THE RATING OF MACHINERY.

A QUESTION of very great interest to ironmasters, engineers, machine and tool makers, and others who employ machinery largely in their business, has been exciting no little agitation in Hunslet and the Leeds district generally. The last valuation of the Hunslet Union was made in 1873-4 by the late Mr. Newsam, of Leeds. As new property has been erected within the union, it has been valued and assessed in the usual way, and at this moment the rateable value of the union is £195,987. The overseers, thinking that the time had come for a second valuation, engaged Messrs. Hedley and Sons, of Sunderland, to revalue the mills, ironworks, machine works, collieries, railways, and canals. These gentlemen have departed from the course which has been customary in Hunslet and other manufacturing districts. They have been guided, it appears, by a judgment delivered by Lord Chief Justice Cockburn, Mr. Justice Mellor, and Mr. Justice Lush, in January, 1878. Mr. James Laing, a shipbuilder at Bishopwearmouth, appealed against a valuation made in 1875 by Messrs. Hedley and Sons, on behalf of the overseers, for the purposes of assessment. Messrs. Hedley had included in their valuation punching machines, shearing machines, lathes, drilling machines, saw benches, and steam hammers. The judges held that certain rules had been established by previous decisions, and it appeared to them, after having carefully considered the character of the machinery in question, that the whole of it, though part might be capable of being removed without injury to itself or the freehold, was essentially necessary to the shipbuilding business, to which the appellant's premises were devoted, and must be taken to be intended to remain permanently attached to them as long as these premises were applied to their present purpose. Their lordships practically held that the case was covered by the decisions they had quoted, and gave judgment for the respondents. The appeal was not carried further, and, so far as authority goes, their lordships' decision appears to be the law with regard to the assessment of machinery. Applying this principle for the first time to the valuation in Hunslet, Messrs. Hedley and Sons added largely to the rateable value, and caused wide-spread dissatisfaction in that union. Some idea of the difference made at several of the Hunslet establishments will be gathered from the following figures:—Messrs. John Fowler and Co.'s present amount is £2472 1s. 8d., under the new it is £5640; Messrs. Kitson and Co. are raised from £1583 to £5388; Messrs. Taylor Bros. and Co., £2240 12s. 6d. becomes £3563; Messrs. Hathorn, Davey, and Co. rise from £391 to £891; and so on. It will be seen that the excess in the valuation is simply monstrous, not only in large, but in all establishments. The increase in seven cases is more than the entire assessment on the old basis. In one instance—Messrs. Kitson and Company—the increase is more than double the whole amount at which they are at present assessed, while in another typical instance, one firm previously assessed at £154, suddenly find £371 added to that value. It is impossible to suppose that there can have been any such remarkable increase in the value of the property to the proprietors as to justify such an arbitrary advance. Of course, the abrupt change in "value" is entirely due to the new method of assessment, to which the parties concerned naturally object most strenuously. There has also been a considerable increase in the valuation of collieries, railways, and canals.

When the firms found their valuations increased from £11,000 to £22,570, it was time to make a bold stand. With other firms they employed a solicitor to look after their interests, Mr. T. Simpson, who had an interview with the Assessment Committee. Mr. Hedley showed every desire to afford information as to the principle on which his firm had gone in their method of rating. In principle the classification was thus:—In Class 1 were included tools, the foundations of which are built in the soil, or which are otherwise so attached to the freehold as to become incorporated with it—for example, steam hammers. Mr. Simpson, on the part of the appellants, admitted that that class of machinery was rateable, and that it was incorporated with the property, and had really become part of the freehold. The machinery which they claimed should be exempted from rateability had been classified as follows:—Class 2 (*a*): Heavy tools resting upon a platform or base, either of stone or concrete, held rigid by bolts and nuts—driven by belts. 2 (*b*): Light tools resting on the floor and held rigid by bolts and nuts; also driven by belts. Class 3 (*a*): Tools standing upon the floor and not held rigid by bolts or otherwise. 3 (*b*): Tools of this class with power attached—the source of the power being loose as well as the tool—and having steam or hydraulic power supplied to them by a pipe. Class 4: Tools not falling within the above classes, but for which exemption is claimed. They have special features which are set out against each tool. Mr. Simpson pointed out that the machinery in Class 2 was not like boilers, or engines, or fixed shafting, which had manifestly become a part of the freehold, but was merely held in its position for the accommodation and convenience of those using it. In Class 3 they get to a division which he should have thought would never have entered into valuation at all, namely, machines or tools which stand on the floor and were perfectly loose. The only connection between these machines and the freehold was a belt which might be thrown over the drum, and which could be removed at any moment. Class 3—*b*—had this peculiarity about it: in order to get the motive power, a small pipe was attached through which hydraulic or steam power was conveyed. It was no more a part of the machine than a small india-rubber pipe attached to a gas pipe formed part of a gas standard. They also claimed exemption in Class 4, because it included tools which ought not to be rated at all. In addition to the points urged by Mr. Simpson, the machine makers of Hunslet, submitted that their position was not analogous to that of the Bishopwearmouth shipbuilder. In that case the judges were guided by the fact that the appellants admitted that the machinery rated was permanently fixed to the freehold, while in the valuation at Hunslet had been included loose machinery and plant temporarily fixed, and not incorporated with the permanent buildings.

So strong is the feeling against the new system of rating, that at a further meeting of the Assessment Committee, one member—Mr. Pearson—moved: "That this Committee does not feel inclined to test the principle of rating machinery, and that Messrs. Hedley and Son be instructed to prepare a valuation on the principle of £4 per horse-power." This practically meant a return to the old system, Mr. Pearson remarking that the new principle was not followed in ninety-nine cases out of a hundred. Mr. Hedley insisted that the valuation had been made in accordance with the law on the subject. When custom was at variance with the law, custom had to give way. He differed from Mr. Pearson as to the number of unions which had adopted the system. Movable machinery was rated in Durham, Northumberland, Glamorganshire, and other counties in England and Wales. The principle of simply assessing the horse-power was unjust to the small manufacturers, who had to use larger engines than were absolutely necessary for the amount of their business. To do this would be monstrously unfair, while to adopt any other course than that to which Laing's case pointed would be illegal. Mr. Hedley was pressed to mention a single instance where looms were rated; but he could not mention at the moment a union where this was the case, remarking that he was not acquainted with the principle of valuation followed in Lancashire. His firm, however, were about to make a valuation for the West Derby Union, and it was their intention in that case to press the adoption of the new principle. It was pointed out that there was at present £8000 worth of mill property empty in the district, and the question was asked, who would be likely to occupy it if the rates were increased? Mr. Pearson read a law report in which it was stated that in Lancashire machinery was always treated as chattels, which might be removed from the premises. In connection with the case he referred to, ten valuers were examined at the trial, each one of whom stated it was the custom to rate movable machinery. He added that when the Hunslet Assessment Committee engaged Messrs. Hedley and Son to make a new valuation, they had not the slightest idea that a new principle would be introduced. Members of old committees had informed him that if it had been known such a course would have been followed, Messrs. Hedley would not have been employed. The upshot of it all was that a vote was taken, when it was resolved by five to four to return to the old system of rating, *i.e.*, £4 per horse-power.

It is evident, however, that the engineers and manufacturers of the kingdom have not heard the cost of this new system of rating. Thanks to the courageous and intelligent resistance of the Hunslet firms, the experiment has been repulsed there; but it is certain to be tried elsewhere, and the attempt, whenever made, should be stubbornly resisted in the general interest. It is understood that action is being taken by the manufacturers in Northumberland and Durham to test the legality of assessing machinery. It is almost a pity that the Hunslet Assessment Committee have "harked back" so readily, as a test case would then have been taken, and the whole rating system might have been settled. One point is pretty clear: The manner in which valuers are paid is open to the objection that it does not encourage a minimum valuation. On inquiry at the Union Offices, Hunslet, we were informed that the arrangement with Messrs. Hedley and Son is that they shall be remunerated by commission on the rateable value as settled. Of course there is nothing unusual in this arrangement, and we are not assuming for one moment that this consideration would weigh with gentlemen of the high professional standing of the Sunderland firm; we simply state the fact that the principle of payment by commission is open to the objection that it gives the valuers, whoever they may be, a direct interest in a high valuation. Messrs. Hedley and Son have taken the clear ground throughout that they are following the strictly legal course in rating machinery; and to all inquiries of the Hunslet firms or their solicitors they have been candid and straightforward in every respect.

While at the Union Offices we had the curiosity to examine the list of members of the Hunslet Board of Guardians. Their occupations are as follow:—File cutter, confectioner, licensed victualler, innkeeper, grocer, milk dealer, brick manufacturer, four farmers, felt manufacturer, pawnbroker, timber merchant, quarry master, colliery manager, flax spinner, auctioneer and valuer, "gentleman," and two J.P.'s—*ex officio*. The Assessment Committee itself consists of a confectioner, colliery agent, timber merchant, two farmers, a file cutter, felt manufacturer, innkeeper, and brick manufacturer, with the two J.P.'s—who reside at Oulton Hall. Not one of the engineers or machine-makers, or any of the large manufacturers of Hunslet who bear the great bulk of the rates, is on the Board. Hunslet itself is divided into three wards, and is represented on the Board by the file-cutter, confectioner, licensed victualler, innkeeper, grocer, milk dealer, brick manufacturer, farmer, felt manufacturer, and pawnbroker—all most estimable and worthy persons in their own calling, no doubt, but the Board would surely be none the worse of a sprinkling of the large manufacturers, on whose shoulders fall the weight of the union taxation. The chairman is Mr. Hargreaves, the colliery agent, and the vice-chairman is Mr. Pearson, who is president of the Trades' Council. The elections are fought on political lines, the "colour" of the candidate being considered of more consequence than the status he has in the union, or his capacity for office. If the large employers of labour desire to check these attacks on capital—which must inevitably injure labour—they should put themselves to the trouble of mingling in the elections, and thus correct the error at the fountain-head. Men in business do not care to worry about local offices; yet there is no way of protecting themselves, except by taking pains to be in a position to prevent their interests being imperilled. By the skin of their teeth, as it were—by a majority of *one*, thanks mainly to the sensible course taken by Mr. Pearson, after the employers had made it clear they meant to fight—the rating of machinery is, for the time, abandoned; but what assurance is there that the attempt may not be renewed at "some more convenient season"—say when another "boom" moves the stagnant waters of business in the leading industries of England?

DETERMINATION OF CARBON IN IRON AND STEEL WITH THE AID OF STEAD'S CHROMOMETER.

THE difficulties hitherto met with in determining accurately small quantities of carbon may be removed, according to Stead, by a method employed by him, and which rests on the solubility of the coloured substance formed by the action of dilute nitric acid on iron or steel in potash or soda solution, as well as in the circumstance that the alkaline solution possesses a two and a-half times deeper colour than the acid liquid.

To conduct the proposed operation we require a normal nitric acid solution of specific gravity 1·20, and a normal soda solution of specific gravity 1·27, and we proceed as follows:—1 gramme of iron or of steel, as the case may be, is placed in a beaker of about 200 ccm. contents, and covered with a watch-glass with 12 ccm. of the normal nitric acid, and is to be heated to about 90-100 deg. C., whereby the solution takes place in about the space of ten minutes. In the same way normal iron of known percentage of carbon is to be treated, and then to each experiment 30 ccm. of hot water and 13 ccm. of soda solution is to be added. After a good shaking each is to be diluted to 60 ccm., filtered through a dry filter, and a portion of each to be compared with the others by pouring it into a tube of glass, so that each quantity, when looked down into from above, has the same hue. If, for example, in one tube there are 50 mm. of the normal solution—of a steel of known composition—and the steel to be examined contains just half as much carbon, it will be necessary to employ 100 mm. of that solution to produce the same amount of colour; the carbon constituent, in fact, acts in inverse quantity in the solutions which are to be compared.

As regards the influence of the duration of the treatment with sulphuric acid, it has been found by experiment that the colour is not materially affected when the digestion is a prolonged one; it is, however, convenient and advisable, even when the solution takes place rapidly, to continue the treatment for ten minutes, for the action on the coloured substance, at first formed, is not entirely completed under that time.

In order to test the influence exerted by the amount of nitric acid employed, five experiments were made, in which 12, 15, 18, 21, and 25 ccm. of acid were respectively employed, and it was found that while 6 ccm. of excess of acid does not materially affect the result, a larger excess decidedly reduces the colour.

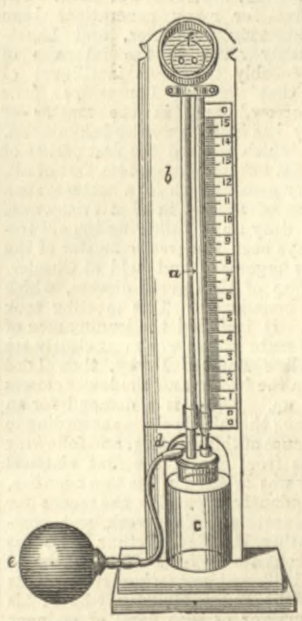
In order to test the influence of a greater or less excess of the soda solution, four specimens of a soft steel were dissolved in the usual way, and to them were respectively added 13, 15, 18, and 21 ccm. of soda solution, whereby it was found, as has already been stated, that 13 ccm. is sufficient to dissolve the colouring matter; by employing a less amount some of it is thrown down with the iron sesquioxide.

