsel then indicated in general terms the nature of the principal evidence he proposed to give, and thought he should be able to show that Otto's first claim is either not new if it is true, or it is not true if it is new. If, then, that claim goes, it was quite sufficient for him. It was not a question of trying to upset a patent, substantially good, because there has been a claim for some trivial detail put in which was not novel and ought not to be put in. It was a claim by which invention had been throttled by Dr. Otto during all these years. There was plenty of room for independent invention on the lines of Barnett, and plenty of room to develop many different kinds of gas engines, but by his claim which said that whenever there was residuum coming in before the charge, you are infringing Otto's patent, although his learned friend admitted that every single gas engine that ever was made had that peculiarity—by such a claim as that, unfortunately upheld by the Court of Appeal because the evidence put before them so inadequately taught them the real facts of the case, he has been able to keep back invention all this time. He does not deserve his patent if he is right, and if the case he put before his lordship is right, that it is a delusion and an imposture that there is this cushion or this stratum of incombustible gas near the piston, or if it is a delusion that it does the good that he says it does. He has been having the advantage during the most critical time with reference to gas engines of controlling the whole market, due to the fact that electric lighting has caused it to be very important to have an immense number of little engines in places where there is not much skill, there has been a vast demand for gas engines, the advantage of which has all gone to Dr. Otto because of that claim. Without that claim all he could say was he might have gone on and sold his engines in any numbers. He did not think there could be a case, if his case is right, in which a patentee could be more justly punished by his patent being made bad until he purged it than in this particular case. It is the widest possible claim, and a claim not in the least expressing his engine and not in the least being a claim for the engine which is contained in the fourth and fifth claims, but it is a claim for a supposed general principle, the usefulness of which is *nil* and the novelty of which is *nil*; but it is a mere laudation only, if he might say so, of a common defect in all gas engines. Then with regard to the second claim, he would only say one word. The second claim he submitted fails entirely if he could get in Beau de Rochas. Beau de Rochas' cycle is exactly the same. Beau de Rochas' cycle necessarily implies the existence of space at the end of the cylinder, and, therefore, he had no doubt whatever if he could persuade his lordship that that was sufficiently published, he should be able to upset the second claim, which would also upset the patent. The publication he proposed to put before his lordship was this. There was the copy in the British Museum; the fact that it was catalogued and remained catalogued for fourteen or fifteen years before the patent was taken out; the fact that a descriptive title of the book was in Lorenz, which is perhaps the book best known as a book of reference for French books, which was not only in the British Museum and in the reference library of the British Museum, so that it is absolutely open for consultation by the public, but was in many other libraries, and is principally used by people who consult those libraries.

Mr. JUSTICE PEARSON: I have no evidence of that kind.

Mr. MOULTON said he proposed to put evidence of that kind before his lordship.

Mr. JUSTICE PEARSON: The only evidence before me at the present moment is that, that in addition to the actual book being in the British Museum and catalogued under the name of "Beau de Rochas," it is also in Lorenz' catalogue under the name of "Beau de Rochas." I have not before me that that catalogue is reasonably even well known in this country.

Considerable discussion then took place as to the admission of this book, the learned judge finally stating that he had considered the matter very seriously in his own mind, after the first day on which

the matter was brought before him, and the question he put before himself was this: Ought I, or not, to consider it sufficient that the book is in the British Museum, in a public library, where, according to the rules of that library, it is accessible to the whole world? He had come to the conclusion that a book of that kind ought not to be considered part of the public stock of learning, unless it is there in such a way either that any person who wants to get some information on this kind of subject reasonably may be supposed to go to that part of the library and get the book, and inasmuch as the book was not in the reading-room, but in a part of the library not accessible to the public, and could only be obtained by a written order for the book, which would be a written order under the name of the author; and he thought he should be going beyond any case he knew, and far beyond the Plimpton case, if he said that such a book was a part of the public stock of knowledge. On the present evidence, he might say, he should refuse it. The learned Counsel then resumed his seat.

(To be continued.)

#### LAUNCHES AND TRIAL TRIPS.

THE screw steamer Coot, built for the Cork Steamship Company by Messrs. Wm. Gray and Co., and engaged by the Central Marine Engineering Company, of West Hartlepool, went on her trial trip, on the 20th inst., from that port to the Tyne. The principal dimensions of the vessel are:—Length, 270ft.; breadth, 37ft.; depth, 18ft. 6in., with 'tween decks laid, and having a carrying capacity of 2650 tons. She is of well-decked type, with poop aft, with handsome saloons and cabins for officers and passengers, long bridge carried forward of the foremast, and which accommodates the crew. Fitted with four hatches, four winches, Clarke Chapman's capstan windlass. The engines are on the triple expansion principle of the special type of the Central Marine Engineering Company, and similar in design to those of the s.s. Enfield, which have done excellent work on the first voyage to the Black Sea on a small consumption of coal. The dimensions of the engines are:—Cylinders, 19in., 32in., and 53in., with a stroke of 36in. They are fitted with Mudd's reversing gear, and provided with steam by two single-ended boilers of Siemens steel, fitted with Fox's corrugated furnaces. The working pressure is 150 lb. per square inch. As the ship when taken on trial was very light, having no cargo, no speed trial of any value could be made, but she ran about 10 knots per hour by the log against wind and tide with considerable rolling at times. The chief object of the trial was, however, to test the working of the engines under ordinary conditions at sea. We are informed that the engines worked admirably, and were run at 70 revolutions per minute; the long bearings which the Central Marine Company always uses were effectual in entirely preventing any sign of a tendency to "heating."

On the 20th inst. Messrs. Joseph L. Thompson and Sons launched from their shipbuilding yard, North Sands, Sunderland, the steel steamer Hubuck, built for Messrs. W. Lund and Partners, of London, for the Australian wool and passenger service. The vessel is of the following dimensions, viz.:—Length, 338ft.; breadth, 40ft.; depth of hold, 25ft. 6in., with a total displacement of about 6000 tons, having double bottoms fore and aft for water ballast, on the longitudinal cellular system. The vessel is built on the three-deck rules, and is of the highest classification at Lloyd's. The engines, which are of 1800 indicated horse-power, are being built by Messrs. J. Richardson and Sons, of Hartlepool, and are of the triple expansion type, designed to develop power for a speed of 11 knots with very economical consumption, constructed under the superintendence of Mr. A. Thomson, of the firm of Thomson and Port, of London.

The s.s. Selembría, chartered by the Falkland Islands Meat Company, has recently been fitted with cold air machinery and chambers for carrying cargoes of frozen meat on a more extensive scale than has yet been attempted. The two main forward holds, the after hold, and the 'tween decks both fore and aft, are insulated and estimated to contain about 950 tons, or 30,000 carcasses of mutton. The cold air machines are four in number, and are fixed in the forward 'tween decks, distributing the air by means of trunks to the various chambers fore and aft. As it is intended to freeze the meat on board this vessel while lying in harbour at the Falkland Islands, a portion of the 'tween deck is utilised for freezing the carcasses solid as soon as they are brought on board. The cold air machinery was supplied by Messrs. J. and E. Hall, of Dartford, the entire fitting out of the ship with the refrigerating chambers and appliances having also been carried out by them. Mr. G. A. Goodwin acted as consulting engineer for the meat company. The ship sailed about eight weeks from the commencement of the work.

On the 19th inst. the steam fishing cutter Lindsey, built and engaged by Messrs. Earles Shipbuilding and Engineering Company, Hull, for the Boston Deep-sea Fishing Company, was taken on her trial trip. The following are the particulars of the vessel:—Length, p.p. 100ft.; breadth, extreme, 20ft.; and depth of hold to top of floors, 10ft. 6in. The vessel is fitted with patent windlass worked by messenger chain from a 6in. by 10in. steam winch of Earle's special make and design. She is propelled by a set of compound engines on the triple expansion system, also made and fitted by Messrs. Earles, and having cylinders 11in. by 17in. and 30in. diameter by 21in. stroke, and supplied with steam from a steel boiler made for a working pressure of 150 lb. to the square inch. Owing to the extremely foggy weather the vessel could not be taken on the measured mile off Withernsea.

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

(From our own Correspondent.)

THE political excitement of the week has not been favourable to business. It has induced in some circles a return of a spirit of unrest, and affords buyers a further excuse for continuing to stand off the market. The year is so far opening tamely, and the demand is nothing like equal to the supply.

A new feature in trade has appeared this week in the action which has been taken by Messrs. W. and J. S. Sparrow and Co., of Bilston, a firm of long experience, and occupying an important position in the trade. Realising that selling prices are still on the decline, Messrs. Sparrow are dissatisfied with the reduction of only 5 per cent. in millmen's wages which has been declared by the arbitrator to the Wages Board. Anticipating that 5 per cent. would be the amount of Alderman Avery's drop, they, before the award came out, gave their millmen notice of a 7½ per cent. drop. The workmen have now declined to accept the reduction, and the firm have locked them out. Puddlers' wages Messrs. Sparrow are satisfied to reduce only 5 per cent., but they hold that millmen ought certainly to fall 7½ per cent. Up to the time of this dispute the firm have been members of the Wages Board. There is now some probability that, if the workmen prove obstinate, the firm will close their works and retire from trade, for they have long been complaining of the profitless prices.

The wages' dispute at Messrs. J. B. and S. Lee's Albion Ironworks, West Bromwich, continues, the mill hands continuing to resist the proposed reduction of 10 per cent. for which the firm have given notice, owing to special circumstances.

Another new feature of trade is a determination come to by Messrs. E. P. and W. Baldwin, of the Wilden and Swindon Sheet Iron and Tin-plate Works, which are situated on the borders of South Staffordshire and East Worcestershire. This firm are desirous of increasing their tin-plate manufacture, but the heavy railway rates, and the importance of being near to a cheap and plentiful

supply of steel, has together determined them not to extend their present works, but to erect altogether new works close to Newport, Monmouthshire. The rates which they have at present to pay for conveyance to the coast are about 13s. per ton to Liverpool and 17s. per ton to London. By shipping from Newport to Swansea these rates will be wholly avoided. An extensive site has already been purchased, and estimates are in Messrs. Baldwin's hands for the erection of plant and machinery. It is hoped that ultimately the new works will reach a capacity of perhaps 4000 boxes a week. A private limited liability company, under the title of A. Baldwin and Co., Limited, is being formed to run the new works, and a large capital will be invested. Some months ago the firm closed their tin-plate works in Wolverhampton, since the situation had become unprofitable.

Prices of sheets and medium and common bars are without much change on the basis of £6 2s. 6d. to £6 5s. for sheets of 20 gauge; £6 10s. to £6 12s. 6d. easy for 24 gauge, and £1 additional for 27 gauge. Common bars are £5 10s. down to £5; ordinary bars, £6; and marked bars, £7 10s. and £7.