As by the acid method small quantities of hydrochloric acid materially affect the result and the test is of no value, being untrustworthy, it appeared important to test the effect as regards the alkaline method. Four experiments with a specimen of steel showed that the presence of chloride exerts no influence; nitric acid, on the other hand, even in small quantities, checks the formation of the colouring substance which is due entirely to it.

If a steel containing much carbon be heated to a red heat and then quenched in water, the steel so treated gives, by the coloration test, a weaker colour than it would have done before being hardened. If the amount of carbon is low, the difference is relatively less, as the following results show. A number of specimens of iron and steel were heated to a red heat and cooled. The examination before and after this treatment gave the following results:—

	Percentage.	
Soft steel..	0·168	Difference 0·010
,, hardened in cold water.. ..	0·158	
,, hardened in hot water	0·168	
Stafford square iron rod	0·110	Difference 0·010
,, ,, ,, hardened.. ..	0·100	
,, hoop-iron	0·069	Difference none.
,, ,, ,, hardened.. ..	0·069	
Soft steel..	0·077	Difference 0·006
,, hardened	0·071	

Although iron and soft steel are seldom hardened before they come to be analysed, it is satisfactory to know that even in such a case the analysis is not useless. From repeated experiments with the new method it has been found that certain steel gives a much yellower coloration than others do, and that this arises from the existence of two different coloured bodies, which can be separated, and may be prepared in an almost pure condition. One is bright yellow, like potassium chromate; the other is of a dark brown-red. In certain steels the one is in excess, in others the other. It is to be hoped that further investigation may throw light on the constitution of soft and hard steels.



As regards the comparison of the coloured liquids, two methods may be employed. Either we act, as we did before when the acid method was in use, by diluting the dark-coloured liquid till the same intensity of colour is shown in a unit of space; the diluted volume is then to be noted, and the amount of carbon read off in tenths of a per cent. for a cubic centimetre. In the alkaline method, however, it is better to use the second method as above described, and directly compare the intensity of colour of the undiluted solution by measuring the lengths of two columns. For this purpose the apparatus shown in figure is adapted. It consists of two parallel tubes, *a* and *b*, of any desired diameter, one of which, *a*, is narrowed 23 cm. from the upper end, and is open both at top and bottom. The lower end goes through a cork of caoutchouc to the bottom of the bottle *c*, of about 120 ccm. capacity, which contains the normal solution. A second tube *d* of narrow diameter communicates through the stopper valve with the flask with the air-ball *e*. Close over the narrowed part of the first tube *a* there is a small glazed porcelain cylinder, as well as at the closed lower end of the second tube, about 23 cm in length, so that by being placed parallely the distance of the upper open end of the surface of the porcelain cylinder is equally great. The normal tube is graduated from 0·01 — 0 : 15, and when used a little mirror is brought at an angle of 45 deg. above the open end of the tubes.

To carry out a comparison we bring the solution to be tested into the second tube *b* up to a given mark, and then pump up, by squeezing the ball, the normal solution into first tube *a* so far that the coloration of the two tubes appears equal in the mirror, and then we read off the height of the normal solution, which gives the amount of carbon in the iron or steel under investigation in per cents.

THE SOCIETY OF ENGINEERS.

PRESIDENT'S ADDRESS.

(*Concluded from page* 117.)

In history it is found that those nations most active and successful in war turn with greatest ardour to the pursuits of peace; and after the great European struggle which terminated with the exile of the first Napoleon, England, released from her absorbing care in those great events, commenced a development of her trade and resources which soon left her without a rival. The times were most auspicious. A young Queen sat on the throne of these kingdoms, whom Heaven in its goodness still preserves to reign over our favoured land; and with her Consort, a man of sound common sense, and a deep student of political economy, her Majesty devoted untiring attention to everything that could encourage the development of all the resources of her wide dominions. To second such enlightened views prevailing in the highest quarters, there was a people whose aggressive instincts had been diverted from the prosecution of a tremendous war to the pursuits of peace. Free from national anxieties, while honoured and respected throughout the world, it became a matter for no astonishment that trade of every kind increased with surprising rapidity, and the prosperity of our nation seemed to attain the zenith of its most ambitious hopes. The researches of scientific inquirers were abundantly rewarded by nature unfolding her choicest secrets to their ardent gaze. Literature and art also flourished in the wake of successful trade, and it seemed as if an era of peace and prosperity was dawning on the world. No proof is now necessary that a very different condition of things prevails at the present time; for, instead of peace, we hear more of war; and instead of prosperity, all the music of the land is in the minor key. There is disquiet abroad and discontent at home; and even our real riches and prosperity are made a cause of croaking and despondency by weak unmanly spirits among us, men immeasurably inferior to those who laid the foundations and reared the fabric of our country's greatness. Following the example and profiting by the experience of England, other nations endeavoured, successfully, to enlarge the boundaries of their trade; not, however, in the fearless open-handed way in which England did not disdain to exhibit even her processes of manufacture, in the Great Exhibition of 1851, but in a mean and timid exclusiveness, characteristic of conscious weakness—afraid to let manufactures stand on their own merits with those of other countries, and taxing their own countrymen to prop up a system which could not stand without such adventitious aid. In Germany, along with prohibitive tariffs, a somewhat different course was adopted, even when that great empire was divided into many small principalities, in uneasy antagonism among themselves. These Governments devised and carried out very thorough systems of education, and sent their journeyman apprentices to extend their travels beyond the confines of their own country. These young men came in great numbers to England, and being subsidised by their own Governments, they were able to work for less wages than our own people required, and being also docile and intelligent, they readily secured positions which gave them a thorough insight into the methods by which our trade was carried on. This experience enabled them, on returning home, or setting up on their own account, to reap great advantages from their English apprenticeship. Their education also gave them a better start than English youths of corresponding age; and the practical outcome of the competition we have had to meet from other countries has been to draw particular attention to the education of those who are to be engaged in trades in our own country, and compelling us to neglect no longer the warning voices of those who foresaw and endeavoured to supply a better system of technical education many years ago. Indeed, so great has been the reaction that many timid people nowadays are inconsiderately rushing to the somewhat absurd conclusion that all our former plans by which England became so prosperous must have been wrong, and all we can do now is to admire and slavishly imitate a system which answers well enough in Germany, but is not necessarily adapted to a people like our own, of very different temperament. Rather ought we to choose good points out of the Continental systems, and engraft them upon the well-proved standard which educated our forefathers so wisely and so well. We should also remember the born instinct for engineering pursuits which prevails amongst the English race, more than among any other on the globe; and take care to cultivate the originality, and guide the inventive genius of our people rather than adopt a hard, unyielding, semi-military educational system, destructive of both. The northern parts of England have for many generations been the chief seats of its manufacturing industries, and Lancashire is the county most keenly alive to the interests of trade; and in native talent probably the most intelligent of all. It has been well said that 'where Lancashire leads to-day, England follows to-morrow,' and in the matter of education this particular county has been in nowise behindhand. The rapid progress in prosperity which marked the first period of the Victorian age from 1837 to 1851 affected Lancashire first of all, and led to the expression of a very general wish for a better system of education. The then leaders of society in that aristocratic county admirably fulfilled their duty; and following the old traditions that the Church has always been the great educator of the people, an imposing meeting was organised and held at Chester, under the presidency of the bishop of that great diocese, which then included Lancashire in its boundaries. This meeting took place on the 25th January, 1839. It included the leading men of Cheshire and Lancashire, and its main object was most clearly set forth in a speech made by the late Earl of Derby, then Lord Stanley. He said that "between the higher and the lower classes there is a great gap to be filled up. There is a demand for an improving scientific education among the middle classes according to the march of science." In consequence of this meeting, and following upon such important statements from one of the first classical scholars of his day, a deep interest was aroused in the two counties, and subscriptions flowed in abundantly to provide the means for a comprehensive scheme of education. The work was commenced at once, and my late father, the Rev. Arthur Rigg, was appointed to arrange and carry out its details. The college at Chester was opened in the year 1842, and my father received its keys from the hands of the present Prime Minister, who in his green old age remains the last survivor of that band of eminent men who gave the great impetus to practical education more than forty years ago. The schools were continued and gradually developed "with such an amount of useful and practical knowledge as may qualify the boys in an eminent degree for agricultural and commercial employments." In 1843 the diocesan report states that "many articles of furniture had been made by the boys in the intervals between their school hours," and the evidence of neighbouring manufacturers gave encouragement to the system of education, as they stated with considerable acumen, that if a knowledge of the combinations of machinery were taught in those districts, a very important lesson would be taken towards raising the moral and intellectual character of our artisans. Many different trades were practised at the college, and again and again did her Majesty's inspectors testify that the knowledge gained in these workshops was more valuable than any other, and that—in 1850—they knew of no other place where such instruction could be gained.

In 1851 the tendency of the school towards the teaching of mechanical engineering became more pronounced; Mr. E. A. Davidson, the first science teacher educated by the Department of Science and Art, had taken charge of the instruction in geometrical drawing and orthographic projection, not only in Chester, but in the great works of the London and North-Western Railway Company at Crewe. The workshops and laboratory were enlarged, and chemistry, under the care of Professor Crookes—now F.R.S.—with other sciences, received their due share of attention. In 1862 a demand for engineers in India had arisen, and certificates of residence at the College, Chester, were "accepted by the Secretary of State for India from candidates for appointments, as if they had passed an equal time under a civil, mechanical, mining, or telegraph engineer," and large numbers of engineers now scattered over many lands received their education there. When its founder retired in 1869, after the arduous labours of thirty years, this, the first engineering school in England, ceased to exist; and the only memento of his work now to be seen at Chester is an admirable marble medallion, which has been erected last year in the college chapel by numbers of his former engineering pupils. The novel and unique educational system thus carried on at Chester caused the school to be visited by numerous Englishmen and foreigners interested in the subject. It thus served as a pattern and encouragement for others, and things have now reached such a pass, that now there is hardly a school for boys or girls of the smallest pretensions that does not teach science of some sort. Numerous schools now exist in London and the provinces, where admirable instruction is given in the principles and practice of engineering, both civil and mechanical. At King's College in the Strand, University College in Gower-street, at the Crystal Palace, and in the Technical Schools in the City of London, there are classes devoted to these subjects; while in the provinces at Owens College, Manchester, the Hartley Institute, Southampton, and the Corporation College at Nottingham, and other places, technical education is carried out: so that the younger generation of Englishmen cannot fall short of those advantages which may possibly have been one of the reasons that have enabled foreigners to run them so close. For an exclusively engineering education the chief place must be assigned to the College at Cooper's Hill, now opened for the education of all engineers, not specially of those destined for India. With schools so numerous and so good, some might be disposed to think that the older system of apprenticeship to engineers has become unnecessary, but no error could be more damaging to its victim; for do what you will, a school can never supply the experience necessary for practical life. Where, indeed, is such experience to come from? Not from the pupils or students, for they are often ignorant of the art of learning. Neither are books fit instructors of the many-sided requirements of ordinary life; and, however clever the professors, it is physically impossible for one among many to teach them as much as they will learn when they occupy a corresponding position scattered and isolated among others. The conclusion we are forced to come to is that no final training can ever be so good as carrying out works under the guidance of an engineer engaged in the ordinary affairs of his profession. A school is a world in miniature, and as far as a child resembles a man, the comparison is just; but it must not be carried further, and the best that any school can do is thoroughly to ground its pupils in general principles, and give them an insight into the best methods of their application. An engineer has to administer the perfect laws of nature, and although these are described in text books as unchanging and unchangeable, yet so hard and fast a condition of things is very far removed from what actually prevails. All these laws are subject to modification by external influences, and no mathematician can calculate, nor can any array of figures convey to the mind, their infinite variety. If, for example, we take a law so definite and absolute in its dominion as the attraction of gravity, a law which affects the limitless boundaries of eternal space, equally with the irresistible attraction, no microscope reveals, which holds together what we call the atoms of solids, we soon find that there are other laws equally universal, which may override the attractions of gravity. Centrifugal force, heat, and chemical affinity alike limit its extent, and a clear insight into all natural laws reveals how easy it is for us to regulate material things exactly as our varying needs require, without in the least denying their potency or curtailing their universal sway. The architect and civil engineer need only consider the statical properties of immovable bodies, while the studies of a mechanical engineer must include the whole range of their dynamical relationships. These greatly modify his methods and practice, and may indeed be regarded as placing him on a higher standing from a scientific point of view. Then, again, intruding into the domain of matter and motion, chemistry enters more largely than formerly into the education of an engineer, and there is no other science to which he is more deeply indebted.