The list of John Bagnall and Sons for the new year is:—Bars, 1in. to 6in., £7 10s.; 6½in. to 9in. flat bars, and 3½in. to 4in. round bars, £8; 4½in. to 4½in., £8 10s.; 4½in. and 4½in., £9; 4½in. and 4½in., £9 10s.; 4½in. and 5in., £10. As to rounds only, the large sizes are:—5½in. and 5½in., £10 10s.; 5½in. to 5½in., £11; 5½in. and 5½in., £11 10s.; 5½in. and 6in., £12; 6½in. and 6½in., £13. Hoops and angles are quoted £8, and rivet iron £9 to £10, according to quality. Sheet quotations are:—20g., £9; 24g., £10 10s.; and 27g., £12; but these quotations are hardly more than nominal. Boiler plates are £9, £10, £11, and £12, according to quality.

Staffordshire ironmasters are still confronted with continental competition. South of England iron merchants are now buying common bars f.o.b. Antwerp £3 15s. per ton, and after paying carriage they can get them delivered into their warehouses at sensibly under the prices which would be required for Staffordshire iron of similar make.

The manufacture of galvanised sheets is increasing, which is hardly a welcome fact in view of the already severe competition in this branch of trade. Messrs. George Adams and Sons, of the Mars Ironworks, Wolverhampton, are at the present time erecting a galvanising plant, and as the firm is one with abundance of capital and a great deal of enterprise, the new departure is likely to be a matter of some trade importance.

Works for galvanising wrought iron tubes for water purposes are also being just now erected in Wolverhampton by Messrs. Brand, who, under the title of the King's-hill Galvanising Company, already own galvanising works at Wednesbury.

In the pig iron trade, all-mine hot blast is quoted at 55s., medium qualities ranging from 40s. up to 45s., and common cinder pigs from 32s. 6d. to 35s. The current quotations of 54s. for hematites are steadily adhered to, and the Derbyshire and Northamptonshire makes realise 38s. to 40s. It is thought that the restricted output in those districts will have a tendency to strengthen Staffordshire makes.

Constructive engineers here continue to be visited by London representatives of Belgian and German makers of rolled iron joists, seeking orders in competition with the joists rolled by Messrs. Dorman, Long, and Co. The foreigners are evidently determined not to allow English makers to have the business without a struggle. They are prepared to underquote the English make.

Messrs. Dorman, Long, and Co.'s price list, for quantities of 5 tons and upwards, f.o.t. works at Middlesbrough, is for plain rolled joists, 18in. deep × 7in. × 7in., £7; 16in. × 6in. × 6in., £4 15s.; 14in. × 6in. × 6in., £4 12s. 6d.; 12in. × 6in. × 6in., and 3in. × 3in. × 3in., £4 10s.; 10in. × 5in. × 5in., and 8in. × 5in. × 5in., £4 10s.; 8in. × 4in. × 4in., and 3in. × 1½in. × 1½in., £4 10s. Rolled joists with flanges are £6 to £6 5s. per ton. Channel iron is £5 5s. to £5 15s. and on to £6 5s., according to section. Equal-sided angles, £5 10s., £5, and £4 10s., according to section; also 6 × 6 × 7, £6; and 8 × 8 × ½, £8. Square edge and obtuse angles, £5; and unequal-sided angles of 8 × 4½ × ½, £7. Plain tees are £5 10s.; bulb tees, £6 10s., £7 10s., and £8 10s.; bulb angles, £5 10s., £6 10s., and £7; bulb bars, £5, £5 10s., £6, and £7; half-round bars, solid or hollow, £5; opposite angles, £6 10s.; hatchway iron, £6 and £5 10s.; and pillar iron, £6.

The rolled iron joists are guaranteed to bear a tensile strain of 21 tons per square inch. Best best iron or steel joists are the subject of special quotations. The normal lengths in Messrs. Dorman, Long, and Co.'s list are:—Joists, up to 30ft.; angles and bulb bars, up to 50ft.; tees and channels, up to 30ft.; and bulb tees, bulb angles, and bulb bars, 40ft. The firm state that they keep a constant stock of 5000 tons at their Middlesbrough works, including all sections and various lengths.

The demand for Middlesbrough rolled joists is less conspicuous in this district than it would be but for the considerable distance which separates the two districts, and the consequently heavy railway freights. The railway charge on lots of under two tons is 30s., and the carriage on Belgian iron from Thames to Birmingham is less than this. The sizes as to which local engineers find it most to their advantage to buy of native manufacture are those of 16in., 12in., and 10in.

It is a cause for gratification to this district that during the discussion at the late meeting of the Liverpool Engineering Society, when Mr. A. J. Maginnis read his paper upon the unaccountable failure of Bessemer steel in marine boilers, prominent mention was made of the composite steel manufactured by the New British Iron Company, Corngreaves. This metal being a combination of iron and steel, is supposed to have all the advantages of both, without weaknesses of either. It was represented as being especially valuable where welding is required, this being always a difficult operation with ordinary steel.

The coal trade shows very little improvement, and the pits are all making short time. The very best collieries on Cannock Chase are realising 10s. for all deep coal; 9s. for deep one-way; 8s. for deep kibbles; and products of the shallow seams 1s. per ton less for the respective descriptions. Second-class collieries are realising 9s., 8s., and 7s. for their deep seam qualities. Staffordshire ironworks mill coal is 7s.; furnace coal, 7s. to 9s.; forge, 5s. to 6s.; and steam, 5s.

At a meeting of the Birmingham Chamber of Commerce last week, it was proposed to convene a conference of manufacturers and railway freighters to consider a scheme for improving the water communication between Birmingham and the Bristol Channel ports, more particularly for widening and deepening the canal between Birmingham and Worcester.

Many of the hardware manufacturing firms here are for the present employed upon stock in anticipation of the spring demand, and they are giving attention to the bringing out of improved patterns, or altogether new goods, for the coming season. This feature is seen particularly among the japanners and tin-plate workers.

Orders in the lock trade are arriving slowly, yet the leading firms in the brass cabinet branches are keeping their hands steadily engaged. Australia and the East Indies are the principal export markets at date, but the lines are not very large. German competition continues to be a matter of considerable complaint.

The Speedwell annual show of cycles, which was to have taken place in Birmingham on the 3rd of February, will be postponed until the 13th of March. This course has been adopted principally to suit the convenience of continental buyers, and has met with the approval of the principal makers.

A public meeting was held at Smethwick, near Birmingham, on Monday, under the auspices of the National Amalgamated Society of General Toolmakers and Machinists, to consider the depression in trade. A protest was made against the statement that the depression was in part due to the action of trades unions, and a resolution was passed pledging the meeting to sup-



port trades unionism, organisation being considered to be the only remedy for the distress.

### NOTES FROM LANCASHIRE.

(From our own Correspondent.)

*Manchester.*—Business all through the iron trade of this district continues dull, and so far the year has brought forward only very discouraging results. Trade has never recovered from the general quietness which settled over it just prior to the Christmas holidays, and the first month of the year closes with no weight of business having come forward, or with anything in prospect to encourage hopes of any early improvement. The only direction in which trade would seem to have taken a turn for the better is in the United States, but too much importance would seem to be attached to the reports of improvement which have recently been received from that quarter. Any improvement that has taken place in America has not yet resulted in inquiries being sent over here, except for a few moderate parcels of hematites, and the improvement in the United States will have to undergo considerable further development before it results in actual business being given out in this country of sufficient weight to make itself materially felt. In the meantime the home trade of this country, if it does not get actually worse, shows no sign whatever of improvement. Pig iron makers experience great difficulty in getting consumers to take deliveries of iron they have bought. There are very few of the finished ironworks that have not had to go on short time, whilst prices all round are exceptionally low, with no one disposed to buy except from hand to mouth.

About an average attendance was brought together at the Manchester iron market on Tuesday, but business all through was very flat. For pig iron some little inquiry was reported; in most instances, however, the prices offered by buyers were lower than makers cared to accept, and the actual transactions resulting were few, and small in weight. Nominally there is no very material change in the quoted list rates for either local or district brands, but when business is done buyers have to be met with some concessions, and the average basis of selling prices does not exceed 37s. 6d., less 2½, for the cheap district brands, and 38s. 6d. to 39s., less 2½, for local and the better class Lincolnshire irons, delivered equal to Manchester. For outside brands prices are extremely low. Good Scotch iron, delivered at Runcorn or Liverpool, can, taking into consideration the carriage, be bought at fully 2s. per ton under the price of Glasgow warrants, and good foundry Middlesbrough at about 40s. 4d. net cash, delivered equal to Manchester.

Hematites remain tolerably firm at about 53s. 6d. to 54s., less 2½, for good foundry qualities delivered equal to Manchester; but the business doing at present is still only small.

Rather more inquiries are reported in some quarters to be coming out for manufactured iron, but there is no appreciable improvement in the actual business doing. Orders come forward only in dribbles, and prices are cut extremely low. One or two makers are still quoting £5 5s. for bars, delivered in the Manchester district; but for good ordinary Lancashire and North Staffordshire qualities the average basis does not exceed £5 2s. 6d.; hoops, not more than £5 12s. 6d.; and local made sheets, £6 10s. to £6 12s. 6d. per ton.

In the metal market trade is in a very depressed condition, and there is keen underselling to secure any orders that are being given out. Delivered into the Manchester district, the quoted prices are about 5½d. per lb. for solid drawn brass locomotive tubes, 6½d. ditto condenser tubes, 7d. to 7½d. solid drawn copper tubes, 5d. brass wire, 7d. copper wire, and 5d. per lb. for rolled brass.

In the engineering trades the wages question still absorbs the chief attention, and during the past week further notices of reduction affecting a large number of men have been posted in this district. A combined meeting of representatives of the various trades union societies affected by the reduction has been held to consider the matter, and a resolution passed that the Employers' Association should be asked to receive a deputation composed of representatives of the various trade societies. This request has been under the consideration of the Iron Trades Employers' Association, and it is to be hoped that some arrangement may be come to by which the matter may be amicably adjusted without any disastrous struggle being entered upon between employers and employed.

Messrs. Craven Bros., of Manchester, have converted their firm into a private limited company, with the object of admitting the junior members of their families into partnership. The name of the company is Craven Bros., and the business will be carried on under the same management as before, Messrs. William and John Craven being the managing directors.

In the coal trade business generally is only dull, with pits in most cases barely working full time. The recent severe weather has naturally produced an extra demand for house fire coals, but there has been no actual pressure, whilst all other classes of fuel still meet with a very slow sale, and common steam and forge coals and inferior descriptions of slack are a drug with very low sellers in the market. At the pit mouth prices average 8s. 6d. to 9s. for best coals, 7s. to 7s. 6d. seconds, 5s. 6d. common, 4s. to 4s. 6d. burgy, and 2s. 6d. to 3s. 6d. for slack, according to quality, with one or two special sorts fetching 4s. per ton.