If we consider the few elementary substances with which an engineer has to deal, they are found beyond all other endowed with the most unexpected and even contradictory qualities. These elements are four in number—oxygen, hydrogen, carbon, and iron; and without trespassing into pure chemistry, or wearying your patience with what is after all an adjunct of engineering, I think we may briefly consider what are some aspects of those substances so important to an engineer, and what some of their peculiarities. Oxygen, the main support of life, while also the cause of its decay and ultimate destruction, combines with every other substance, and may be called the haven of rest, or indeed the "Nirvana" of all material things. The comparatively small amount free in our atmosphere, is the residue from those imposing conflagrations which ushered in the present order of things, together with what has been rescued from its combinations by the strangely mysterious power of sunlight. With nitrogen, itself the most inert of gases, and oddly enough the essential ingredient of explosive compounds, oxygen forms the most corrosive of acids, while in combination with hydrogen it is the purest and most useful substance we know. In its higher allotropic form of ozone, chemistry itself seems defeated in assigning limits to its protean character. In water we have a marvellous and most unlooked-for development of powers and qualities of which not a trace can be found in either of the gases of which it is composed. A liquid unique amongst all others, possessing the highest known specific heat, and familiar to us in three conditions, it becomes the most convenient means for transmitting heat and utilising the chemical energies taken from the atmosphere countless ages ago by the sun, and locked up for our present use in the most perfect of "storage batteries." If we notice in passing the combinations of hydrogen and carbon, it is only to remark how the engineer who is concerned with gasworks must devote great care and attention to their study, and how of late years his colleague the chemist has positively made the bye-products of gas-making a source of greater profit than the hydro-carbons with which our streets and dwellings are illuminated at night. Carbon is perhaps, without any exception whatever, the most wonderful substance of which we possess any knowledge. At once the most permanent of all things, and the one which unchanged endures the most intense heat we can produce—that of the electric arc—this substance combines so easily with oxygen as to be readily burnt in our fires, and thus to it we owe most of what renders life supportable. And yet its affinities are so admirably adjusted, that during the combination of a hydro-carbon with oxygen, as may be readily seen in an ordinary candle flame, the hydrogen is first consumed, and raises the carbon to such a temperature that its solid unchanged particles illuminate the feeble glow of the hydrogen flames before they themselves are changed into an invisible harmless gas. In blast furnaces this singular adjustment in the affinity of carbon for oxygen at different temperatures is made to play an important part. Those metallic oxides which are the chief ores of iron are reduced by the superior attraction which carbon possesses for oxygen at high temperatures; and if the pure metal so extracted be again exposed to atmospheric influences, we witness the curious phenomenon of its recombination with oxygen at ordinary temperatures, while carbon would remain for ever unchanging at its side. This variation at different temperatures of the affinities for oxygen by carbon and iron amounts to a complete reversal of an ascertained law. A philosopher residing in a planet where high temperatures were unknown, might most justly assert that oxygen possessed a greater affinity for iron than for carbon; whereas an inhabitant of the sun might on equally good grounds come to exactly the opposite conclusion. Thus this law, like many others, is governed by the conditions under which it is exercised, and it forms one of many illustrations how easy it is to bend the inflexible laws of nature to suit our endlessly varying requirements. Familiar qualities of all substances gradually disappear as they change from a solid to a gaseous condition. The hardness and brittleness of cast iron finds no place in its liquid state, nor can the properties of any liquid be traced in its gas. Thus we only know the properties of bodies such as are displayed in the narrow compass of temperatures which we can observe, and cannot tell anything of their mutual relations under different conditions of temperature, density, and of perhaps unexpected allotropic changes in their nature. Carbon possesses a greater number of separate compounds than any other element, and even these compounds sometimes behave as elementary substances, and combine amongst themselves. The conditions of mere mixture, and as carbide of iron, under which this element changes that metal into steel and cast iron, endowing it with new peculiarities, are at the present time the subject of an elaborate investigation by some of our leading metallurgical chemists, and the final result of their labours will be awaited with deep interest by engineers. Iron is the most important element with which engineers have to do; indeed, it may be said that they could not exist without it. This metal is more plentifully distributed than any other; easily reduced from ores, and possessing very different qualifications according to the proportions of carbon or other metals with which it is combined. In common with platinum, wrought iron has the rare quality of welding, by which its atoms at a white heat seem to be removed sufficiently far apart as to be within the sphere of attraction of another bar similarly heated and driven into close mechanical contact. But it is not alone in these qualities that iron is so remarkable a metal. Its peculiarly electrical and magnetic properties have within the last few years rather distracted attention from its other natural gifts. The investigations to which iron has rendered such signal service have tended more than anything else to place this youngest born of sciences in the position which now it occupies.

Although the effect of an electrical current in producing magnetism was first discovered by the late Professor Faraday in the year 1831, it was not until the year 1834 that this distinguished philosopher invented and showed at the Royal Institution an early form of dynamo-electrical machine; and, after resting for many years, and being the subject of many experiments, this machine has been taken up by a class of men of very different character to its original inventor, and it is only quite recently that engineers have had anything to do with it. Not like the older sciences, a slow growth of centuries, nor like engineering, the work of an entire generation, this precocious infant of days seems to have sprung into existence all at once, and everybody is expected to accept as proved the crude theories and unfounded assumptions of those who claim to be the sole depositories of the secrets of a new science. To the general public, ignorant of a new and uncouth nomenclature, and disconcerted by an array of mathematical symbols, which, if they knew the truth, not unfrequently resemble sheep walks on a barren moor, that start from nothing and lead nobody knows where, some of the electrical companies have made too hopeful promises, and financial disaster has proved an inevitable result. Indeed, we may see that the elementary principles of mechanical engineering have been entirely unknown by them, and that many thousands of pounds have been wasted in the construction of ill-designed machines which were little else than dangerous experiments for ascertaining the simple laws of centrifugal force, or the correct proportions of pulleys and bearings for transmission of power at high speeds. We used also continually to hear of irregular driving and engines breaking down; and though these evils might arise through mistaken cheapness, or not knowing the actual power transmitted in driving dynamo-electrical machines, yet, as the indicator was invented by Watt, and is now in universal use, such ignorance is wholly inexcusable, and no engineer could make such a mistake. All these proceedings form a good illustration of the need for some standard of qualification which shall enable the public to place confidence in a man's claim to rank as an engineer; and there is, unfortunately, no such security of any kind in this country. Besides, many people possessing the merest smattering of engineering, who would resent the suggestion that their own simple arrangements might be improved, will yet consider themselves perfectly competent to design or arrange a complicated mechanical combination, or discuss details which can only be mastered by much study and experience. In a new departure like modern electrical science it was only natural that experiments were necessary, and failures to be anticipated, and it is not to such that we allude; but that it should be implied that every educated engineer does not know the proper proportions of pulleys and belts to transmit a given power, nor how to construct an engine that shall not break down, is to place a most unmerited slur upon the profession. In the construction of their machinery the electricians have by this time blundered into more reasonable proportions; but they cannot be surprised that their want of knowledge in these matters, so generally known, should hardly form their best credentials for making statements upon the details of a science the most mysterious and extraordinary ever brought under the dominion of man. The practical details of electrical work are quite distinct from the true engineering involved in construction of engines and machinery, and in it electricians may fairly claim a position of their own; and it is only in continuation of previous remarks upon the unique properties of iron that I would venture to make a short excursion into their special province. Whether neutralised electricity or magnetism exists in all substances or not remains still to be proved; but certain it is that the earth and sun, and probably all the other planets, are powerfully magnetic, each as a whole. It is principally through the properties of iron that we are able to bring magnetism to practical use; and if we study Professor Hughes' most interesting experiments on the polarisation of its molecules under the influence of electrical currents, we see how, as by the action of wind on a field of corn, the magnetic pole of each molecule is turned in the same direction, and a maximum effect is reached. When, with pure iron, the exciting cause is withdrawn, the molecules again neutralise each other, and no external magnetism is perceived. But the addition of carbon, as in cast iron or steel, necessitates increased electrical force to rotate the molecules, and at the same time prevent their ready return. It is this property of carbon which gives us permanent magnets, and although the outlines of this theory are not new, yet Professor Hughes' experiments promise to throw more light upon the subject of magnetism, and collaterally upon the internal constitution of matter, and we may await their development with increasing interest. If magnetism is thus shown to be the polarisation of molecules of iron, what can electricity be, with which it is so intimately associated? It is an influence subject to none of the laws of matter, and has been ascribed to that mysterious ether which enters into the innermost recesses of all material things, like light through transparent glass, and at the same time seems only bounded by the confines of infinity. This appears to be the vehicle by which the light of stars is transmitted to our eyes, and may be the medium through which gravity acts, though not sub-

RAILWAY MATTERS.

BY a collision, on the 6th inst., between two construction trains on the Chesapeake and Ohio Railroad, near Morehead, Kentucky, five men have been killed and fifteen injured.

THE half-yearly report of the directors of the North London Railway presented yesterday gives the miles of lines owned by the company as 12, the miles leased as 5, and the miles worked over as 98¼, making a total worked by engines of 115¼ miles. Over these miles the company's trains made 1,009,687 miles, for which the total cost of locomotive power was £43,166 6s. 8d.; maintenance of way and works, £16,091 19s. 1d.; maintenance and renewals of carriages and wagons, £13,270 13s. 9d.

IN concluding a report on the circumstances which attended the accident that occurred on the 6th ult. at Coppull Moor Bridge on the London and North-Western Railway, when the foreman Hammonds and six of the men that were under the bridge were killed, two others had broken legs, and three more were injured by the premature fall of the bridge they were taking down, Colonel Rich says:—"I think that the safest, best, and most expeditious method of getting down old arches in situations like Coppull Moor-road, where there is no population in the vicinity, is to use a little powder."

A NEW map of the metropolitan railways, tramways, and miscellaneous improvements, deposited at the Private Bill Office November 30th, 1883, has been published by Mr. E. Stanford, of Charing Cross. This map shows that though houses are increasing very fast, railways and tramways are becoming so numerous that on the map they seem to take up all the room and leave none for houses. To some extent this is actually the case, and railways force people to live in the outer circle. In the new map the Thames is crossed by no less than six red lines, meaning proposed new crossings over or underneath its waters. Only two western areas are shown as included in electric lighting Bills.

A REPORT to the Board of Trade has been published on the collision which took place on the 26th December near Ferryhill Station on the North-Eastern Railway, when a special goods train—consisting of engine, tender, eighteen wagons, and a brake-van—from Consett to Ferryhill was run into—at the rear—by the express goods train—consisting of engine, tender, nine wagons, and a brake-van—from Newcastle to York. The report blames the fog signalmen, and says the collision, like many others which have recently occurred, points to the necessity for the adoption of an arrangement by which a signalman shall be prevented from giving "line clear" for a train until the whole of the train has passed out of the block section.

THE report of the directors of the London, Chatham, and Dover Railway, presented to the meeting on Wednesday, gives the total cost of locomotive power as £75,088 2s. 4d.; carriages and wagons, £21,814 14s. 4d.; way and works, £45,163 15s. 4d.; traffic expenses, £92,690 6s. 7d.; general charges, £16,045 14s. 1d. Miles of way authorised, 192 miles 61 chains; miles constructed, 168 miles 69 chains; miles constructing or to be constructed, 23 miles 72 chains; miles worked, 173 miles 28½ chains, including 6 miles 43 chains foreign lines. The train mileage, by company's own trains, 1,560,873 passenger and 273,765 goods, total 1,834,638. Total mileage by trains of other companies on London, Chatham, and Dover Railway lines, 141,839 miles. The total cost of locomotive fuel, coal and coke, was £25,045. The cost of fuel per train mile was thus 2·62d.

THE Lancashire and Yorkshire Railway has in progress work of considerable interest. For many years that company was stationary, it did little in the way of extension and less in the way of improvement of its lines or its stations, and it became extremely unpopular in its own district. It has awakened to its position, and has for a few months, or for the last two or three years, been engaged on plans of extension and improvement. In the past six months it has expended on capital account £737,329, half of which was on lines and works that are in course of construction. In the half-year that is now current it is estimated that the capital expenditure will be still higher, £832,958 being the official estimate; but less of this in proportion is on new works. Out of the total, £490,407 is for increased station accommodation and land, and a further and smaller sum—£30,793—is for working stock, the balance being for works in course of construction and for land. It is evident that the old policy of the Lancashire and Yorkshire Railway has been reversed, and that it is intended to meet in very large degree the requirements of a district that is perhaps the most populous in the kingdom if the metropolis is excepted. Necessarily, the expenditure will have its effect on the capital of the company and on the return that the shareholders will receive, but it must be assumed that the policy of providing for the wants of the neighbourhood served, and for the meeting of the competition that is now so keen, will, in the end, be the most beneficial to the company. And as some of the works on which large sums of money have been spent are now nearing completion, it must be expected that the company will in a short time benefit by the fresh streams and traffic that should be tapped.

AN electric locomotive fitted with the apparatus of Mr. Leo Daft s now running experimentally on the Saratoga, Mount McGregor, and Lake George Railway, a somewhat steep and crooked 3ft. gauge line ten miles long, laid with 32 lb. rails. The following particulars are given in the *Electrician and Electrical Engineer*:—"A mile of this road was fitted for electric operation by tightening the joints of the existing track, and laying a special middle rail or conductor upon wooden blocks, which were saturated with pitch. Starting from the terminus, the track ascends gradually for 600ft., and then descends for 2000ft. more, when a sharp curve and an ascending grade of 93ft. to the mile is encountered. The electric motor is designed for heavy work. It bears the name of 'Ampère.' The motor is 9ft. 6in. long, 5ft. wide, stands 3ft. above the rails, and weighs 4500 lb. The armature and field magnets are inclosed in a box at the rear of the platform, in front of which is the driver's seat and a dash-board carrying three controlling switches and a keyboard. The right switch makes and breaks the current, the left switch controls an electric brake, and the centre switch and keyboard control the combinations of the coils of the motor answering to the cut-off of the steam locomotive. The reverse lever is on the right. Two phosphor-bronze wheels press firmly upon the centre rail by the action of a spring upon their pivotted supports. The current passes from this rail through the wheels to the switches and keyboard, thence to the electric engine, and through the driving wheels to the outer rails. The generators are two in number, of Mr. Daft's manufacture, each occupying a space 5ft. by 4ft., and weighing 1200 lb. They were driven by a 25-horse power Fitchburg engine, and the current led thence to the rails—a distance of about 200ft.—through underground conductors. On the day of the trial the motor was attached to an ordinary 10-ton passenger coach, into which sixty-eight passengers—nearly double its ordinary capacity—were crowded, while the motor carried six more, making a total load of about 17 tons. The 'Ampère' started slowly, but surely, and ran to the end of the mile without stopping, at the rate of about eight miles an hour. Descending the 93ft. grade on the return trip, a considerable speed was attained, causing the motor to jump the track at the curve, by which accident its running gear was slightly damaged. The trip was made in the presence of nearly 2000 spectators, many of whom amused themselves by trying to obtain shocks from the track, but the sensation was found to be scarcely perceptible. Since the first trial the 'Ampère' has been run in wet and snowy, as well as dry, weather, with satisfactory results. The results of this trial show that an electric locomotive under perfect control, weighing 2 tons, will haul an ordinary passenger coach, weighing, with its load, 15 tons, over heavy grades and sharp curves at a speed of eight miles per hour, by means of an electric current, generated by a 25-horse power engine, and transmitted one mile."