For shipment there has been a moderate demand, with 7s. 3d. per ton about the average figure for steam coal delivered at the high level, Liverpool, or the Garston Docks, but 7s. is taken where sellers are at all under the necessity of pressing sales.

The committee of the Manchester Coal Exchange have this week issued their report and balance sheet for 1885. There has been an increase of thirty-eight in the number of subscribers over last year, and the balance of profit has been raised considerably. The committee point out that the success attending the operations of the past year—a year marked by severe depression in trade—augurs well for the future welfare of the Exchange. The revenue account shows an income of £215, of which £212 is from subscriptions, against which there has been an expenditure of £169, leaving a balance of profit of £46, which, added to previous similar balances, brings the total balance of profit in hand to over £200. The annual meeting is to be held next Tuesday, and Mr. John Rawcliffe, of Preston, has been nominated, without opposition, to the office of president of the Exchange for the ensuing year.

*Barrow.*—There is a much better tone in the hematite pig iron trade of this district, and makers are in a better position for orders than they have been for a considerable time. The demand, especially for Bessemer iron, has improved all round, and the consumption of this class of metal is likely to increase in ratio with the improvement which from time to time takes place in the steel trade. The demand for the latter has of late improved, and makers are better sold forward than they have been for some time. The output of pig iron has been increased by the blowing in of several furnaces, and the belief is entertained that a further increase in the production will be necessary so soon as the spring season starts. Prices for iron and steel are rather higher. Iron ore has been largely sold forward in heavy parcels at fuller prices than have lately been ruling. Upwards of a twelvemonth's delivery, representing nearly 1000 tons per week, has been sold at an advance of 1s. per ton on present quotations.

A local contract for a large delivery of steel plates has been made with the Steel Company at Barrow, and it is believed this is but the inauguration of a trade for which the town and district is eminently adapted, and by which other local industries, such as shipbuilding, which at present is in a very depressed condition, will be benefited.

There is every prospect of a strike in this trade this week, owing to the notice of the masters to reduce the earnings of the workmen 10 per cent.

An arrangement has been come to between the Corporation of Barrow and the contractors for the new municipal buildings to pull down the present defective tower and rebuild it to a height of 170ft. on a better foundation. By this agreement much unnecessary legal expense and great difficulty has been fortunately avoided.

### THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

THE Yorkshire Miners' Association held a meeting at Barnsley on Monday, to decide upon a scheme of settling the wages disputes of the future. Mr. Benjamin Pickard, M.P., who is the secretary of the Association, speaking the same evening at Water, indicated the broad outline of what the miners propose. They desire to form a Board of Conciliation—nine working men and nine employers—"to discuss with freedom any question which might be brought before them." Mr. Pickard says that when that scheme is put into operation, when the working men and their employers or their representatives could meet together and take part in such discussions on common ground, without fear or favour, "there was no doubt that to a large extent the great social problem as to whether a man should be allowed to live and enjoy life in that country would be almost solved." Mr. Pickard is very confident that after that day's Council meeting, as far as Yorkshire was concerned, the days of strikes would have gone by, and, he trusted, gone by for ever. Of course, a joint committee is all right, as far as it goes, but no amount of free discussion between eighteen men will settle a wages dispute either in the coal or any other trade. What is wanted is an accepted standard price of coal, according to which wages may rise and fall as values fluctuate above or below the basis agreed upon. Any arrangement which is not automatic in its operation cannot fail to be unsatisfactory. The Board of Conciliation would be useful in settling the many minor disputes which crop up in working a colliery, and frequently lead to serious results in the management of mining property.

The strike at Messrs. Richard Hornsby and Sons, Spittlegate Ironworks, Grantham, still continues. The men have offered to resume work if they were allowed to make time and three-eighths, but this has been refused, the employers standing out for time and a quarter wages. The agricultural implement trade is not so brisk at present as it was a few months ago. Another wages dispute has occurred in this district—the Norfolk Foundry, Ecclesfield—where Messrs. Green and Co. have submitted a new price list, which the men regard as equal to a reduction of wages in certain cases. Messrs. Green disclaim any desire to lower wages, maintaining that the change is simply one of management. It is the iron moulders who are affected. The firm desire that in future moulders' castings should be priced at so much each, or set, instead of being paid for at so much per cwt. as heretofore. It is not expected that the dispute will have any serious results.

The report of the Sheffield Chamber of Commerce and Manufacturers, submitted to the twenty-ninth annual meeting on the 28th inst., deals with a number of interesting subjects. The Chamber regrets that the question of appointing a Minister of Commerce "seems to have dropped out of the range of practical politics." The Chamber state that they are still of opinion that "the benefits which must accrue to the commercial interests of the country by their being placed under the superintendence of one high official responsible to Parliament would be great." In March last, in consequence of a communication from Mr. Strachey, H.B.M.'s Chargé d'Affaires at Dresden, asking for information as to German tariffs upon Sheffield goods, and making serious inquiries as to the course of trade between this country and Germany, the Council appointed a committee to consider the matter and send to Mr. Strachey such information as they could collect. Mr. Strachey has recently issued a very interesting report upon the subject of commerce between this country and the German Empire. He has acknowledged the value of the information sent to him from Sheffield. The Chamber strongly urge the Government to persist in pressing upon Spain the claims of British commerce to be more justly treated, and they have given notice of their intention to propose a resolution at the next annual meeting of the Associated Chambers of Commerce, approving of the view of the negotiations set out by Lord Salisbury, in his despatch dated 25th July, 1885, expressing the doubt they feel that the course of conduct adopted by Spain will be persevered in, and urging the Government yet once more to enter into negotiations to secure most-favoured-nation treatment. Satisfaction is expressed at the announcement that the Government contemplate spending £1,000,000 annually, in addition to the amount usually spent, upon public works in India, and that this amount was principally to be devoted to railway construction. Railway terminal charges, railway rates and charges, rating of machinery, the Royal Commission on the Depression of Trade, and the opening up of new markets by the annexation of Burmah, are other subjects brought before the Chamber on the report of the Council, who "feel that the present depressed state of trade cannot be ameliorated more speedily than by the acquisition of new markets for the goods of the district." In conclusion, the Council regret they cannot report any improvement in the trade of the locality.

### THE NORTH OF ENGLAND.

(From our own Correspondent.)

No improvement is yet discernible in the Cleveland pig iron trade, and small lots only are being sold and purchased. Last week No. 3 g.m.b. changed hands at 31s. per ton for prompt delivery; that price being 1½d. per ton less than any accepted in recent times. At the market held at Middlesbrough on Tuesday last the feeling which prevailed was as despondent as ever. Consumers showed, however, some disposition to buy for delivery to the end of June at 3d. to 4½d. per ton advance on prompt rates, but sellers generally declined, believing they would do better when the shipping season commences. Makers are pretty well supplied with orders for the present, and keep out of the market. Merchants offer only small lots, and quote 31s. per ton for prompt delivery, and 31s. 1½d. for delivery to the end of February.

There is no great demand for forge iron, and the price remains at 30s. 6d. per ton.

Warrants are less firmly held than they were. Some holders are now willing to accept 31s. 9d. per ton, and one or two sales have even taken place at 31s. 6d.

The stock of pig iron in Messrs. Connal and Co.'s Middlesbrough store is growing rapidly. During the week ending Monday last the increase was 5355 tons, and the stock now amounts to 155,253 tons.

Shipments of pig iron have improved somewhat during the last few days. Up to Monday last 41,219 tons were exported, which is rather more than during the corresponding portion of January, 1885, but about 3000 tons short of the December exports.

There is no change in the finished iron trade, either as regards demand or prices. The plate-making firms have great difficulty in getting sufficient specifications to keep their mills going, and the suspension of work at the shipyards is affecting their interests detrimentally.

The strike still continues, and there is no immediate prospect of a settlement. Last week the men sent the following message to the employers, viz.:—"That we, the representative District Committee of the Tyne and Wear, on behalf of the members of our society in this district, do hereby request the joint employers of both rivers to allow their workmen now in the dispute to return to their work at an early date on the same terms as previous to the stoppage, but immediately after the men have started the employers in each yard to supply the various sections of men—namely, platers, anglersmiths, riveters, and caulkers—with lists setting forth the jobs on which the employers allege high rates of wages can still be earned, the masters and men to arrange the amount of reduction on each in each yard. Time wages in each branch to remain as at present." The employers considered this not very intelligible communication on Saturday last, and unanimously decided not to agree to it.

The men employed at Messrs. Bolckow, Vaughan, and Co.'s Easton blast furnaces have received notice of a reduction of wages ranging from 10 to 15 per cent.

The distress in Middlesbrough continues very great. Over 4000 persons are now in receipt of outdoor parish relief. Between 600

and 700 are in the workhouse, and between 100 and 200 are waiting to enter. About one in twelve of the population are receiving assistance in some form from the rates, and £800 per week is being disbursed in that way. The committee appointed to collect funds for dispensing cheap dinners to children and others incapable of self-support report that they have been giving away about 8000 dinners per week. At Stockton poverty prevails to almost as great an extent. Innumerable cases of pitiable destitution are reported and vouched for by unimpeachable witnesses. A woman was seen pawning her children's dresses at 6d. each, to obtain the means of procuring a scanty supply of food and fuel. Another woman had only a halfpenny-worth of bread to serve as dinner for herself and two children. These are but sample cases. There is a general outcry at the folly of men striking under such circumstances, and so throwing deliberately away much of the income which might still fall to the share of northern towns, to support their populations till better times. "Woeful want" is certainly now being augmented, if not caused, by "wilful waste."

### NOTES FROM SCOTLAND.

(From our own Correspondent.)

THERE has been a somewhat improved tone in the Glasgow iron market this week, and business has been done at prices showing an advance upon those current during the last fortnight. But the business is almost entirely of a speculative nature. The week's shipments of pigs were 6051 tons, as compared with 4725 in the preceding week, and 6422 in the corresponding week of 1885. Since Christmas the total shipments have been 21,329 tons, against 30,761 last year, and 37,754 in 1883. And not even the whole of the 21,000 is Scotch iron, as that amount includes about 2400 tons of Cumberland hematite pigs brought round to Glasgow for transshipment to the United States. The week's addition to the stock in Messrs. Connal and Co.'s store is about 2800 tons, and it is certain that a very considerable increase is taking place in makers' private yards. There is a total decrease for the present year in the arrivals of Middlesbrough pigs in Scotland.

Business was done in the warrant market on Friday at 40s. 2d. cash. The market opened dull on Monday at 40s., declining to 39s. 1½d., but afterwards becoming firmer in the afternoon, and closing at 40s. 1½d., sellers after touching 40s. 2d. On Tuesday forenoon business was done at 40s. 2d. to 40s. 3d. cash. In the afternoon transactions occurred at 40s. 2d. to 40s. 1½d. cash. Business was done on Wednesday, at 39s. 10d. to 39s. 9d. cash. To-day—Thursday—the market was quiet at 39s. 9d. to 39s. 11d., closing with buyers at 39s. 10d. cash. Cumberland hematites quoted here at 42s. 6d., and Cleveland warrants at 31s. 1½d. cash.

The demand for makers' iron for shipment is quiet, although an order for 6000 tons of pigs has been placed with a firm of Scotch ironmasters for shipment to Adelaide. The market values of makers' iron are as follow:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 45s.; No. 3, 42s. 6d.; Coltness, 48s. and 44s. 6d.; Langloan, 46s. and 44s.; Summerlee, 49s. 6d. and 43s. 6d.; Calder, 48s. and 42s. 6d.; Carnbroe, 44s. and 42s.; Clyde, 45s. and 41s.; Monkland, 40s. 6d. and 38s.; Quarter, 40s. and 37s. 6d.; Govan, at Broomielaw, 40s. 6d. and 38s.; Shotts, at Leith, 46s. and 45s. 6d.; Carron, at Grangemouth, 48s. 6d. and 45s. 6d.; Kinnell, at Bo'ness, 43s. 6d. and 42s. 6d.; Glengarnock, at Ardrossan, 44s. 6d. and 41s. 6d.; Eglinton, 40s. 6d. and 38s.; Dalmellington, 42s. 6d. and 39s. 6d.

The shipments of iron and steel manufactures from Glasgow in the past week included machinery to the value £1725; sewing machines, £4323; steel goods, £4350; and general iron manufactures, £18,000.

There has been rather more doing this week in the coal trade. There were shipped from Glasgow, 21,951 tons; Greenock, 1274 tons; Ayr, 8338 tons; Irvine, 1599 tons; Troon, 7028 tons; and Leith, 1471 tons. The demand for steam coals still continues backward; but for household qualities there has been a brisk sale. In spite there is little doing in the export market, and coal-masters report that they have only very limited orders for abroad. As in the West, however, the domestic inquiry is quite satisfactory.

A meeting of the Fife and Clackmannan Coalmasters' Price Association was held at Dunfermline a few days ago for the purpose of determining the maximum and minimum rates at which shipping coals should be sold at the different collieries. This Association has had for a number of years little difficulty in fixing the prices, but lately orders have been so scarce that some members are understood to have been inclined to do business at rates slightly below the minimum. There was a general agreement at the meeting, however, that the Association had been the means of steadying both prices and wages, and it was resolved that in the meantime the rates should be 5s. 9d., 6s., and 6s. 3d. per ton f.o.b. at Burntisland, and 3d. less at Charlestown and the other ports.

Several meetings of miners have been held in the West of Scotland. At one of these, held at Rutherglen, Mr. Small, miners' agent, stated that the average price for export coal over the kingdom was 9s. 1d., while it was 8s. 3d. f.o.b. at Glasgow. He held that the Board of Trade returns proved that the reports of dull trade were fallacious, and he urged the miners to continue their efforts to obtain better wages. It was resolved to restrict the output by keeping one idle day a week. However the matter may be over the country, Mr. Small's figures are very far from accurate with respect to Glasgow. During the past year main coal has sold at the ship's side from 5s. 9d. to 6s. 3d.; ell, 6s. 3d. to 7s. 3d.; splint, 6s. 3d. to 6s. 9d.; and steam, 6s. 6d. to 8s.

### WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

THE question of shot firing is come to the front. The danger, if any, arising can be reduced to a minimum by adopting it on Mondays and Saturdays. For getting out the necessary quantity of coal, ripping tops, &c., it is essential to continue shot firing. Another item in respect of the Mardy is the dust lying in pits, and I hear that colliery managers will resort to the new patent, which not only lays the dust of the roads but maintains a spray of water upon the sides of the pits.

The coal trade is rather dull at present. Cardiff sent away about 130,000 tons, as compared with 139,000 tons for the preceding week; but Newport, Mon., shows a decline of 9000 tons in foreign coal exports, and Swansea simply maintains the average. House coal is slacker than I have known it at this time of the year, and small steam is falling in price and demand. As for the best steam, prices remain in the low position they have so long held, and only holders of the best, who work large quantities, can be said to profit much.

As I anticipated, the Ocean Scale has declared the selling prices for the last term to warrant a reduction of 2½ per cent. The remaining, and the important scale of the Coalowners' Association, have had to declare, and colliers must be content if it be no greater. There is to be a spurt in the coal trade directly, Government orders being expected in the course of another week or two; 50,000 tons of Welsh coal are wanted for the Channel ports, and 35,000 tons for the foreign requirements.

There is also some degree of interest attached to the Greek question, and I shall not be surprised at coaling ports being well looked after.

A few shipments of steel rails took place last week principally for India, but things generally are quiet, and a month will very likely elapse before spring orders are booked.

Tin-plate is not so brisk in demand, and prices are drooping again. This is the result of a failure of the combination of masters, and not the only result. I see that stocks are accumulating. Last week at Swansea 42,414 boxes were brought down from works and 27,632 boxes shipped. The stock now amounts to 155,617 boxes, so that a falling price and an increasing stock does not augur well. Last week 1200 tons were sent to New York and 200 tons to Buenos Ayres.



AMERICAN NOTES.

(From our own Correspondent.)

NEW YORK, January 16th.

AMONG the engineering enterprises occupying the attention of manufacturers and investors, are the Government enterprises looking to the improvement of the Welland canal; the Hennepin Canal; Eads' ship railway; a new bridge across the St. Lawrence; the improvement of the Mississippi; the projected improvement of the Allegheny, and some other interior streams, besides the construction of some three or four thousand miles of railroad, intended to develop new territory, where extensive purchases of land are being made. The improvement during the past four months has stimulated investment of this character and is giving confidence to capitalists to push schemes that have been under consideration for two years or more. A great deal of money is flowing southward, where the industries are prosperous, and where manufacturing enterprises have been paying fair dividends, in iron, coal, railroad interests and cotton manufacturing. As much money will be invested in the south this year as last and in the far south-west much more. The tide of immigration is in that direction, and it is evident that in a few years real estate will be greatly enhanced, that mineral properties will be in demand, and that lumber territory will become very valuable. The investments being made in these directions are of very large proportions, and desirable land is being picked up at very low prices.

The exports from New York for the calendar year just closed foot up 330,818,693 dols.; figures for 1884, 330,861,376 dols.; for 1883, 349,442,426, dols. The highest year within eight was in 1880, when exports were 415,822,370 dols. The exports to China were 3,343,460 dols.; to Turkey in Europe, 1,331,330 dols.; to France 17,267,910 dols.; to England and Wales 137,290,303 dols. The export trade in manufactured products is slowly increasing. American agents in European and South American countries have been sending in orders since September for a greater variety of products from America, and in some cases the contracts are large. Heretofore the export trade has been of a sampling character. The iron and steel industries are growing in all markets from New York to St. Louis. The consumption of material is increasing, and in consequence a greater production can be reported in every iron making centre. The railroad managers met yesterday and decided upon higher rates on freight coming east from Chicago. Raw material has advanced, and as the supplies are not heavy, buyers are purchasing for forward requirements. Steel rails are selling at 35 dols. at mill. Old rails are quoted at 22 dols. to 23 dols. Contracts for Bessemer pig were placed this week for delivery in March. Old rails, foreign and domestic, are extremely scarce, and demand is urgent. The pig iron industry is prospering and prices are firm at 16 dols., 17 dols., and 18 dols. for forge, two and one foundry.

NEW COMPANIES.

The following companies have just been registered:—

*Craven Brothers, Limited.*

This is the conversion to a company of the business of engineers and machine tool and crane makers, carried on by Messrs. Craven Brothers at the Vauxhall Ironworks, Osborne-street, Manchester. It was registered on the 16th inst. with a capital of £104,000, divided into 660 A preference, and 1420 ordinary shares of £50 each. The subscribers are:—

- \*G. Craven, Harpurhey, engineer . . . . . 1
- \*W. Craven, Smedley House, Manchester, engineer . . . . . 1
- \*J. Craven, Smedley Lodge, Manchester, engineer . . . . . 1
- \*J. G. Craven, Harpurhey, engineer . . . . . 1
- \*W. H. S. Craven, Smedley House, Manchester, engineer . . . . . 1
- C. Craven, Smedley Lodge, Manchester, engineer . . . . . 1
- Isaac Simpson, 339, Queen's-road, Cheetham, Manchester, draughtsman . . . . . 1

The number of directors is not to be less than three nor more than five; qualification, fifty B shares. The first directors are the subscribers denoted by an asterisk. The company in general meeting will determine remuneration.

*Alfred Baldwin and Co., Limited.*

This company was registered on the 21st inst. with a capital of £50,000, in £20 shares, to carry on the business of iron, steel, and tin-plate maker, and other similar businesses. The subscribers are:—

- \*Alfred Baldwin, Wilden House, near Stockport, ironmaster . . . . . 1
- R. Birch, Langland Bay, near Swansea, steel manufacturer . . . . . 1
- \*J. Butler, Newport, Monmouthshire, steel manufacturer . . . . . 1
- \*W. Farnworth, Swindon, near Dudley, ironworks manager . . . . . 1
- W. Felton, Wilden, near Stockport, ironworks manager . . . . . 1
- H. A. Saunders, Kidderminster, clerk . . . . . 1
- J. R. Wright, Gower-road, near Swansea, steel manufacturer . . . . . 1

The number of directors is not to be less than three nor more than five; qualification, fifty ordinary shares; the first are the subscribers denoted by an asterisk; remuneration, £100 per annum.

*British Burmah Lead Company, Limited.*

This company proposes to carry on mining operations in British Burmah, or elsewhere. It was registered on the 14th inst. with a capital of £100,000, in £1 shares, with the following as first subscribers:—

- \*J. Wilson, Ingram House, Fenchurch-street, East India merchant . . . . . 1
- T. J. Lawrence, 165, Fenchurch-street, secretary to a company . . . . . 1
- W. H. Smith, 5, Wightman-road, Hornsey, solicitor . . . . . 1
- C. B. Brodie, 32, Goldhurst-terrace, South Hampstead . . . . . 1
- W. McLachlan, 20, Bucklersbury, merchant . . . . . 1
- C. M. Wilkins, M.D., 446, Strand . . . . . 1
- J. T. Jago, 1, Lombard-court, iron merchant . . . . . 1

The number of directors is not to be less than three nor more than seven; qualification, 250

shares; the first are Major-General H. A. Brown, Colonel J. F. McAndrew, and Messrs. James Wilson, J. M. Burnup, and Wm. Ogilvie Low; remuneration, £550 per annum, and an additional £100 for each £1 per cent. dividend in excess of £5 per cent. per annum.