NOTES AND MEMORANDA.

FOR preparing a waterproof paper which will shine in the dark, the *Papier Zeitung* gives the following mixture: 40 parts paper stock, 10 parts phosphorescent powder, 10 parts water, 1 part gelatine and 1 part bichromate of potash.

TO render leather, paper, &c., impermeable, MM. Huleux and Dreyfus give the following mixture, which operates according to the quantity and the proportions of the material added:—White or yellow wax, first quality, 1000 grammes: Burgundy pitch, 60 grammes; oil of arachide, 80 grammes; sulphate of iron, 50 grammes; essence of thyme, 20 grammes.

IT appears from the researches of M. Sokoloff that the water of the Neva at St. Petersburg, at a depth of 9ft., is very pure when compared with the water supplied to other large cities. The matter in suspension in one cubic metre of water in September and October, *Nature* says, does not exceed 5·5 grm., and sometimes it is so small as to be less than 0·02 grm. The mineral matter dissolved varies from 31·0 to 38·1 grm., and the organic matters reach but 18·7 to 22·5 grm. The average for August and September is 20·4 grm. of organic matter and 31·6 of inorganic; for October, 21·7 and 33·9 grm. respectively.

M. MARTIN DE BRETTES recently described in the *Comptes Rendus* an apparatus for printing messages transmitted by light. The rays from an electric arc, made parallel by a Mangin projector, would be sent from one station, and would be received at the other end on a converging lens in the focus of which is a selenium cell. This cell is in circuit with a local battery, and the receiving instrument so adjusted that the changes of resistance produced in the selenium cell by the action of light would alter the amount of current passing, and so act on the electro-magnet of the receiver. The rest may be imagined. Morse or Breguet instruments may be used, the inventor thinks.

FOR the week ending January 12th, in 29 cities of the United States, having an aggregate population of 7,026,300, there died 2972 persons, which is equivalent to an annual death-rate of 22·0 per 1000, a slight increase on the rate for the preceding week. For the North Atlantic cities the rate was 20·1; for the Eastern cities, 22·7; for the Lake cities, 17·5; for the River cities, 21·5; and in the Southern cities, for the whites 24·1, and for the coloured 38·2 per 1000. Of all the deaths, 33·2 per cent. were of children under five years of age, the proportion of deaths of this class being 54·7 per cent. in Milwaukee, 55·2 per cent. in the coloured population of Columbia, and 60 per cent. in that of Charleston.

MANY articles of brass cannot readily be finished by the file or by abrading substances, owing to the intricacies of their surfaces. Especially is this true of brass castings of an ornamental character. But an elegant finish can be obtained by means of acids, which may be protected, if desired, by means of a lacquer or varnish; the acid finish, however, is generally preferred without the addition of a varnish. If the work to be finished is greasy, it should be cleaned by heating and dipping in acidulated water—vinegar and water, or washing soda in water—and then in clear water. The *Scientific American* says the finishing bath may be either nitric acid two parts, water one part; or one part sal ammoniac, one part sulphuric acid, one part nitric acid, one part water; all by measure, and the sal ammoniac to be dissolved in water until a saturated solution is obtained. The articles should not be allowed to remain in the acid more than ten seconds, then taken out, plunged into clear, cold water, thence into hot soapy water, and dried in hot sawdust.

IT is quite manifest, says the *Scientific American*, that the streams, ponds, swamps of all this part of the country, including. certainly, New England and the Middle States, are most remarkably destitute of water; and this deficiency has been steadily becoming more strongly marked and more troublesome for some time past, certainly as much as three years. The complaints from the large manufacturing towns where their dependence is on water power have been great, and reasonably so, and manufacturers have been discussing seriously the question whether their trust must not be placed on steam instead of water. The records correspond with this general impression. Taking New Haven as a fair example, the rainfall there for the past ten years has averaged 42·9in., while for the last four years it has been but 36·4, and of the last two it has been 31·6. The average from 1873 to 1879 inclusive was 46·9, and Mr. Schott, in the "Smithsonian Contributions," vol. xviii., p. 93, gives it for the years from 1804 to 1867—though the records are incomplete—as 44·43.

IN the report of the General Superintendent of the United States Life-saving Service, it is stated that there were at the close of the last fiscal year 194 stations, 149 being on the Atlantic, 37 on the Lakes, 7 on the Pacific, and one at the Falls of the Ohio, Louisville, Ky. There were 300 disasters to documented vessels within the field of station operations. There were 3792 persons on board these vessels, of whom 3777 were saved and only 15 lost. The number of vessels totally lost was 68. In addition there have been 116 disasters to smaller craft, such as sail-boats, row-boats, &c., on which were 244 persons, 240 of whom were saved and four lost. The results of all the disasters within the scope of the service aggregate therefore, as follows:—Total number of disasters, 416; total value of property involved, 7,242,720 dols.; total value of property saved, 5,671,700 dols.; total value of property lost, 1,571,020 dols.; total number of persons involved, 4036; total number of persons saved, 4017; total number of persons lost, 19; total number of shipwrecked persons succoured at stations, 651; total number of days' succour afforded, 1879.

IN 1839 there were eighty-two millions of letters posted, of which about one in every thirteen was franked. In 1840, the circulation rose to 169,000,000, although franking was abolished. At the present time it has reached the astonishing total of 1,280,000,000. It will perhaps be gratifying to the pride of Englishmen to learn that, notwithstanding the boasted superior education of Scotland, each member of the community there writes on the average thirty-one letters in the year, while in England and Wales the number is forty-one; in Ireland only seventeen. But increased letter correspondence is only one item in the growth of the Post-office. Post-cards did not exist in 1839; they are a wholly new invention within the memory all of us. Their circulation now exceeds 144,000,000. In addition 288,000,000 of book packets and circulars and 140,000,000 of newspapers passed though the post in the year, making a total of more than 1,852,000,000 of packets of one kind and another. The increase in the circulation during a single year is now nearly equal to the total number of letters carried by the department in 1839.

AT the last meeting of the Chemical Society the secretary read a paper "On the Influence of the Temperature of Distillation on the Composition of Coal-gas," by Mr. L. T. Wright. The author distilled a carefully mixed sample of Newcastle coal in a small iron retort; the charge was 2·24 lb., and the distillation occupied twenty-five to forty-five minutes. Four experiments were made at various temperatures; with the lowest temperature 8250 cubic feet of gas per ton of coal were obtained of 20·5-candle power, at the highest temperature 12,006 cubic feet of 15·6 candles. The gas in the first case contained 38·09 % H, 8·72 % CO, 42·72 % CH_4, 55 % other hydro-carbons, and 2·92 % N. The gas obtained at the highest temperature contained 48·02 % H, 13·96 % CO, 30·7 % CH_4, 4·51 % hydro-carbons, 2·81 % N. The author discusses the influence of marsh gas, carbonic oxide, &c., on the illuminating power of the gas, and criticises the experiments of Frankland and Thorne. In the second part of the paper the author gives some analyses of gas drawn from retorts at different stages of the ordinary process of gas manufacture. The results confirm those obtained by D. Henry. Prof. Foster said that apparently no analysis of the coal was given. He also gave an account of some experiments which he had made of passing steam over coke, and thus liberating the nitrogen contained in it.

MISCELLANEA.

AT the next meeting of the Royal Institute of British Architects on the 18th inst., a paper will be read by Mr. Killingworth Hedges, C.E., on the "Electric Lighting of houses and the precautions to be adopted on its introduction."

WITH reference to the removal of Messrs. Hammond and Co., from 110, Cannon-street, to 117, Bishopsgate-street, we are requested to state that the address of the Hammond Electric Light and Power Supply Company, Limited, remain as heretofore 110, Cannon-street, E.C., the Company having enlarged its offices by the addition of those lately occupied by Messrs. Hammond and Co.

MR. WILLIAM FOSTER, of Queensbury, Bradford, died on Friday last at his country seat, Hornby Castle, near Lancaster, from paralysis, resulting from long-continued disease of the heart. Mr. Foster was a large landowner, and was proprietor of the Queensbury Mills, Bradford, employing some 3000 people. He was for some years a director of the Lancashire and Yorkshire Railway, and was a keen promoter of the earlier branch systems of railway in Yorkshire.

THE naval court which has inquired into the explosion on board the Royal mail steamer Severn in November last has suspended ths first and second engineers for three months, and has imprisoned the second engineer for a week for trying to screen another party. The Court gave orders that the Severn was not to leave without a survey. It has advised the Board of Trade to investigate the circumstance under which her certificate was granted while her boilers were defective.

ARCADES are growing in favour in Birmingham. There is now an effort to build another in that town. This time it is proposed to connect New-street with Worcester-street, upon the site of the well-known Hen and Chickens Hotel in the former thoroughfare. The arcade would doubtless be a great convenience to the Birmingham people, for it would tend to relieve the often congested traffic at Worcester-street corner. The project has taken the form of the Hen and Chickens Arcade Company with a capital of £50,000.

MOTHER-O'-PEARL shells are largely used in the Sheffield trades. At the London sales last week higher prices were reported all round. Two hundred and eighty cases of Manilla were sold at and beyond last sale prices in December; owing to the small stocks, competition was keen, first quality shells fetching as high as £207 10s. per ton. Tortoise shell, of which only 5000 lb. were on offer, were 1s. to 1s. 6d. lower, except for ordinary and pickings, which were unchanged. Hoof also declined 1s. to 2s., and yellow belly 2s. to 4s. per lb. Turtle shell sold at 2s. 6d. per lb., but only 32 lb. met with purchasers.

A MOST successful temporary installation on the British system was recently shown at Derby on the visit of the Prince to that town to attend the Bachelor's Ball. A Brockie arc lamp of 2000-candle power was suspended across the High-street and worked from an A Gramme machine which was driven from a small engine at a brewery close by. The lamp, which was particularly noticed for its absolute steadiness and brilliancy from 8.30 p.m. to 3.30 a.m., made Derby look as it never had done before. The whole of the arrangements were carried out by Mr. A. de Sanhague, of 12, Delahay-street, Westminster, S.W.

THE requisite arrangements for the show of the Royal Agricultural Society at Shrewsbury in July next are being pressed forward. The works on the racecourse and adjoining property, where the sheds will be erected, are progressing, and the railway companies have completed their plans for extra sidings and for temporary platforms for passengers. This was reported at a meeting of the Corporation on Tuesday, when the whole council was made a committee to co-operate with the Town Committee. The erection for the occasion of an extra footbridge across the Severn it was determined should be fully considered at the next meeting.

THE 1884 edition of the "Tricyclists' Vade Mecum; a complete Guide to Tricycling," has just been published by Messrs. Cordingley and Sharpe. No less than 192 octavo pages are filled with descriptions of the many tricycles now made, and of the very numerous details, a knowledge of which is necessary to the cyclist who likes to know all that is to be known of the practical mechanics of this mode of travelling. The book also gives particulars relating to tricycling clubs, learning to ride, championships, rules of the road, railway charges, speed and power gears, and an article of some interest on the origin and development of the tricycle.

DURING last week the floods in America were very serious. On the 7th it was reported that Lawrenceburg, Indiana, was flooded by the breaking of a levee, and thousands of people were leaving the town. In Pittsburg and Alleghany city 5000 buildings were submerged, and some 10,000 people homeless; while it is estimated that 15,000 men were thrown out of work by the stoppage of the mills and factories. Throughout Western Pennsylvania and Eastern Ohio railroad and highway travelling has been interrupted, bridges swept away, and the railway tracks covered with water. Much damage has also been done by freshets and ice gorges in the Delaware and Susquehanna rivers, in Pennsylvania.

MESSRS. OSLER, of Oxford-street, have on view for a few days a remarkable throne in cut glass, which has been made by them at their Birmingham works to the order of an Indian prince. From the back and arms of the throne there spring pillars, supporting a dome-shaped canopy, above which appears a large star. Every portion of the surface has been cut, the pine-shaped finials which surmount the arms having no fewer than 324 facets. The ornamentation of the dome is especially elaborate, and as it is at present illuminated by two incandescent electric lamps, which are fixed beneath it, it sparkles like a gigantic diamond. The work is believed to be the most important example of cut-glass that has ever been made, and the effect is singularly brilliant.