*Clydesdale Oil Company, Limited.*

This is the conversion to a joint-stock company of the business of the Clydesdale Oil Company, trading at Manchester and elsewhere, as oil merchants, refiners, crushers, and exporters, and as dealers in tallow and other fatty substances, and also as commission and general merchants. It was registered on the 19th inst. with a capital of £50,000, in £10 shares. The subscribers are:—

- L. B. Page, 32, Macfarlane-road, W. cashier . . . . . 1
- G. J. Kembal, 3, Woodgrange-road, Forest-gate, clerk . . . . . 1
- D. Grandison, 25, Cricketfield-road, Hackney Downs, commercial traveller . . . . . 1
- C. A. Ward, 4, Belle Vue-terrace, Leytonstone, commercial traveller . . . . . 1
- J. Rogers, 28, Marine-street, Bermondsey, book-keeper . . . . . 1
- E. Parsons, 29, Marine-street, Bermondsey, oil refiner . . . . . 1
- T. McSweeney, 9, Leighton-terrace, Bermondsey, manager of an oil refinery . . . . . 1

Most of the regulations contained in Table A of the Companies' Act, 1862, apply to the company.

*Droskyn and Ramoth Tin Mining Company, Limited.*

This company proposes to acquire concessions for working mines situate at Perran Porth, in Cornwall. The property being situated within the jurisdiction of the Stannaries Courts, the company was duly registered at Truro on the 12th inst. with a capital of £30,000, in £1 shares. The subscribers are:—

- Wm. Palmer, Elmstead, Chislehurst . . . . . 10
- John Allen, 99, Cannon-street, merchant . . . . . 10
- Wm. Newton, 11, Mitre-court-chambers, Temple
- George Smith, West Bank, Lewisham . . . . . 1
- Everingham Smith, 7, Martin's-lane, E.C., chartered accountant . . . . . 1
- C. Coleman, 32, St. George's-road, Regent's Park, clerk . . . . . 1
- F. W. Porter, Grahsmere, Sundorne-road, Charlton, secretary to a company . . . . . 1

The number of directors is not to be less than three nor more than seven; qualification, 100 shares (first directors excepted); the subscribers are to appoint the first and act *ad interim*. Remuneration, £100 per annum to each director.

*Botten's Patents, Limited.*

This company was registered on the 16th inst. with a capital of £2000, in £10 shares, to purchase letters patent, dated 2nd September, 1884, granted to Henry Botten, for the manufacture of improvements in stopping bottles. The subscribers are:—

- J. L. Cooper, 144, St. Paul's-road, Camden-square, accountant . . . . . 1
- A. Martin, 28, Bellefield-road, Brixton, clerk . . . . . 1
- H. Freeman, 37, Hetherington-road, Clapham, clerk . . . . . 1
- A. T. Bell, 14, Griffiths-road, Wimbledon, secretary of a building society . . . . . 1
- T. Hitch, 102, Birchanger-road, South Norwood, wine merchant . . . . . 1
- J. Cowen, Lewisham, clerk . . . . . 1
- W. Davis, 6, Cottrell-road, Hackney, clerk . . . . . 1

Registered without special articles.

*Drypool and Marfleet Steam Tramways Company, Limited.*

It is proposed by this company to construct tramways in the parishes of Drypool and Marfleet, the township of Southcoates, and the parish of Garrisonside, and elsewhere in Hull and the East Riding of Yorkshire, and to work the same by means of steam, electricity, horse, or other motive power. It was registered on the 15th inst. with a capital of £12,000, in £10 shares, with the following as first subscribers:—

- \*John Fisher, Garrisonside, Hull, timber merchant . . . . . 20
- \*F. B. Grottrian, 188, High-street, Hull, merchant . . . . . 20
- \*J. Stuart, 22, High-street, Hull, seed crusher . . . . . 20
- \*H. H. Briggs, Postern-gate, Hull, shipowner . . . . . 20
- Henry Webster, governor of H.M. Prison, Hull . . . . . 1
- Henry Hodge, 6, High-street, Hull, seed crusher . . . . . 1
- R. Jameson, Queen's Dock, Hull, timber merchant . . . . . 1

The number of directors is not to be less than three nor more than seven; qualification, £200 in shares or stock; the first are the subscribers denoted by an asterisk. The company in general meeting will determine remuneration.

*National Inventors' Association, Limited.*

On the 8th inst. this company was registered with a capital of £1000, in £1 shares, to take over the business, property, and liabilities of the National Inventors' Association, and to conduct the business of patent agents in all branches. The subscribers are:—

- J. Gramousky, Lower Broughton, manager . . . . . 1
- J. Downham, Bury, Lancaster, machinist . . . . . 1
- J. Quarmby, Chorlton-on-Medlock, agent . . . . . 1
- J. T. Turner, Broughton, Manchester, traveller . . . . . 1
- L. A. White, Chorlton-on-Medlock, Manchester, factor . . . . . 1
- E. A. King, 5, Victoria Bridge, Manchester, manufacturing electrician . . . . . 1
- W. B. Shorland, 25, Albert-street, Manchester, estate agent . . . . . 1

Table A of the Companies' Act, 1862, will apply.

*Isleworth Brewery, Limited.*

This company proposes to take over the brewery business carried on at the Isleworth Brewery, Isleworth, Middlesex, by Mr. William Farnell Watson. It was registered on the 15th inst. with a capital of £300,000, in £20 shares. The subscribers are:—

- \*W. F. Watson, Isleworth, brewer . . . . . 1
- \*Francis Sich, Chislewick, brewer . . . . . 1
- \*R. Moss, Southampton, brewer . . . . . 1
- \*R. C. Garton, Kingston-hill, brewer . . . . . 1
- T. Nash, The Pirs, Hounslow, brewery manager . . . . . 1
- N. Wootton, Brewery House, Isleworth, clerk . . . . . 1
- C. W. Collins, 11, Queen Victoria-street, chartered accountant . . . . . 1

The number of directors is not to be less than three nor more than five; qualification, £1000 of

nominal capital; the first are the subscribers denoted by an asterisk; remuneration, £300 per annum, or such other sum as the company in general meeting may determine.

*Queensland Quicksilver Estates, Limited.*

This company proposes to carry on mining operations, power being also taken to acquire lands for colonisation and agricultural purposes. It was registered on the 16th inst. with a capital of £400,000, in £1 shares. The particular property which the company contemplates acquiring is not referred to in the memorandum and articles of association. The subscribers are:—

- J. T. Edmunds, White House, Telegraph-street, secretary to a company . . . . . 1
- G. Chapman, Martell-road, West Dulwich, commission agent . . . . . 1
- T. G. Evans, M.R.C.S., 26, Ledfield-road, Green-lanes, N. . . . . 1
- H. M. Guillemeard, 3, Copthall-chambers, E.C. . . . . 1
- J. Wright, 23, Colebrooke-road, Walthamstow . . . . . 1
- P. L. Elms, 13, Weston Villas, Crouch-end . . . . . 1
- A. A. E. F. Burrow, 446, Strand, sub-editor "American Register" . . . . . 1

The number of directors is not to be less than three nor more than nine; the subscribers are to appoint the first, and are to act *ad interim*; remuneration, 5 per cent. of the profits, provided that the maximum remuneration be equal to £500 per annum for each director, and the minimum £150 per annum each. If the profits are not sufficient for the payment of the latter amount, the same will be paid or made up out of the assets of the company, irrespective of profits.

*Welsbach Incandescent Light Company, Limited.*

This company proposes to acquire the benefit of an invention of Dr. Carl Auer von Welsbach for incandescent lights, and any letters patent obtainable in respect thereof. It was registered on the 15th inst. with a capital of £30,000, in £1 shares. The subscribers are:—

- \*C. T. D. Crews, 88, Throgmorton-street, stock-broker . . . . . 1000
- \*T. Uzielli, 49, Fitzjohn's-avenue, Hampstead . . . . . 500
- C. H. Fellen, Queen's Wood, Eltham . . . . . 2500
- G. Huggins, 2, Draper's-gardens, stockbroker . . . . . 500
- \*A. Casella, 1, Wetherby-road, South Kensington 100
- A. C. Sebag Montefiore, 14, Throgmorton-street, stockbroker . . . . . 100
- Allan Marriott, 125, Seven Sisters-road . . . . . 50

The number of directors is not to be less than three nor more than seven; the first are the subscribers denoted by an asterisk, and Mr. Frederick de la Fontaine Williams; qualification, shares or stock of the nominal value of £100; remuneration, £1500 per annum.

*Irish Home-Manufacture Association, Limited.*

This company proposes to encourage the native industries of Ireland, and to carry on such trade or manufactures as may be peculiarly advantageous to its members. It was registered on the 18th inst. with a capital of £5000, in £1 shares. The subscribers are:—

- W. H. Lalor, 79, Berkley-street, Liverpool, book-keeper . . . . . 1
- F. Graham, Moorfields, Liverpool, commercial traveller . . . . . 1
- W. J. Miller, 4, Mount Vernon, Liverpool, merchant tailor . . . . . 1
- C. Brown, 13, Balkan-street, Liverpool, book-keeper . . . . . 1
- T. Corry, 101, Dale-street, Liverpool, traveller . . . . . 1
- J. Lecomber, 12, Mount Pleasant, Liverpool, watch manufacturer . . . . . 1
- E. J. Pitman, 15, Whitechapel, Liverpool, pianoforte dealer . . . . . 1

The number of directors is not to be less than five nor more than twelve; qualification, ten shares; Mr. William Henry Lalor is appointed managing director.

PRODUCTION OF COBALT IN THE UNITED STATES.—The amount of cobalt oxide made in 1884 was 2000 lb., as against 1096 lb. made in 1883. Its value, at 2 dols. 55c. per lb., was 5100 dols. The value of cobalt ore and matte cannot be ascertained, as it is chiefly dependent on the nickel contents.

LOCOMOTIVE INSPECTION.—There's Pete Simons. He's one of those old fellows that's pulled the throttle for thirty years. Learned his trade forty years ago, and had to do all his own repairs when he first began to run; and somehow he can't get over it. Well when he gets in, it means business. He gets out with a hammer and wrench and torch, and I don't believe there's a nut or bolt between the nose of the pilot and the back bumper he don't try before he gets through. But Pete is always in trouble. You see, he began to run on the old Spartan, you can see her down in the lower roundhouse now, and though she was called a crack engine in her day, she never made a trip that she didn't have to be tinkered up. So Pete thinks his big 18 x 24 is just the same, and he frets and fumes about her valve motion and running gear till the foreman of the machine shop dodges out of sight every time Pete sticks his head inside the door. He knows there's nothing the matter, but Pete says there is. Pete rather had the wind taken out of him a little while ago. He was having lots of trouble with his side rods, and never made a trip but he had them down, and got a man out to file his brasses. At last the boss got track of it, and came out to see what was up. He took off the strap and slipped the brasses over the pin, and whaled the key down tight, and bless your soul they were as solid as a rock, and lacked a sixteenth of coming together. "Well," said he, "I guess I'll bore those out instead of filing off." So he had the brasses all fitted up first-class, and then he told Pete that if he found out that those keys had been touched he'd cut his—Pete's—head off on the spot. Pete tried to get in a word, but the boss meant business and Pete knew it. Well you'd a' died laughing to see Pete inspect that engine. He'd crawl underneath, look over everything just the same, and then come out and look at those rods. He wanted to drive the keys, or file the brasses, but he'd only shake his head kinder mournful like, and put on his coat and go home. How did the rods run? Oh, first-rate, ran a year, when the engine was brought in for repairs; but Pete thought they ought to have been filed every trip.—*American Journal of Railway Appliances.*

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

Applications for Letters Patent.

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

19th January, 1886.

- 788. ATTACHING MATTRESSES TO BEDSTEADS, F. R. Baker, Birmingham.
- 789. BOXES FOR CARRIAGE AXLE-TREES, J. G. Harrison, Birmingham.
- 790. STEERING APPARATUS, W. J. Williams, New Brighton.
- 791. ICE CHAMBER FISH CARRIER, W. Burgess, Malvern Wells.
- 792. UTILISING WATER POWER, J. Howarth, Manchester.
- 793. RAILWAYS, J. Whitley, Leeds.
- 794. FLUSHING DRAINS AND OTHER PIPES, A. Thomas, West Cowes.
- 795. RAG ENGINE BOTTOM PLATES, C. Crookes, London.
- 796. LIFT FOR COVERS OF JUGS, &c., R. Waycott, Paignton.
- 797. SODA-WATER MACHINERY, &c., J. P. Jackson, Liverpool.
- 798. GAS MOTOR ENGINES, C. W. King, Southport.
- 799. VENTILATING HALLS, CHURCHES, &c., G. Hurdle, Southampton.
- 800. REELS FOR HOLDING FABRICS, C. Longbottom, Bradford.
- 801. SPRINGLESS SELF-ADJUSTING DOORS, A. Pilling, Bury.
- 802. FIREPROOF CASING, R. and J. Dempster, Halifax.
- 803. GAS STOVE, J. G. Dimelow, C. Parkin, and W. Stelfox, Manchester.
- 804. ROUGH PLATE GLASS, J. Scott, Durham.
- 805. ORNAMENTATION OF GLASS, W. Jukes, and W. J. Kershaw, Birmingham.
- 806. EXTINGUISHING FIRES, H. J. Allison.—(P. L. Patmer, U.S.)
- 807. INDICATING SPEED, W. Chadburn and G. Smith, Liverpool.
- 808. LOCK NUTS, &c., J. Trippett and T. Searls, Sheffield.
- 809. TREATING THE SURFACES OF ASPHALT, &c., J. Hadfield and J. Trippett, Sheffield.
- 810. LUBRICATORS, J. T. Hedley, Newcastle-upon-Tyne.
- 811. GAS MOTORS, D. Clerk, Glasgow.
- 812. INTERCEPTING AND GREASE TRAP, A. Hill, Manchester.
- 813. INCREASING THE TRACTIVE POWER OF LOCOMOTIVES, E. A. Muskett, Enfield.
- 814. UTILISING THE JOLTING MOTION OF ROAD AND RAILWAY CARRIAGES TO GIVE MOTION TO ADVERTISEMENTS, D. T. Gordon, Barking.
- 815. PREVENTING LOSS OF BEER, &c., H. T. Larty, London.
- 816. DECORATIVE NAIL, A. Drake and C. Hassan, London.
- 817. NIGHT-DRESSES FOR FEMALES, T. H. Cumberland, London.
- 818. TYPE-WRITERS, T. D. Wortall, London.
- 819. LOCKING NUTS ON BOLTS, H. C. Sheldon, London.
- 820. DECORATING WOOD, LEATHER, &c., C. Jensen, London.
- 821. STUDS, &c., L. P. Conard, London.
- 822. PORTABLE PUMPS, J. H. Brown, London.
- 823. AUTOMATIC BOILER FEEDERS, H. J. Haddan.—(W. R. Baird, U.S.)
- 824. GOVERNORS FOR STEAM ENGINES, H. J. Haddan.—(M. R. Goding, U.S.)
- 825. TRACTION ENGINES, L. C. Taber, London.
- 826. BOLT-HEADING MACHINES, F. Phillips, London.
- 827. RAILWAY TRAIN SIGNALS, E. Restieaux, Llanelly.
- 828. BARBERS' CHAIRS, W. H. Osborne and T. W. Garrett.—(T. A. Koch, United States.)
- 829. FLUSHING WATER-CLOSET PANS, J. G. Stidder, London.
- 830. VENTILATORS, R. Boyle, London.
- 831. MACHINERY FOR MAKING PAPER BAGS, F. C. Belcher, London.
- 832. PRINTING ON STRIPS TO BE MADE INTO BAGS, F. C. Belcher, London.
- 833. MOULDS FOR PASTRY, G. F. Redfern.—(E. Lafond, Belgium.)
- 834. COUPLING FOR ROLLING STOCK, W. A. Butrows, London.
- 835. BALL BEARINGS FOR HEAVY VEHICLES, H. H. Leigh.—(C. D. de Saint-Sauveur, France.)
- 836. PAPER FOR BANK NOTES, W. S. Hodgkinson and F. Lee, London.
- 837. APPARATUS FOR CONVEYING PASSENGERS, B. Wainmaley, London.
- 838. LADDERS, B. Ramsden, London.
- 839. LUBRICATORS, P. M. Justice.—(A. Lambert, Belgium.)
- 840. CANDLE SAVER, S. Washington and T. Green, Manchester.
- 841. PLUG FOR TOBACCO PIPES, J. M. Baines, Manchester.
- 842. VENTILATING FANS, W. W. Wardle and M. Shillito, London.
- 843. SAFETY ATTACHMENT FOR BICYCLES, H. H. Lake.—(E. H. Foote, United States.)
- 844. PROPULSION OF SHIPS, H. H. Lake.—(H. C. Bender, United States.)
- 845. SHOES OR SLIPPERS, H. H. Lake.—(The American Novelty Shoe Company, United States.)
- 846. KEYS FOR LOCKS, H. J. Allen, London.
- 847. PREPARING PLASTIC MATERIALS, N. Spyer.—(The Aquila Fibre Company, United States.)
- 848. RING SPINNING, R. Chalmers, Glasgow.
- 849. RULING LINES IN BOOKS, H. Salisbury, London.

20th January, 1885.

- 850. PARING THE HEELS OF BOOTS AND SHOES, J. E. Cutlan, Wellingborough.
- 851. MARINE VENTILATION OR PUMPING, A. Bakewell, London.
- 852. PRODUCING CERTAIN PARTS OF BRAKE IRONWORK, J. G. Harrison, Birmingham.
- 853. SPECTACLE, F. Moore, Edgbaston.
- 854. BOTTLES AND STOPPERS, C. I. and A. F. Bell, London.
- 855. ORNAMENTING POTTERY, &c., J. Willdigg, Hanley.
- 856. SQUARE-BOTTOMED PAPER BAGS, G. Anderson and F. D. Bumsted, Birmingham.
- 857. ATTACHING METAL PINS TO PORCELAIN, &c., Knobs, R. Hartshorn, Birmingham.
- 858. CISTERNS FOR WATER-CLOSETS, &c., W. Towler, Leeds.
- 859. PHOTOGRAPHIC ROLLER SLIDE, J. T. Chapman, Manchester.
- 860. CARTOLEUM, L. H. Goggs, London.
- 861. SPIRAL SPRING, T. F. Veasey.—(J. Lancaster, United States.)
- 862. STREAM ENGINES, T. Casey and G. C. Swindells, Manchester.
- 863. TENSIONING WIRE SPOKES OF BICYCLE WHEELS, E. C. Clarke, Derby.
- 864. SHUTTLES, D. Morrison, Glasgow.
- 865. ASBESTOS LAMP WICKS, F. M. Mole, Birmingham.
- 866. FLEXIBLE TUBING, S. Alley, Glasgow.
- 867. HORSEHOSES, S. Skerritt, Sheffield.
- 868. BOX FOR PREPARING SALT, C. Gaul and T. Wolstenholme, Bradford.
- 869. VALVE OF STOP COCKS, G. H. Kendall, Halifax.
- 870. OVEN FOR BAKING BREAD, F. P. and G. S. Tunks, Newport.
- 871. COMBINED COUCH AND CHAIR, S. Osborn, London.
- 872. PRODUCING SULPHUROUS ACID IN SOLUTION, P. Thomas, London.
- 873. DRIVING BANDS, &c., J. and A. Firth, Sheffield.
- 874. PREPARING COTTON, &c., B. A. Dobson and W. I. Bromley, Manchester.
- 875. ATTACHING UMBRELLA RIBS, G. R. Adams and R. S. Barie, Dundee.



- 876. MUZZLES FOR DOGS, A. M. Butterfield, Bradford.
- 877. NOBLES' COMBING MACHINES, J. B. Sharp and S. Metcalfe, Bradford.
- 878. ENTWINING LACES FOR FASTENING BOOTS, J. Smith, Stoke-upon-Trent.
- 879. VELOCIPEDS, W. Smith and G. Hicking, London.
- 880. BRUSHES, R. C. Willis, London.
- 881. FINISHING LABELS FOR ORNAMENTING COTTON, &c., J. Watson and Sons, Manchester.
- 882. LAMP HOLDER FOR BICYCLES, J. M. Starley, Coventry.
- 883. INDICATOR LOCKS, S. S. Phillips and S. Wise, London.
- 884. DRIVING SPINDLES FOR SPINNING, &c., M. Astle, London.
- 885. DESIGNS FOR BRACKETS, &c., G. R. Halse, London.
- 886. PUMPING ENGINES, F. W. Stoker, London.
- 887. BUTT STRAPS FOR CONNECTING THE PLATES OF SHIPS, D. Purves, Surrey, and J. T. Milton, Kent.
- 888. BOTTLES AND STOPPERS, T. Herb, London.
- 889. REPLENISHING OIL OF SPIRIT LAMPS, C. E. Wallis, London.
- 890. SHEARING MACHINES, &c., L. Delaloe, London.
- 891. JOINT FOR PIPES, C. E. Hodges, London.
- 892. TRANSFERRING DESIGNS TO ARTICLES OF POTTERY WARE, W. de Morgan, London.
- 893. HOLDERS FOR INCANDESCENT ELECTRIC LAMPS, A. Swan, London.
- 894. FOLDING CHAIRS, A. E. Mannering, London.
- 895. AXLE-BOXES OF VEHICLES, E. Edwards.—(P. Mourgues, France.)
- 896. BOOTS AND SHOES, E. Edwards.—(H. Taverner, Belgium.)
- 897. MOVING BEDSTEDS UPON FLOORS, E. Edwards.—(J. Pusch, France.)
- 898. PURIFYING FEED-WATER, J. A. Guy, London.
- 899. CAMERA LENS, S. D. McKellen, Manchester.
- 900. PURIFICATION OF FLUIDS, A. G. Salamon, London.
- 901. STEAM GAUGES, U. Melachrin.—(M. Melachrin, Egypt.)
- 902. APPARATUS FOR REFRIGERATING LIQUIDS, T. Curtis, Glasgow.
- 903. MANUFACTURE OF SULPHURIC ACID, F. B. Rawes, London.
- 904. BOTTLING WINE, &c., E. F. Goransson, A. Jacobi, M. Elliot, and H. Mattsson, London.
- 905. DOOR-LOCK SPINDLES, T. Young, London.
- 906. APPARATUS FOR RECEIVING COIN AND THE AUTOMATIC DELIVERY OF GOODS IN EXCHANGE THEREFOR, C. H. Russell, London.
- 907. SEPARATING SOLID IMPURITIES FROM LIQUIDS, A. Howatson, London.
- 908. IRONING MACHINES, C. H. Felton, London.
- 909. MOTOR APPARATUS, H. H. Lake.—(E. Friedrich, Austria.)
- 910. HANDLE ATTACHMENTS FOR SIEVES, J. Gilbert, jun., London.
- 911. DISHES OR TRAYS FOR PHOTOGRAPHIC PURPOSES, F. Hazeldine, London.
- 912. WASHING PHOTOGRAPHIC PLATES, F. Hazeldine, London.
- 913. EXPOSING SENSITIVE PAPER TISSUE OF FILMS IN ROLLER SLIDES, S. D. McKellen, Manchester.