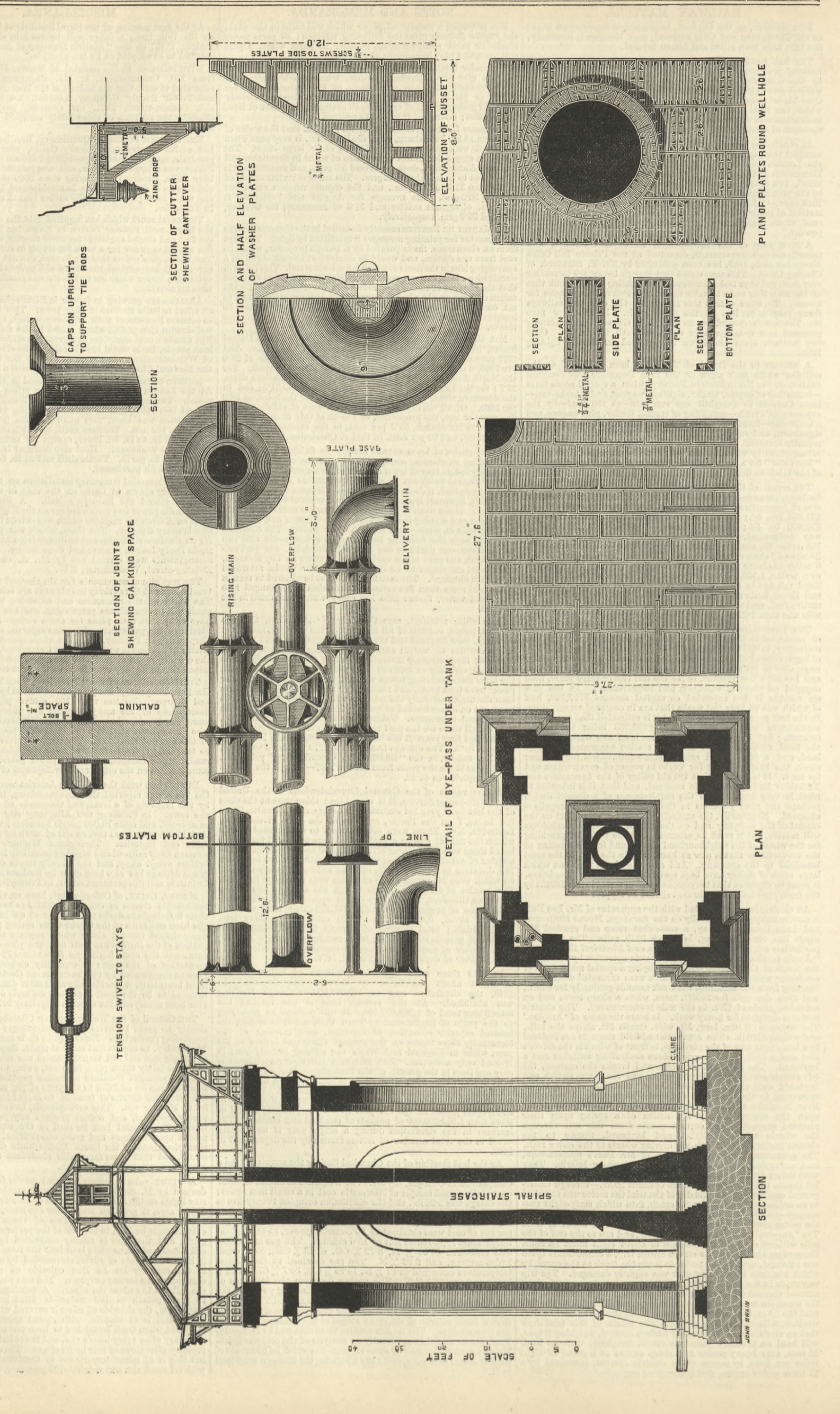
THE Council of the Wolverhampton Chamber of Commerce are clearly no great believers in the advantages to be derived from restricting production. Referring, in their annual report issued on Wednesday, to the present state of trade, they remark that, so far as the pig iron and rail manufacturers are concerned, an improvement has lately taken place in prices, owing to the extensive combination amongst members to reduce production. The effect of this has been an addition to the price of pig iron in Scotland and the Cleveland district of from 2s. to 5s. per ton, and to rails from 5s. to 10s. per ton. This arrangement, however, it is thought, is purely artificial, and cannot produce any permanent benefit to trade. The council look forward in the coming year to small profits upon business and great competition. But it is believed that the trade of the South Staffordshire district is financially sound, and that these favourable conditions may be expected to continue in the immediate future.

A PIGMY voltaic battery of great power for its size has been devised by M. Skirwanov, and is now employed to furnish the star lights on the heads of the ballet of *La Farandole*, Paris. The *Times* says, it gives an ampère for one hour, and has an electromotive force of 1·45 volts. Two of these cells, contained in ebonite cases buckled to the belt of the performer, keep a star light going, and the light is readily controlled by the wearer. Each cell consists of a zinc plate bent into the form of a U, and holding in its inside a plate of silver, surrounded by chloride of silver, as in the ordinary De La Rue chloride of silver cell used by electricians for testing purposes. The zinc plate forms one pole of the cell and the silver the other. A solution of caustic potash—75 parts potash to 100 water—is filled in, and as a porous diaphragm, the chloride of silver is covered with parchment paper. The vessel is of ebonite, with closed mouth, which, however, is opened when fresh liquid has to been put into the cell. This is necessary after every hour's run, and the chloride of silver has to be replaced after three or four hours of use. The cell is thus expensive, but this is of minor importance in theatrical work as compared with its small size and weight—100 grammes.

WATER TOWER, COLCHESTER WATERWORKS.

MR. CHARLES CLEGG, M. INST. C.E., ENGINEER.

(For description see page 133.)



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PARIS.—Madame BOYVEAU, *Rue de la Banque.*
BERLIN.—ASHER and Co., 5, *Unter den Linden.*
VIENNA.—Messrs. GEROLD and Co., *Booksellers.*
LEIPSIC.—A. TWIETMEYER, *Bookseller.*
NEW YORK.—THE WILLMER and ROGERS NEWS COMPANY, 31, *Beekman-street.*

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*** *With this week's number is issued as a Supplement a page Engraving of a Water Tower at Colchester. Every copy as issued by the Publisher contains this Supplement, and subscribers are requested to notify the fact should they not receive it.*

TO CORRESPONDENTS.

*** *In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a 1d. postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these instructions.*

*** *We cannot undertake to return drawings or manuscripts; we must therefore request correspondents to keep copies.*

A. A. W.—(1) *About 8 lb. per horse per hour.* (2) *Not that we are aware of.*

DRAWN STEEL TUBES.—*Apply also to Messrs. Piggott and Co., Springhill, Birmingham.*

J. A.—*There is no special treatise on condensing engines. Probably Bourne's "Catechism of the Steam Engine" will give you all the information you want.*

WEEKLY READER.—*You are quite at liberty to use the arrangement you show. In a brick-making machine you will not infringe a patent for a stone-breaker.*

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B. C.—*"Machine Construction and Drawing," by E. Tomkins, and "Principles of Machine Construction," by same author, both published by W. Collins, Son, and Co., London.*

W. F. W.—*There is no really good technical dictionary of the kind in existence. Those already published do not really give the workshop equivalents of the two languages. If some of the translations are correct and idiomatic, others are too litteral, and in some cases even ridiculous. Again, such dictionaries always aim at too much and are too large. That a good engineer's dictionary of English, French, German, and Italian is wanted there can be no doubt. Whether it would pay to produce it is a question for a publisher. We can express no opinion on the subject.*

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MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, Feb. 19th, at 8 p.m.: Ordinary meeting. Adjourned discussion upon the paper by Mr. Conder, "Speed on Canals;" and, time permitting, the following paper will be read, "Hydraulic Propulsion," by Mr. Sydney W. Barnaby, Assoc. M. Inst. C.E. Thursday, Feb. 21st, at 8 p.m.: Special meeting. Fourth lecture "On Heat in its Mechanical Applications—Gas and Caloric Engines," by Professor Fleeming Jenkin, F.R.SS., L. and E., M. Inst. C.E. Friday, Feb. 22nd, at 7 p.m.: Students' meeting. Paper to be read and discussed, "The Qualities of Metal for Various Purposes," by Mr. E. J. M. Davies, Wh. Sc. Stud. Inst. C.E.

ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS AND SURVEYORS.—A meeting will be held at South Shields on Saturday, Feb. 16th. Members will assemble at 11.30 a.m. in the Town Hall. The following papers will be read and discussed:—"Recent Street Improvements in South Shields," by Mr. Matthew Hall, C.E., Borough Surveyor, South Shields. "Hospital Construction," by Mr. A. Campbell Munro, M.B., C.M., Dr. of Science in Public Health, Medical Officer of Health, South Shields. The members will afterwards visit, under the guidance of Mr. Hall, the extensive street improvements recently executed, the Tramway and Corporation Stables, the new Infectious Diseases Hospital, and the Marsden Quarries, for which a special train will leave Westoe-lane at 2.30 p.m.

CHEMICAL SOCIETY.—Thursday, Feb. 21st, at 8 p.m.: Ballot for the election of Fellows. Paper to be read, "An Analysis of Spotley Bridge Water," by Mr. H. Peile.

ROYAL METEOROLOGICAL SOCIETY.—Wednesday, Feb. 20th, at 7 p.m.: The following papers will be read:—"The Great Storm of January 26th, 1884," by Mr. William Marriott, F.R Met. Soc. "The Height of the Neutral Plane of Pressure, and Depth of Monsoon Currents in India," by Professor E. D. Archibald, M.A., F.R. Met. Soc. "On the Sunrises and Sunsets of November and December, 1883, and January, 1884," by the Hon. F. A. Rollo Russell, M.A., F.R. Met. Soc.

SOCIETY OF ARTS.—Monday, Feb. 18th, at 8 p.m.: Cantor Lectures. "Building of London Houses," by Mr. Robert W. Edis, F.S.A. Lecture I. Their arrangements, aspects, design, and general planning. Wednesday, Feb. 20th, at 8 p.m.: Eleventh ordinary meeting. "Reclamation of Land on the North-Western Coast of England," by Mr. Hyde Clarke.

DEATH.

On the 5th inst., at Cleethorpes, JOSEPH EDWARD FISHER, M.I.C.E., Resident Engineer of the Manchester, Sheffield, and Lincolnshire Railway and Docks, Grimsby.

THE ENGINEER.

FEBRUARY 15, 1884.

THE ROYAL COMMISSION ON THE METROPOLITAN DRAINAGE OUTFALLS.

LONDON has seen six Commissions of Sewers, and is now in the midst of a third inquiry as to the effect of the existing system of sewerage on the state of the Thames. With the expiration of the sixth Commission there arose the Metropolitan Board of Works, and in 1865—nine years after the formation of the Board—the present drainage system was so far advanced as to be the occasion of a formal opening by the Prince of Wales. This, however, was but the beginning of the end, and it was not until another ten years had elapsed that the drainage works of the metropolis were pronounced complete. Yet complete they are not, even now. Originally estimated to cost £2,300,000, just double that sum has been laid out upon them, in addition to which the Board are constructing relief lines and additional sewers, costing £1,500,000 more. The Board have also planned an enlargement of the sewage reservoirs at the outfalls, which will require a further expenditure of £160,000, making a total for the main drainage of £6,260,000. Unfortunately, even this may not represent all that the metropolitan ratepayers will be called upon to bear, though it is encouraging to find that the works have been well executed, and have immensely improved the condition of the Thames. Opinions, nevertheless, differ as to the extent of the improvement. The northern drainage had only been in full operation for three years, and in partial operation for two years previously, when the famous "Barking Memorial" made its appearance, and the Home Secretary directed the present Sir Robert Rawlinson to institute an inquiry into the allegation that the northern outfall sewer was choking up the river and the adjacent creek with sewage silt. In his report to the Home-office at the close of the investigation, Sir R. Rawlinson announced that "the allegations in the memorial had only been partially proven." This report was presented in November, 1869, and in ten years afterwards came what is called "The Mud-Bank Inquiry," instigated by the Thames Conservators, in connection with the reports of Captain Calver. The report of the arbitrators and the umpire charged with the conduct of the inquiry, was such as to exonerate the Metropolitan Board from all responsibility with regard to the mudbanks in the river, and the Conservators were left to their own resources. Still the question has not been allowed to rest, and now we have a third inquiry, in the form of a Royal Commission, the result of persistent and loud complaints made to her Majesty's Government, as to the state of the Thames, consequent on the discharge from the outfalls.