- 972. INDUCING MOTION IN FLUIDS, G. Stevenson, Airdrie, N.B.
- 973. SWITCH FOR ELECTRIC LAMP, T. and H. Bayley, Walsall.
- 974. ECONOMIC BELL BATTERY, A. Allmack, St. Oswalds.
- 975. HOLDER FOR INK AND PENCIL ERASERS, H. P. Boulnois, Southsea.
- 976. WASHING MACHINERY, J. M. Smales, London.
- 977. NAILS, J. Nichols, Birmingham.
- 978. SNOW GUARDS AND SHIELDS, &c., J. S. Edge, jun., Birmingham.
- 979. REGULATING FANLIGHTS, W. Leggott, Bradford.
- 980. COGGING, &c., MILLS, J. Spencer, T. Doughty, and C. Robertson, Glasgow.
- 981. REGULATING SKYLIGHTS, W. Leggott, Bradford.
- 982. SCREW GILL BOXES, G. W. Douglas and J. Shaw, Bradford.
- 983. PICKING STRAP, J. Wilkinson, Bradford.
- 984. TESTING CARD FLATS, E. Tweedale, Halifax.
- 985. FRONCS OF HARROWS, J. McKenzie and A. J. Tuckey, Cork.
- 986. SHIPS' STEERING GEAR, J. S. Clark, Baytown-in-Furness.
- 987. STOP WATCHES, W. Jenkins, Birmingham.
- 988. MEASURING PIECE GOODS, F. Thorman and C. Bender, London.
- 989. STEAM TRAPS, J. Y. Johnson.—(Messrs. Körting Brothers, Germany.)
- 990. KITCHEN RANGES, J. W. R., and R. Green, Sheffield.
- 991. STOPPERING AERATED WATER BOTTLES, G. J. Chambers, London.
- 992. KEYS FOR WINDING TIME-KEEPERS, F. Buckley, London.
- 993. COMBINATION ELECTRIC BELL AND HOOK, S. P. Weston, London.
- 994. GAS AND FLUID PRESSURE REGULATORS, W. Key, Glasgow.
- 995. VICES, C. Neil, London.
- 996. GAS REPORT MOUTHPIECES, &c., G. Waller, London.
- 997. ACOUSTIC TELEPHONES, Messrs. Corder, Allen, and Co., London.
- 998. GUN CARRIAGES, H. C. E. Malet and A. Myall, London.
- 999. RAILWAY ROLLING STOCK, A. J. Boul.—(J. Meyer-Fröhlich, Switzerland.)
- 1000. ATTACHING SMOKE PROTECTORS TO CHANDELIERS, J. C. Cleland and W. Earp, London.
- 1001. SMOKE CONSUMING FURNACES, &c., A. J. Boul.—(G. A. Heiser, Germany.)
- 1002. BOOTS AND SHOES, J. W. Jones, London.
- 1003. REVOLVER CASE FOR PINS, A. A. Olivier and E. Lucy, London.
- 1004. SEPARATING CREAM FROM MILK, L. V. E. Moller, Copenhagen.
- 1005. LUBRICATING &c., SPINDLES, J. Dodd, Manchester.
- 1006. FURNITURE CASTORS, E. Newman, London.
- 1007. AUTOMATICALLY SOUNDING ALARMS, J. O. Spong, London.
- 1008. APRON, M. Wilson, London.
- 1009. LEATHER BRAKE BLOCK, C. C. Horsley, London.
- 1010. TRANSPARENT WINDOW TABLETS, J. Brand, London.
- 1011. DRY ELECTRIC BATTERY, A. Rettich, London.
- 1012. WATCHES, W. H. Beck.—(M. S. Haasfeld and F. H. Galuszka, France.)
- 1013. SECURING LAMP GLOBES ON THEIR SUPPORTS, A. Rettich, London.

23rd January, 1886.

- 1014. PREVENTING SET OFF ON PRINTING MACHINES, C. T. Watson and B. Thompson, London.
- 1015. BAKERS' OVENS, G. Wilkinson, Manchester.
- 1016. DISTILLATION OF COAL, &c., H. Kenyon, Manchester.
- 1017. OVENS OF RETORTS, H. Kenyon, Manchester.
- 1018. TAPS OR VALVES, C. Shorrook, Halifax.
- 1019. PROVIDING FACILITIES FOR THE RAPID ESTIMATION OF THE REFRACTION OF THE HUMAN EYE, C. E. Fitzgerald and G. Prescott, Dublin.
- 1020. SOLITAIRE COLLAR STUD, &c., G. H. Harrison, Birmingham.
- 1021. METAL TIPS FOR BOOTS AND SHOES, J. S. Crowley, Manchester.
- 1022. ARTIFICIAL TEETH, J. Hooton, Manchester.
- 1023. PICTURE NAILS AND RESTS, H. Munslow, Birmingham.
- 1024. SCRAPING PAVEMENTS, &c., J. and W. Wright, Bradford.
- 1025. BILLIARD CUE REST, S. J. Burroughes and E. J. Surl, London.
- 1026. LUBRICANTS, R. Hutchison, Glasgow.
- 1027. SEPARATING PRECIOUS METALS FROM LEAD, T. J. Greenway, Sheffield.
- 1028. TELEPHONE RECEIVER, E. H. Andreoli.—(J. Boisset, France.)
- 1029. LAMPS, G. Asher and J. Buttress, Birmingham.
- 1030. TRAIN STAFFS FOR RAILWAYS, &c., B. D. Wise, Belfast.
- 1031. MONEY-CHECKING APPARATUS, J. P. Lakin, Harborne.
- 1032. FEEDING PAPER TO PRINTING MACHINES, F. Hoyer, Liverpool.
- 1033. PADDLES FOR BOATS, W. Foster, J. Crawford, and E. E. Hoyle, Newcastle-upon-Tyne.
- 1034. ELECTRICAL CONDUCTORS, G. Sutton and W. T. Henley's Telegraph Works Company, London.
- 1035. FOLDING BATHING RECEPTACLES, S. C. Neal, London.
- 1036. SCREWS, SCREW-BOLTS, AND NUTS, E. Hawks, Glasgow.
- 1037. PREVENTING, &c., INCORUSTATION IN BOILERS, J. L. Wade, Glasgow.
- 1038. MARINERS' COMPASSES, E. Bisson, London.
- 1039. DOOR LOCKS, C. F. Veit, London.
- 1040. COATING SHEETS, &c., WITH TIN, &c., E. Morewood, Llanelly.
- 1041. OIL CANS, J. Walker, London.
- 1042. SUPPLYING THREAD TO NEEDLES, H. J. M. Mellor and H. M. Foulds, London.
- 1043. WORKING SIGNALS AT SIDINGS, &c., H. O. Fisher, London.
- 1044. ELECTRICAL INSULATORS, J. E. Griffith, London.
- 1045. COUNTING OR OTHER REGISTERING DEVICE, T. Cuttriss, London.
- 1046. BREAD AND BISCUITS, J. Montgomerie, Glasgow.
- 1047. DEVICES FOR ATTACHMENT TO HORSESHOES, J. Hay, London.
- 1048. AMMONIA, &c., FROM AMMONIUM CHLORIDE, L. Mond, London.
- 1049. AMMONIA, &c., FROM AMMONIUM CHLORIDE, L. Mond, London.
- 1050. CARBONATES OR BICARBONATES OF SODIUM OR POTASSIUM FROM THEIR SULPHATES, W. Bramley, London.
- 1051. BOILER TUBES, C. Wickstead, London.
- 1052. LETTERS, &c., FOR SIGN-BOARDS, A. J. Boul.—(R. Baumann, France.)
- 1053. CONTINUOUS FILTRATION, G. H. Leame, London.
- 1054. PLATES FOR ELECTRIC BATTERIES, J. H. Noad, London.
- 1055. SHIP'S STEERING APPLIANCE, A. Zillwood, London.
- 1056. ORNAMENTAL DECORATIONS, E. Smith and F. Smith, London.
- 1057. FASTENER FOR PAPERS, &c., A. Cox, London.
- 1058. LUBRICATING BEARINGS, N. Rix, London.
- 1059. STREAM BRONCHITIS KETTLES, E. Peel, Manchester.
- 1060. BLANKS FOR CARTRIDGE CASES, &c., A. Jullien, London.
- 1061. LYE FOR THE MANUFACTURE OF PAPER, G. F. Redfern.—(J. Ubertin, Corsica.)
- 1062. SAND BLAST PROCESS, J. B. Stone and F. W. Hindson, London.
- 1063. DELIVERING CIGARS, J. Breeden, London.

25th January, 1886.

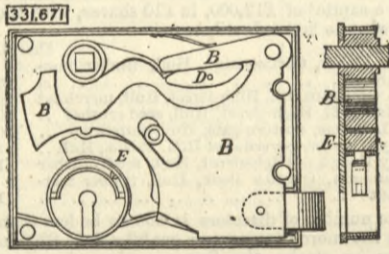
- 1064. TEMPLES TO LOOMS, A. Shaw, Manchester.
- 1065. SCREW-CUTTING LATHE, J. Shaw, T. Harrison, and W. Shaw, Bradford.

- 1066. PROVIDING AGAINST OVER-PRESSURE OF A FLUID BY USING A GLASS RECEIVER, A. H. Haigh, Eastbourne.
- 1067. GALVANIC BATTERIES, T. Calk, Malvern Link.
- 1068. ATTACHING STAMPS, &c., TO LETTERS, &c., H. Becker and H. Mellin, Birmingham.
- 1069. SAFETY BUFFER FOR SHIPS, L. Lihn, Rhenish Prussia.
- 1070. HANGING TOASTING FORKS, C. Lee and W. E. Hart, jun., Wolverhampton.
- 1071. DAMPER FOR PIANOFORTES, T. E. Harley, Manchester.
- 1072. CYCLES, Howe Machine Company and T. Hill, Glasgow.
- 1073. SELF-FASTENING BUTTONS, W. N. Taylor, Ilkley.
- 1074. NUTS, A. H. Lane, Birmingham.
- 1075. SERVICE CISTERNS, A. Deas, Glasgow.
- 1076. TREATING NOXIOUS GASES, H. Fewson, Buckingham.
- 1077. TOUCH REGULATOR FOR PIANOFORTES, E. A. Sydenham, Scarborough.
- 1078. LOCKING POINTS, SWITCHES, &c., W. H. Elliott, Tipperary.
- 1079. TINS FOR PRESERVED FOOD, &c., J. Henderson, London.
- 1080. LAWN TENNIS APPARATUS, J. Penketh, London.
- 1081. BOTTLE STOPPERS, T. E. Harper, South Weald.
- 1082. SAFETY EXPLOSIVE, G. V. Jameson, London.
- 1083. SHIPS FOR DEPOSITING SEWAGE, &c., AT SEA, S. J. Mackie, London.
- 1084. STAND FOR CARDS, &c., C. Potter, London.
- 1085. BOOTS AND SHOES, W. T. Hooker, London.
- 1086. PAINT, F. Wendling, London.
- 1087. COMMODES, E. Stuekert, London.
- 1088. MACHINES FOR MORTISING, &c., H. Hunting and A. Telfer, London.
- 1089. EARTHWARE, &c., IN CONNECTION WITH WATER-CLOSET CISTERNS, A. Shaw, Longton.
- 1090. COVERING WIRE FOR ELECTRICAL PURPOSES, J. A. Spurling and S. S. Bromhead, London.
- 1091. STONE SAWS, J. Peckover, London.
- 1092. PIANOFORTES, GRADUATING AND SILENCING THEIR TONES, O. Inray.—(J. I. Birch, France.)
- 1093. FIRE ESCAPE, A. C. Gloyd, London.
- 1094. DOUBLE LOCK-STITCH SEWING MACHINES, W. von Pittler, London.
- 1095. FACING, &c., METALS, G. Waller, London.
- 1096. INCANDESCENT ELECTRIC LAMPS, B. J. B. Mills, London.
- 1097. SHIPS' PROPELLERS, B. J. B. Mills, London.
- 1098. COUPLING, &c., RAILWAY TRUCKS, &c., C. Wroot and J. W. Woodthorpe, London.
- 1099. MECHANICAL TELEPHONES, O. Shinner, London.
- 1100. COMBINED SCISSORS, &c., F. G. Sudgen, London.
- 1101. COMPOUND ENGINES, J. A. Rowell, London.
- 1102. EXTRACTING SPELTER, W. Tooth, London.
- 1103. STOVE CURTAIN SCREEN, A. E. Walker, London.
- 1104. PENCIL SHARPENERS, A. J. Boul.—(W. H. Lamson, U.S.)
- 1105. STRAIGHTENING NEEDLES, &c., G. M. Eames, London.
- 1106. BOATS, &c., W. H. Daniels, London.
- 1107. FORKS FOR HAY, &c., W. Hassell, Liverpool.
- 1108. SUBSTITUTE FOR CAOUTCHOUC AND INDIA-RUBBER, A. M. Clark.—(J. J. Haug and C. Hoffman, Russia.)
- 1109. EXCAVATING APPARATUS, J. Shanks and J. G. Lyon, London.
- 1110. PIPE COUPLINGS, J. Y. Johnson.—(L. Etienne, France.)
- 1111. WINNING COALS IN MINES, C. Burnett, London.
- 1112. DRILLING HOLES, C. Burnett, London.
- 1113. SOAP, R. and J. E. Park, Glasgow.
- 1114. POTATO SHOVELS, A. Wait, Glasgow.
- 1115. WRINGING MACHINES, W. Buchannan and J. McLennan, Glasgow.
- 1116. HAIR NET FOUNDATIONS FOR WIGS, F. Page, London.
- 1117. SEPARATING LIGHT AND HEAVY SUBSTANCES, H. Seck and H. Simon, London.
- 1118. COMBINED THROTTLE AND GOVERNOR VALVES, W. R. Lake.—(T. R. Pickering, United States.)
- 1119. THROTTLE VALVES, W. R. Lake.—(T. Pickering, United States.)
- 1120. BOOTS AND SHOES, J. L. Hodgkins, London.
- 1121. CARPETS, RUGS, &c., W. and W. C. Green and J. Nicholls, London.
- 1122. KNITTED PANTS, J. C. McGeorge, Dumfries.

SELECTED AMERICAN PATENTS.

(From the United States' Patent Office official Gazette.)

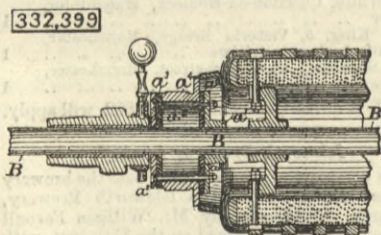
331,671. LOCK AND LATCH COMBINED, John A. E. Anderson, Lebanon, and Jacob Gushwa, Lafayette, Ind.—Filed March 13th, 1884.  
 Claim.—In a weight lever lock latch, the combination of a single weight lever B, formed, as shown, with



arm B1, and projection e, knob lever C, intermediate lever D, and segmental locking tumbler E, having recesses in its periphery, substantially as set forth.

332,399. COMMUTATOR FOR DYNAMO-ELECTRIC MACHINES, Charles D. Jenney, Indianapolis, Ind.—Filed July 20th, 1885.

Claim.—(1) The combination of a commutator in which the conducting parts are slotted, an armature the ends of the wires of which lead to and enter said slots, and a non-conducting covering wound over the outside of said ends of wires, substantially as set forth. (2) The combination in a commutator of numerous insulated parts, each of which has a projecting portion, the end of which is slotted, said slots being of slightly less diameter than the armature wires, whereby said armature wires when placed therein will



be flattened and held into close and permanent contact therewith. (3) The combination in a dynamo-electric machine of the armature and the commutator, said commutator being constructed substantially as specified and provided with slots to receive the ends of the wires of the armature, and a wrapping or covering over the ends of said wires, whereby dirt is kept therefrom and from the interior of the armature. (4) The combination of the shaft B, metallic plates or discs a1 and a2, securely mounted on said shaft, insulating discs a3, numerous metallic parts a4, secured between said insulating discs and separated by sheets of insulating material, each having a tooth-like pro-

jection which enters said insulating discs, and the bolts a5, passing through from one of said metallic plates to the other and securing the whole together.

332,308. COUNTERSINK, George R. Valentine, New Bedford, Mass.—Filed October 1st, 1884.  
 Claim.—The countersink having, in combination with its drill-holding tube bore, the semi-elliptical and

332,308

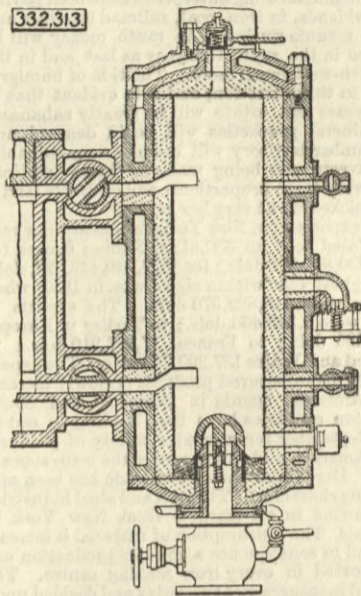


countersinking grooves, and the diametrically-crossing strip slots, substantially as and for the purpose herein specified.

332,313. GAS ENGINE, Stephen Wilcox, Brooklyn, N.Y.—Filed May 22nd, 1885.

Claim.—(1) A gas engine containing a working cylinder, a combustion chamber separated therefrom, and an intermediate induction valve chest to which

332,313

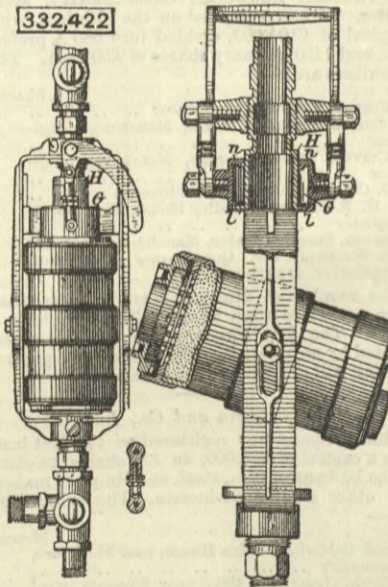


said parts are connected, whereby the valve is in pendently located so that it may be removed without disturbing the adjacent parts, and also water-jacketted for its special protection. (2) In a separate combustion chamber of a gas engine, the combination of the main or the auxiliary air supply with an auxiliary gate, whereby combustion is maintained while the engine is still. (3) A burner for gas engines, consisting of a head having a central air passage, an annular oil passage, a cap covering said passages, and an external absorbent, said cap being capable of automatic action by the pressure of the air.

332,422. FILTER, William Neracher, Cleveland, Ohio.—Filed February 19th, 1885.

Claim.—(1) In combination with a water supply pipe, a frame connected to the pipe, a reversible filter mounted in said frame, movable endwise therein, and between the ends of the supply and discharge pipe, combined with movable connections for forming water-tight joints between the filter and the pipe at one end and fixed connections at the other, substantially as described. (2) In connection with a water supply pipe, a frame connected to the pipe, a reversible filter mounted between the ends of said pipe on

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trunnions working in elongated bearings in said frame, combined with a fixed seat at one end, a movable seat at the other, and a lever for operating the parts carrying the movable seat, whereby the water-tight joints are formed, substantially as described. (3) In combination with the frame and reversible filter mounted in trunnions, which turn and slide in said frame, a fixed seat and packing at one end, a guided ring G and its seat fitted to the packing of the filter, the flange n on said ring and a flange l on the pipe section H, said ring being provided with operating levers, all substantially as described.

PRODUCTION OF CEMENT IN THE UNITED STATES.—About 100,000 barrels, of 400 lb., of artificial Portland cement were made in 1884, or 10,000 barrels more than in 1883; the total value, at 2 dols. 10c. per barrel, being 210,000 dols.

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