The Royal Commissioners appointed to deal with this latest phase of the question have issued what they term their "first" report. The phrase is ominous, as indicating an uncertain something yet to come. The Commissioners have held fifty-nine meetings, and have examined 126 witnesses. They have listened to speeches from learned counsel, and have received "a large number of plans, tables, and other documents, prepared in most elaborate detail." We are almost aghast to learn that in addition to the "great mass of evidence" brought by the complainants to prove their case, they were prepared with 282 more witnesses to the same facts. The Commissioners deemed it prudent to dispense with the attendance of these parties, but we are promised their names and the heads of their evidence in the forthcoming appendix to the report. The whole of the evidence, including both sides, is divided by the Commissioners into two classes—one the scientific, and the other the popular. The scientific evidence appears to go a very small way towards settling the question at issue, for the obvious reason that there is so much of it on either side. As against the outfalls there were such authorities as Mr. Baldwin Latham, Mr. Mansergh, Dr. Meynott Tidy, Dr. Frankland, Dr. Corfield, Mr. Heaton, Professor Tuson, Professor Way, Dr. Lionel Beale, and several others. In defence of the outfalls there were Sir F. Abel, Dr. Odling, Dr. Voelcker, Dr. Dupré, Dr. Sorby, Mr. Law, Mr. Chatterton, and Mr. Dibdin. Engineers, medical men, chemists, and microscopists, "all gentlemen of high professional standing," are thus arrayed in opposition to each other, and the Commissioners appear to conclude that the balance of scientific evidence is about level. In order to turn the scale they refer to evidence of the "popular" type. Here they encounter a multitude of witnesses who are all positive as to the annoyance which they personally suffer from the effect of the outfalls. The Commissioners say, "We find the real question to be, Is there a nuisance? and if so, to what extent?" This, they observe, seems to them substantially a question of fact; "the scientific evidence, on either side, only tending to show that such a nuisance may or may not be expected."

It is here that we come to a critical point in the inquiry. The Commissioners say:—"We find it impossible not to be satisfied by the overwhelming amount of concurrent evidence, much of it from indisputable sources, as to the real existence, under certain conditions, of the nuisances complained of." They say it is altogether incredible that such a wide-spread feeling of dissatisfaction should prevail without reasonable ground, or that it can be the result of mistake. In their judgment it appears impossible to account for the agitation, except for the justifiable motive of obtaining the removal of grievances which are felt to be serious and substantial. The Commissioners further observe that the magnitude of the causes in operation is so great that it is hardly surprising some such results should occur as are the subject of complaint. The daily quantity of sewage going into the Thames is enormous, amounting on an average to 23,000,000 cubic feet, or at the rate of 16,000 cubic feet per minute, equal to 446 tons. Looking at statistics of this sort, the Commissioners say, "It is surprising that the nuisance is so far mitigated as we find it to be." They consider that a nuisance does exist, though not to the extent alleged. They state in their "Conclusions" that, as a general rule, "Above Greenwich and below Greenhithe the river does not afford ground for serious complaint." But they say: "Between these limits the effects of the sewage discharge are more or less apparent at all times. The "evils and dangers" which now exist are also "likely to increase with the increase of the population in the districts drained." Already, according to Dr. Frankland, a million and a-quarter tons of mud go into the river from the outfalls every year, and hence "it cannot be unreasonable that some alarm should be felt at the continuance of the process." Being convinced that the discharge of the metropolitan sewage, as at present conducted, is the source of certain evils, the Commissioners propose to enter on the further branch of their inquiry, which is to discover what measures can be applied for remedying or preventing the mischief that is now going on.

Notwithstanding the moderate tone which generally characterises the report of the Commissioners, there are some rather startling indications as to the current of their ideas. If they could think it practicable, they would apparently recommend that the rainfall should be separated from the actual sewage in the drainage system of the metropolis. There are also intimations that they look upon the present intercepting sewers as too small for their work, and they take great exception to the extensive adoption of storm outlets. It is palpable that if the present outfalls are to be retained, the Commissioners will advise that some system of deodorisation should be rendered compulsory. The policy of the Metropolitan Board, in refusing to adopt any method of sewage treatment which does not offer a prospect of profit to the ratepayers, is particularly unacceptable to Lord Bramwell and his colleagues on the Commission, as it evidently was to Sir R. Rawlinson at the time of the Barking inquiry. The position of the outfalls at Barking and Crossness is another matter which appears to be unsatisfactory to the Commissioners. They would fain see the outfalls farther down the river, if we may judge from the manner in which they review past proposals to that effect. They go through the whole history of the sewage question in reference to the metropolis, and there is a disposition to revive certain old controversies which it might have been thought were buried for ever.

The Commissioners speak with ardent praise of Sir Joseph Bazalgette with respect to the drainage works which he has carried out, so far as the design and execution are concerned; but we apprehend they would have preferred that a bolder scheme had been adopted. So far as present defects may be remedied, they say nothing to show that they would be satisfied with the proposed enlargement of the sewage reservoirs. It is a fact that the volume of sewage has outgrown the capacity of the tidal reservoirs at Barking and Crossness, so that on sundry occasions in the course of a year the discharge of the sewage has either to commence before the tide has begun to ebb, or to continue after it has begun to flow. The Royal Commissioners would fain have larger sewers as well as bigger reservoirs, and they would be glad to see the outfalls placed farther down the river. So, at least, we infer from some things they say, and from the fact that certain things are left unsaid. But some of the work that has been done cannot be undone, and we fear it will severely tax the ingenuity of the Royal Commissioners to discover a plan by which the sewage of the metropolis shall be disposed of so as not to inconvenience anybody. If another million or two, beyond what is already contemplated, would put things straight—would abolish all the disagreeable smells, make the river pure, restore the fish, and make the sand and gravel clean again, it would be money well spent. The main drainage works have not been dear, but their design has been, perhaps, too closely limited by economical considerations, though happily the workmanship has been excellent.

THAMES STEAMBOATS.

THE London Steamboat Company finds it necessary to re-arrange its affairs; and a crowded meeting of shareholders was held at Cannon-street Hotel on the 11th inst. to consider a scheme for the re-construction of the company. The assets of the company are estimated to be worth £197,000, but there are debts amounting to £74,000, leaving the net available assets £123,000. The goodwill of the company is valued at £35,000, making the total assets £158,000. It is proposed that the company shall be re-constructed with a capital of £210,000 in 42,000 shares of £5 each, of which 32,000 shares are to be preference and 10,000 ordinary shares. It seems that the shareholders are asked to pay £20,000 in cash, wanted at the moment, and liquidators have been appointed to carry out the sale by the old company to the new one. This seems to be a favourable opportunity for urging on the company the propriety of making a change in its system of dealing with the public, which change could not fail to prove serviceable to all concerned. The passenger steamboats plying on the Thames are very, very far from what they ought to be; and there is no good reason why they should not be supplanted by craft constructed more in accordance with modern ideas of comfort, speed, and safety. By far the larger number of the Thames "penny steamers" are very old, having been built quite thirty years ago. They were no doubt well designed for the period, and well adapted to the demands made on them, and the conditions under which they worked. The Thames then, and for long afterwards, was little better than an open sewer, and few persons who pretended to refinement would trust themselves on the river. The piers and dummies were dirty and inconvenient, and the traffic to be provided for was wholly third-class. The river has been purified, its banks have been beautified, and the landing stages are safe and convenient; but no change has been made in the boats, unless it be for the worse; and in spite of the augmentation of traffic between Westminster and the City, the Thames steamboat is not now patronised as it was when London street traffic had attained nothing like its present dimensions. The traffic is wholly third-class, and it cannot possibly be otherwise until superior accommodation for passengers is provided.

Railway companies know that the third-class passenger is very long suffering, but they also know that every attempt that has been made to render the third-class passenger more at his ease has been fully appreciated by the public. The third-class carriages on most of our great lines are now cushioned and padded, and far more comfortable than second-class coaches were a dozen years ago. Indeed, some of them compare favourably with old-fashioned first-class stock on lines which we refrain from naming. If the London Steamboat Company wishes to earn dividends it must adapt itself to the manners and customs of the day, and it must provide steamboats very different in many respects from those it now uses. We know that this course has often been urged on the company; and we are not aware that any serious defence has ever been set up. A favourable opportunity now occurs at all events for making the change, and we urge its propriety once more on the directors of the company. The alterations needed would not demand any very radical departures as to size from the present type of boat. The oscillating paddle engines, designed and constructed by Messrs. John Penn and Son, have answered their purpose very well, and to the boats which go up to Kew paddle wheels are essential, as a draught of about 2ft. 6in. is the most that can be reckoned on in summer during certain states of the tide. The boats are fairly fast now and are admirably handled; but the new boats might easily be made a little faster with advantage. The accommodation provided for passengers is as bad as it possibly can be now. It consists of the deck, on which are certain hard wood seats, and there is no shelter whatever provided, either from the sun in summer or the rain and wind in winter. There is a cabin below the after deck; the sole attempt made to render this habitable consists in putting a hard wooden bench down each side. Is it a matter for surprise that in winter the traffic falls off? is it not rather wonderful that any passengers at all are carried?

It is too much, we suppose, to expect that really satisfactory boats will be put on the river all at once. Yet we can see no reason whatever why craft of the type of the steam gondola on Coniston Lake should not be used. The boat in question is smaller than a London penny steamer, being about 98ft. long, and carrying 223 passengers. She has a propeller 3ft. in diameter, and steams about twelve miles an hour. Her engines are aft, and she has a good promenade deck over them, while forward is a saloon beautifully fitted up, and provided on all sides with plate glass. A Thames steamer might easily be designed which could have a somewhat similar saloon on deck. There is nothing about the bridges to prevent one from being used. We have said that paddle-boats would be needed for the boats going up to Kew; but seeing what Messrs. Yarrow and Co. have done on the Magdelena and other rivers in the way of shallow draught steamers, it is evident that something very far superior to anything yet seen on the Thames could be made for working the higher portions of the river. For the rest, screws are more suitable than paddles, lending themselves more kindly to the wishes of the designer. The "*mouche*," well-known to all who have visited Paris, may be taken as faintly indicating what could be done on the Thames. The space now uselessly occupied by the cabin of the penny-boat would accommodate engines and boiler; and forward of these might be provided, as we have said, a deck house, the full width of the boat, save a narrow gangway or waterway required to protect its sides from injury when alongside a pier. The house would be low externally, being sunk, so to speak, below the level of the deck; but lofty enough within. The top could be made to serve as a promenade deck, as its level would be below that of the captain's bridge in the penny-boats. The bridges would not interfere even when the tide is highest. Aft of the deck-house would be an open deck, which would be covered, however, by a permanent iron awning, which would keep out the sun and rain. Two classes might be provided for—the first in the saloon, and the second on deck; and this would present no difficulties whatever. It is, of course, impossible to do more here than indicate in general terms the nature of the boat wanted; but any change must be a change for the better, and a change will have to be made. We have said nothing of the larger boats which ply to Woolwich; but they are in no respect better than the smaller craft which ply above bridge. Changes and improvements are wanted in them; but they would take a somewhat different direction from that which we have indicated as suitable for the typical penny steamer.

It is a matter for some wonder that the London Steamboat Company has existed so long without rivalry. Speculations of the most risky character have never failed for lack of funds; yet no one seems to have thought of putting on the Thames steamboats in which the civilised citizens of the greatest metropolis in the world might voyage with some sort of comfort. The fact that the London Steamboat Company is still in existence proves that money can be made by carrying passengers on the Thames as badly as it is possible to carry them. With suitable boats, properly worked, there can be no doubt that the traffic would be enormous as compared with what it is now. Possibly the present company will take warning in time, and endeavour to attract traffic. If not, sooner or later it will find itself supplanted by those who understand more fully modern conditions of success.

COMPOUND LOCOMOTIVES.

THE compound locomotive does not appear to grow in favour with locomotive superintendents. A few are at work in the United States and on the Continent, and about a dozen of Mr. Webb's engines are now running on the London and North-Western Railway. It may perhaps be taken for granted, however, that the number is sufficiently large to permit an opinion to be formed concerning their merits. The results obtained up to the present are not encouraging. Compound locomotives cost more than the ordinary engine. Regularity in the force turning the crank shaft is of no consequence, and they have to depend for favour solely on their powers of saving coal as compared with other engines. In a word, if they are not economical in the consumption of coal, they possess no advantages over other locomotives. A great deal of interest has centred in the performance of Mr. Webb's engines—which were fully described and illustrated in our pages last August. It has been stated in general terms that they burned 20 per cent. less coal than the ordinary London and North-Western engines; but no definite figures were given until very recently, when a contemporary published a statement made by Mr. Webb, which supplies the information wanted. On the 26th October, 1883, a compound engine took the 10 a.m. Scotch express from Euston to Carlisle, a distance of 300 miles in round numbers. The engine and tender weighed when starting 62 tons 13 cwt. The train consisted of twelve coaches to Crewe; a thirteenth was added at Crewe. The gross load, including this, was 214 tons 9 cwt. 1 qr., or up to Crewe, 204 tons in round numbers. The average running speed was a little over 44 miles an hour. Good time was kept. The engine has a pair of high-pressure cylinders, 13in. diameter, and one low-pressure cylinder 26in. diameter, the stroke of all being 24in. The diameter of the driving and trailing wheels is 6ft. 6in. The total weight of coal used—quality not stated—was 79 cwt. The water evaporated weighed 75,460 lb. The evaporation was therefore 8·5 lb. per lb. of coal, a very excellent result, seeing that the feed-water was not heated. The consumption per train mile was 29·46 lb. From this a deduction of 1·2 lb. per mile is made for lighting up. We do not quite see why, as coal is usually weighed on to a tender when the engine is in steam, although the fire has not been made up. However, accepting this deduction, we have 28·25 per mile as the actual consumption per mile. The Gladstone, with an average load of 19·5 vehicles, and about 300 tons gross load, burns 31 lb. per mile, the evaporation being about the same as in Mr. Webb's engine, the speed over forty-five miles an hour. The line is much steeper and more difficult than that between London and Crewe. The consumption per vehicle mile is 1·58 lb. Mr. Webb's engine burned 1·88 lb., counting the engine and tender as two vehicles, and the train as made up all through of thirteen coaches. No allowance has been made in the case of the Brighton Railway engine for coal burned during shunting and standing at Victoria station for some hours.

In order to arrive at a conclusion as to the value of this performance, we must carefully consider the conditions under which it was made. To begin with, the train load was about one-half that taken in the tourist season by single engines from London to Crewe. It is as nearly as possible one-half that of the Brighton 8.45 a.m. up express. Mr. Worsdell sends trains of twenty-two coaches out daily with a single engine. A train of thirteen coaches may be regarded as below the average for anything but limited mails. Again, the speed is not very high. The whole time allowed for running from Euston to Carlisle is seven hours and twenty minutes, from which must be deducted two minutes at Willesden, five minutes at Rugby, seven minutes at Crewe, and twenty minutes at Preston, or in all thirty-four minutes, leaving as running time 406 minutes, or 1·33 minutes per mile, or a little over forty-four miles an hour. There are none but very easy gradients on the London and North-Western from Chalk Farm to Preston. Up to Crewe 1 in 326 is the steepest gradient against a train going north, if we except one or two very short bits of rising ground; that is to say, for 235 miles the road is very level. It then continues to rise, with one small exception, to the top of Shapfell, a distance of about thirty miles. The incline from Tebay to the summit is at the rate of 1 in 75 for a distance of about five miles. This point reached, the line falls to Carlisle—a distance of thirty miles—at such a rate that the descent can be made almost entirely without the aid of steam. Taking into consideration the moderate dimensions of the train; the level profile of the road—with the Shapfell exception—the length of the continuous runs, and the good quality of the coal, as evinced by the performance of the boiler, it must, we think, be admitted 28·25 lb. per train mile is in no way an exceptional performance. It is a very good duty no doubt, but we fancy that it is hardly so good as that of Mr. Stirling's single driver outside cylinder engines on the Great Northern, which are reported to run from King's Cross to Doncaster with twelve coaches on a consumption of 26 lb. per mile. The figures given by Mr. Webb would obviously be far more interesting than they are if he had furnished the public with a statement of the normal consumption of fuel over the same road with his regular engines.

It is not easy to get from the advocates of the compound locomotive a definite statement of the reason why an advantage should be gained. Compounding is not adopted to prevent condensation. Indeed, to put two long cylinders of small diameter outside the frames of a locomotive is hardly the best way to secure that end; in any case, the condensation in a pair of inside cylinders is very small. Nor is it, as we have said, to secure regular turning of the crank shaft that the system has been adopted. Advantage can only be sought in the way of saving fuel; and this, it is clear, can only be had by expanding the steam more in the compound than in the normal engine. In one word, compounding is the same thing as putting in larger cylinders. The engines working the Scotch mail in the ordinary way have cylinders 17in. by 24in.; their capacity is therefore 6·306 cubic feet. The three cylinders of the compound engine have a capacity of 10·962 cubic feet. Two cylinders 22·5in. in diameter would have the same capacity, and we may ask why they should not be used instead of the three cylinders adopted by Mr. Webb. The objections can be briefly stated, and are not insurmountable. It would be possible with a little scheming to get them in between frames by the aid of Joy's valve gear, or by putting the slide valves under them as in the Gladstone. The frames would, however, require some modification in arrangement, in all probability. But with cylinders of this size four coupled drivers could be made to slip with the greatest ease, unless precautions were taken to prevent it. This is one of the reasons why attempts to use locomotives with great cylinder capacity have hitherto not been a success. Their drivers put them in full gear and turn on steam, and the wheels slip at once. If they attempt to start them with the link raised, the ports are blinded and the steam will not enter the cylinders at all. One way out of the difficulty lies in modifying the regulator. If that is made to open gradually by means of a hand wheel and fine pitch screw, it will not be easy to make the engine slip, because the throttle valve will act as a reducing valve. The great objection to the screw—which used to be employed pretty freely in old locomotives—is that if the engine does slip, steam cannot be shut off suddenly; but a modification might easily be made in the stop valve, which would provide for this. When the engine was fairly running it could be worked at a high grade of expansion, and no doubt all the economy that can be derived from compounding would be had. However, we should be slow to advocate the use of two 22½in. cylinders instead of two 17in. cylinders for a passenger locomotive intended to work the Scotch express; but we should like to see what could be accomplished by a pair of 19in. cylinders, the proportions of the boiler remaining unaltered.

Mr. Webb has carried out a most interesting and instructive experiment. It is only to be regretted, we think, that he did not begin with goods engines, in which the steam is worked with much less expansion and to smaller advantage than it is in passenger engines. We understand that, apart from the data given above, the compound engines burn about 6 lb. per mile less than the non-compound. This, however, does not seem to be borne out by the result of the run from Euston to Carlisle, which we have given above, for we can scarcely think it probable that any modern English locomotive can want some 34 lb. of good coal to draw a train of but thirteen coaches over a road for the most part practically level.

THE UNITED STATES CRUISERS.

THE latest advices from the United States go to show that the questions connected with the new cruisers are likely to be settled summarily by the refusal of Congress to build them at all. The United States *Army and Navy Journal* gives us to understand that, not the engines alone, but the hulls of the new ships are criticised. The inquiries of the Senate Naval Committee have revealed serious differences of opinion on the subject of the new cruisers. Chief Naval Constructor T. D. Wilson objects to placing the batteries in a central superstructure with an open forecastle and poop deck, as allowing too much water to dash over the ships and impairing their speed in a high sea. The Secretary of the Navy, the Bureau of Ordnance, and a majority of the Advisory Board were of the opinion, on the contrary, that the sea-going qualities of the ship would be in no way impaired, while the fighting capacity would be notably increased. While Mr. Wilson does not think the Boston and Atalanta will be entire failures, he stated to the Committee that he thought it would be unwise to build any more vessels of their type. He has also doubts about the success of the Chicago. He does not believe she will make over 15 knots an hour in a heavy sea, and will fall considerably below that. The Senate Naval Committee continues to hear testimony on the subject. Admiral Porter was before the Committee and gave his views on the vessels now being built and those that should be built. Commodores Simpson and Semmes, Captain Johnson and Commander Bartlett were also heard. Other officers will be invited to appear. Meanwhile, the daily papers are vigourously discussing the merits of the new cruisers. The New York *Evening Post* has an article rigorously criticising them, which bears internal evidence of having been written by a naval officer. The Chicago papers are especially savage in their attacks. The *Tribune* of that city devotes nine columns to an account of the abuses of the naval administration. Thus the doubt increases as to whether Congress will make any further appropriation for new vessels for the present. This is certainly one way of settling the diffculty.

A GREAT RUSSIAN BRIDGE.

WE learn from Russian newspapers just to hand that the idea of repeating the ice railway across the Bay of Cronstadt, tried with partial success in the year 1881, has now been finally given up. A scheme has, in fact, taken its place for connecting Cronstadt and Oranienbaum by a bridge at a cost of about sixteen millions of roubles. The structure will be erected under the supervision of engineers appointed by the Russian Government. It will rest upon granite pillars, fixed by the caisson method, each of them protected from the action of the waves during the prevalence of south-west winds by an angular wall-like guard of stone. The bridge will be 7½ versts in length, and is expected to be completed in the year 1889. When finished it will consist of two parts—a railway and a foot bridge—and will be lit by the electric light.

LITERATURE.

Steel and Iron; Comprising the Practice and Theory of the Several Methods Pursued in their Manufacture, and of their Treatment in the Rolling Mill, the Forge, and the Foundry. By W. H. GREENWOOD, F.C.S., M.I.M.E., &c. London, Paris, and New York: Cassell and Co. 1884.

THIS volume is one of the series of manuals of technology edited by Professor Ayrton and Dr. Wormell, having for their professed object the description of the various processes practised in the industry of which they treat, and the exposition of the scientific principles which underlie their application. The importance of such a work at the present moment can scarcely be overrated; our industries in general, and the iron trade in particular, are passing through one of those crises which, however much suffering they may for the time being cause to all connected with the trade, rarely pass away without leaving behind them a permanent benefit in the shape of improved processes whose object is an economy either of labour or material; and it is undeniable that the surest mode of attaining such economic improvement is the technical education of the artisan. As long as the workman remains a mere empiricist, content to work by rule of thumb, so long will he be found not only incapable of appreciating, but even ready to oppose, actively or passively, all progress in his trade. When the manufacturer finds that he has but little margin between the selling price and the cost of production, his utmost efforts must be directed towards the reduction of the latter by improved processes of manufacture; and the first step towards this desideratum must lie in the intelligent co-operation of his workpeople. This can only be attained by the prudent education of the masses, and notably by that training in elementary scientific principles which forms the groundwork of technological education, such as has of late years made exceptionally rapid advances in this country, and of the spread of which works like the present are the direct result.

The volume before us gives in a very compact form a clear though brief outline of all the most important processes employed in the production of iron and steel, including their most recent developments; and though the author can tell us but little, if anything, that is novel or original, yet he has succeeded in giving a very good idea of the principles and practice of iron and steel manufacture. The volume commences, as is usual, by a few chapters on the definitions of chemical and technical terms and on the more purely scientific portion of the subject. This is the weakest part of the book, and bears occasional evidences of over-hurry or slipshod work, many of the definitions in particular being very loose. For instance, in his definition of the terms "redshort" and "coldshort," the author states that redshort metals are "such metals as do not permit of being readily worked at a temperature at or above redness," whereas, as is perfectly well known, redshort iron, such as Welsh common bar, has to be rolled or forged at a temperature considerably above redness, namely, at a white heat, at which it is perfectly workable, though it is very short at a red heat.

Again, in the chapters on refractory materials and the ores of iron, we notice several slips. Surely 87 per cent. of silica cannot be considered an unusually high proportion of that substance in siliceous sand, nor do we see how it is possible to have a brown hæmatite containing no water of combination. The description of franklinite is hardly a satisfactory one, and that of ilmenite should have followed after the last-named mineral instead of being wedged in between brown hæmatite and spathic ore. The formula for ferrous carbonate is $Fe\,CO_3$, and not Fe_2CO_3, as it is repeatedly written here. All these are slips that admit of easy correction, but the author goes more seriously astray when he comes to consider the chemistry of pig iron. Throughout his chapters on this subject he has failed to see the immense influence of silicon on the quality of pig iron. Had he properly appreciated the part played by this element he would not have stated that "silicon is an *almost* invariable constituent of pig iron," and he would not have been so totally at sea in everything concerning chilled castings; he would not have stated that "the white portion of such castings is found to be poorer in silicon than the body of the casting," which is not the case; nor would he consider that "it is impossible to predetermine from the chemical analysis of any pig iron whether it will produce good chill castings or otherwise." Not only is it perfectly possible to say from the composition of a pig iron whether it is fit for making chilled castings or not, but even the depth of chill which an iron will give in any casting can be predicted almost to the eighth of an inch. In this connection it may be added that the figure given on p. 198 of a "section of mould for chilling tread of wheel" shows a pattern of most faulty design, which could never make a good chilled wheel. Among other slips in the chemical portion of the subject we may note that the account of the phenomena attending the solution of pig iron in acids on p. 70 wants revision, for it is quite inaccurate as it stands. Terne plates are not iron plates coated with tin, as the author seems to imagine, but with an alloy of tin and lead.

The account of iron smelting in the blast furnace, which forms the next portion of the book, is fairly accurate and comprehensive, although the author does not sufficiently bring out the advantages of the closed front, nor does he pay sufficient attention to the most modern developments of blast furnace construction, such as the jacketting of the hearth with water plates, the employment of large water breasts and bronze tuyeres, &c.; nor does he mention the spray tuyeres which are so highly approved of by some authorities. More space might with advantage be devoted to the theory of blast furnace practice, especially as regards the composition of the charges when working on different kinds of ore.

In the next part of his subject, the manufacture of iron and steel, the author appears to be far more at home than in the production and applications of cast iron. His account of the various methods of producing wrought iron, especially of the numerous mechanical puddlers that have from time to time been introduced, is very good. With regard to puddling, further details of the process might be desirable, and some notice should be taken of the modern improvements in the puddling furnace in which the sides of the bed consist of cast iron water boshes. Nor do we think that metallurgists of the present day will be inclined to accept as correct the explanation here given of the elimination of phosphorus during puddling, which is simply the hypothesis put forward many years ago by Dr. Percy, to the effect that it is due to the liquation of fluid phosphide of iron from the pasty balls of the malleable metal; some of the statements about the elimination of manganese are, to say the least, of questionable accuracy. The diagrams of the puddling and heating furnaces are among the worst in the book. If, as the author states, all his figures are drawn to scale, why is the scale never appended?

The last portion of the book, treating of the manufacture of steel, is very well executed, although the descriptions of some of the processes are scarcely as clear or as complete as might be desired; too much space has, perhaps, on the other hand, been devoted to such processes as the Heaton, Ellershausen, &c. It would also be desirable to have given a more complete account of the arrangements of the casting pits, and the machinery—such as ingot cranes—connected with them, both in the open hearth and the Bessemer processes. The author does not seem to be aware that the "more recent practice" of placing the two Bessemer converters side by side and parallel is the American plan, the advantages of which have only recently been recognised in this country. Though but lately adopted here, it has long been in use on the other side of the Atlantic.

Upon the whole, and in spite of the blemishes we have noticed, the author may be congratulated upon having produced one of the best text books for its size on the technology of iron and steel, and one which cannot fail to be of service to a large class of readers, whether they be students who, possessing a knowledge of pure science, wish to get a clear conception of the different metallurgical processes, or workmen who have already gained their technical knowledge by practical experience, but wish in addition to understand the scientific principles upon which their practice is based.

PRIVATE BILLS IN PARLIAMENT.

ON Thursday, in the Robing Room of the House of Lords, a conference was held between Lord Redesdale (Chairman of Committees of the House of Lords) and Sir Arthur Otway (Chairman of Ways and Means) on the one part, and the parliamentary agent having charge of Private Bills, for the purpose of deciding which Bills should commence in the Lords and which in the Commons. The following Bills, amongst others, will commence in the Lords:—Ayr and District Tramways, Ballyclare, Ligoniel, and Belfast Junction Railway, Belfast and Northern Counties Railway, Belfast Central Railway (Steam Vessels and Traffic Arrangements), Belfast Central Railway (Western Extensions), Belfast, Holywood, and Bangor Railway, Belfast, Strandtown, and High Holywood Railway, Belfast Street Tramways, Brighton and South Coast Tramways, Brighton District Tramways (Extensions), Buenos Ayres and Ensenada Port Railway Company, Charnwood Forest Railway, Colne Valley and Halstead Railway, East and West Junction Railway, Golden Valley Railway (Hay Extension), Golden Valley Railway (Monnow Valley Extension), Gravesend Embankment, Landing Stage, and Railway, Great Western Railway and Bristol and Portishead Pier and Railway Companies, Limerick and Kerry Railway, Liskeard and Caradon Railway, North Cornwall Railway, Manchester Ship Canal, Ouse (Lower) Improvement, Plymouth, Devonport, and South-Western Junction and Devon and Cornwall Central Railways, Portpatrick Railway, Railway Clearing House System Superannuation Fund Association, Rotherham and Bawtry Railway and Bawtry and Trent Railway and Dock Companies, Teign Valley Railway.

The following will commence in the Commons:—Aldershot, Farnham, and Petersfield Railway, Anglesey and Carnarvon Direct Railway (No. 1), Athenry and Ennis Junction and Midland Great Western of Ireland Railway Companies, Avonmouth and South Wales Junction Railway, Barnstable and Lynton Railway, Barrmill and Kilwinning Railway, Barry Docks and Railways, Basingstoke, Alton, and Petersfield Railway, Bishop's Castle Extension to Montgomery Railway, Blackpool Railway, Caledonian Railway (No. 1), Caledonian Railway (No. 2), Cardiff and Monmouthshire Valley Railways, Central Wales and Carmarthen Junction Railway, Chatham and Brompton Tramways, Cleveland Extension Mineral Railway, Cork and Bandon and Clonakilty Extension Railway Companies, Cork and Kenmare Railway, Cranbrook and Paddock Wood Railway, Croydon and Kingston Junction Railway, Croydon Central Stations and Railways, Croydon Direct Railway, Croydon, Norwood, Dulwich, and London Railways, Denbighshire and Shropshire Junction Railway, Dore and Chinley Railway, Dublin Junction Railway, Dublin, Wicklow, and Wexford Railway, Dundee Suburban Railway, East and West Junction Railway, Eastern and Midlands Railway, East London Railway, East London Tramways, East of London, Crystal Palace, and South-Eastern Junction Railway, Easton and Church Hope Railway, Edinburgh Northern Tramways, Edinburgh Street Tramways, Ennerdale Railway, Essex (South-East) Tramways, Folkestone, Sandgate, and Hythe Tramways, Glasgow and South-Western Railway, Great Northern Railway, Great North of Scotland Railway, Great Southern and Western Railway (Additional Powers), Great Southern and Western Railway (Tullow Extension), Great Western Railway (No. 1), Great Western Railway (No. 2), Halifax High Level and North and South Junction Railways, Hendon Railway, Henley-in-Arden and Great Western Junction Railway, Highland Railway (New Lines), Highland Railway (Northern Lines Amalgamation), Hull, Barnsley, and West Riding Junction Railway and Docks, Kilsyth and Bonnybridge Railway, Kingston, Fratton, and Southsea Tramways (Extension), Lancashire and Yorkshire and London and North-Western Railway Companies (Preston and Wyre Railway), Lancashire and Yorkshire Railway, Lea Bridge, Leyton, and Walthamstow Tramways (Extensions), Leominster and Bromyard Railway, Lincoln and Skegness Railway, Liverpool, Southport, and Preston Junction Railway, London and South-Western and Metropolitan District Railway Companies, London and South-Western Railway, London, Brighton, and South Coast Railway, London Central Electric Railway, London Chatham, and Dover Railway (Further Powers), London, Chatham, and Dover Railway (Shortlands and Nunhead), London Eastern Tramways, Avonmouth and South Wales Junction Railway; London, Reigate, and Brighton Railway, London Southern Tramways (Extension), London Street Tramways, London, Tilbury, and Southend Railway, London Tramways, Manchester, Bury, and Rochdale Tramways (Extensions), Manchester, Middleton, Rochdale, and District Tramways, Manchester, Sheffield, and Lincolnshire Railway (Additional Powers), Manchester, Sheffield, and Lincolnshire Railway (Chester to Connah's Quay), Mersey Railway, Metropolitan and London, Tilbury, and Southend Railways, Metropolitan Board of Works (District Railway Ventilators), Metropolitan District Railway, Metropolitan Outer Circle Railway, Metropolitan Railway (Park Railway and Parliament-street Improvement), Metropolitan Railway (Various Powers), Midland Railway, Milford Docks Junction Railway, North-Eastern Railway, North London Tramways, North Metropolitan Tramways, Oxted and Groombridge Railway, Paisley and District Tramways, Peckham and East Dulwich Tramways, Plymouth, Devonport, and District Tramways, Rhondda and Bristol Channel Railway, Ruthin and Cerrig-y-Druidion Railway, Scarborough and East Riding Railway, Scarborough and Whitby Railway, Severn Bridge and Forest of Dean Central Railway, Skipton and North-Eastern Junction Railway, South-Eastern and Channel Tunnel Railways, South-Eastern Railway (Various Powers), South-East Metropolitan Railway, Stockton Carr Railway, Strathspey, Strathdon, and Deeside Junction Railway, Sutton and Willoughby Railway, Swindon and Cheltenham (Extension) Railway, Swindon, Marlborough, and Andover and Swindon and Cheltenham (Extension) Railway Companies Amalgamation, Swindon, Marlborough, and Andover Railway, Taff Vale Railway, Tooting, Balham, and Brixton Railway, Totnes, Paignton, and Torquay Direct Railway, Triferig Valley Railway, Upwell, Outwell, and Wisbech Railway (Abandonment), Lisk and Towry Railway, Uxbridge and Rickmansworth Railway, Walton-on-the-Hill, Banstead, and Caterham Junction Railway, Watford, Edgware, and London Railway, West Lancashire Railway (Capital and Extensions), West Metropolitan Tramways (Extensions), Whitchurch, Nantwich, and Cheshire Junction Railways, Wirral Railway, Wisbech Dock and Railways.

On Thursday the Examiner sat to dispose of a few Bills which, for various reasons, had been postponed. The Tooting, Balham, and Brixton Railway Bill was one of these matters. The object of the Bill is to put the district through which it is to run in more direct communication with the Chatham and Dover Railway, and accordingly powers are taken to construct a line from the Chatham Company's railway at Brixton to Tooting, *viâ* Balham and Tooting Bec Common. For about half its length the line will run almost parallel with the Brixton-road and Streatham Hill. The cost of carrying out the project is estimated by the promoters' engineers at £349,787, which will be covered by the £400,000 which is to be raised in the usual way. Certain owners of property who complained of an infringement of the Standing Orders succeeded in establishing their allegations, Standing Orders not being complied with. The case will in due course go before the Standing Orders Committee.

COLCHESTER WATER TOWER.

THE drawings we give on page 130 and our supplement are those of a brick and stone water tower, and cast iron tank, lately erected in Colchester, for the Corporation, who in 1881 purchased the water works from a company. One of the first things found necessary was the sinking and boring of a new well into the chalk formation, a description of which appeared in THE ENGINEER of January 27th, 1882. The tower and tank just completed is another and principal step in the direction of a constant and full supply. The engine power is somewhat small, and while the water had to be forced immediately into the town mains at a high pressure, the jar and strain on them was very great, leading naturally to the necessity of frequent repairs, and sometimes to actual breakdown of the pumping machinery. The desirability of a high service reservoir thus became apparent; and the Town Council instructed their engineer, Mr. Clegg, to prepare plans and specifications of the work. It was at first thought practicable to construct a covered service reservoir of brick or concrete, on a hill adjoining the town; but on going into the matter carefully, it was seen beyond a doubt, that the elevation of the ground was quite inadequate to overcome the friction in the mains leading to the town, a distance of some two miles, and still have head sufficient to command the upper parts of the town. In consequence of the impossibility of constructing a reservoir of the usual kind, plans and estimates were prepared for the tower and tank now illustrated. The tower is constructed of the red bricks of the neighbourhood, dressed with red Corshill stone, which is rich in colour and an admirable weathering stone. The girders supporting the floor of the cast iron tank are bedded on templates of Bramley fall, and a gran te kerb 2ft. wide is carried round the outer edges of the tower immediately under the sides of the tank. Access is to be had to the tank by means of a spiral cast iron staircase, built up in 9in. lengths on a centre core, the outer ends of the treads resting on York stone corbels, built into the brickwork, as the work proceeded, the steps being left free; in this manner any settlement that might have taken place would have left them free to move, and prevented fracture. On a level with the crown of the arches connecting the pier is a concrete floor; on this level is the valve of the byepass, by opening which the water is able to pass round from the rising to the delivery mains without going into the tank, and the town can be supplied by this means at a sufficient pressure during the cleansing and repairs of the inside of the tank. The tank is built up of cast iron plates, varying in thickness from ⅞in. to ½in., all breaking joint and bolted together as indicated by the drawings. The caulking spaces are carefully filled in and caulked with salammoniac, sulphur, and iron borings. The sides of the tank are stayed by 1¼in. wrought iron ties running right across from side to side, and supported at intervals by uprights, formed of 3in. gas tubing with cast iron caps screwed on to them and recessed to receive the stays. On the outer side of the tank, and at the end of each stay, is a circular cast iron washer plate as shown on the drawing, and the cast iron gussets which are built up in three pieces against the inner sides of the tank plates take the immediate pull of the stays when tightened, and keep the sides of the work true and square. The circular plates in the centre carry the staircase, which from the top of the tank to the lantern on roof is self supporting. The reservoir when at overflow level holds in round figures 230,000 gallons.

The works were opened by the Mayor and Corporation, on Thursday, September 27th, 1883, and Sir Robert Rawlinson, C.B., C.E., who gave his advice to the engineer throughout the entire work, was present and assisted at the ceremony; and his words, "I am assured that the work stands there without a crack and without a flaw," are ample testimony to the way in which the work was executed by the contractors, they being, for the tower, Messrs. H. Everett and Son, of Colchester, and for the tank, main laying, &c., Mr. A. G. Mumford, of the Culver-street Ironworks, in the same town.

TENDERS.

FULHAM-ROAD WORKHOUSE.—FIRE-ESCAPE STAIRCASE.

FOR the erection of fire-escape staircase at the Fulham-road Workhouse, for the Guardians of the Poor of the St. George's Union. Mr. H. Saxon Snell, architect.

	£	s.	d.
C. Batchelder	284	0	0
Chas. Wall	258	0	0
Wm. Bamford	240	0	0

SOUTHALL SCHOOLS.—FIRE-ESCAPE STAIRCASE.

For the erection of fire-escape staircase at Southall Schools, for the Guardians of the Poor of the parish of St. Marylebone. Messrs. H. Saxon Snell and Son, architects.

	£	s.	d.
Wm. Bamford, London	330	0	0
Wm. Woodbridge, Maidenhead	298	0	0
Wall Bros., London	249	0	0
G. Gibson, Southall	235	0	0

ST. LUKE'S WORKHOUSE.—CISTERNS, &c.

For the erection of cast iron cisterns and supports, and for various alterations of the water pipes and adapting them to the new artesian well at City-road Workhouse, for the Guardians of the Poor of the Holborn Union. Messrs. H. Saxon Snell and Son, architects.

	£	s.	d.
M. T. Shaw and Co.	647	15	0
T. Potter and Sons	516	0	0
W. J. Fraser and Co.	612	0	0
J. Richmond and Co.	530	0	0
East Surrey Ironworks	458	15	0
C. Kinnell and Co.	417	10	0
May Bros.—accepted	480	0	0

FULHAM-ROAD WORKHOUSE.—IRON BRIDGE.

For the erection of an iron bridge between men's and women's dormitories of the Fulham-road Workhouse, for the Guardians of the Poor of the St. George's Union. Mr. H. Saxon Snell, architect.

	£	s.	d.
C. Batchelder	236	0	0
Fraser and Co.	195	0	0
Edmund Toms	185	0	0
Jukes, Goulson, Stokes and Co.	175	0	0
Chas. Wall	166	0	0
Benham and Sons	148	0	0
Wm. Bamford	150	0	0
May Bros.	136	0	0
Potter and Sons—accepted	130	0	0

IRON AND STEEL WORKS, RESCHITZA, HUNGARY.

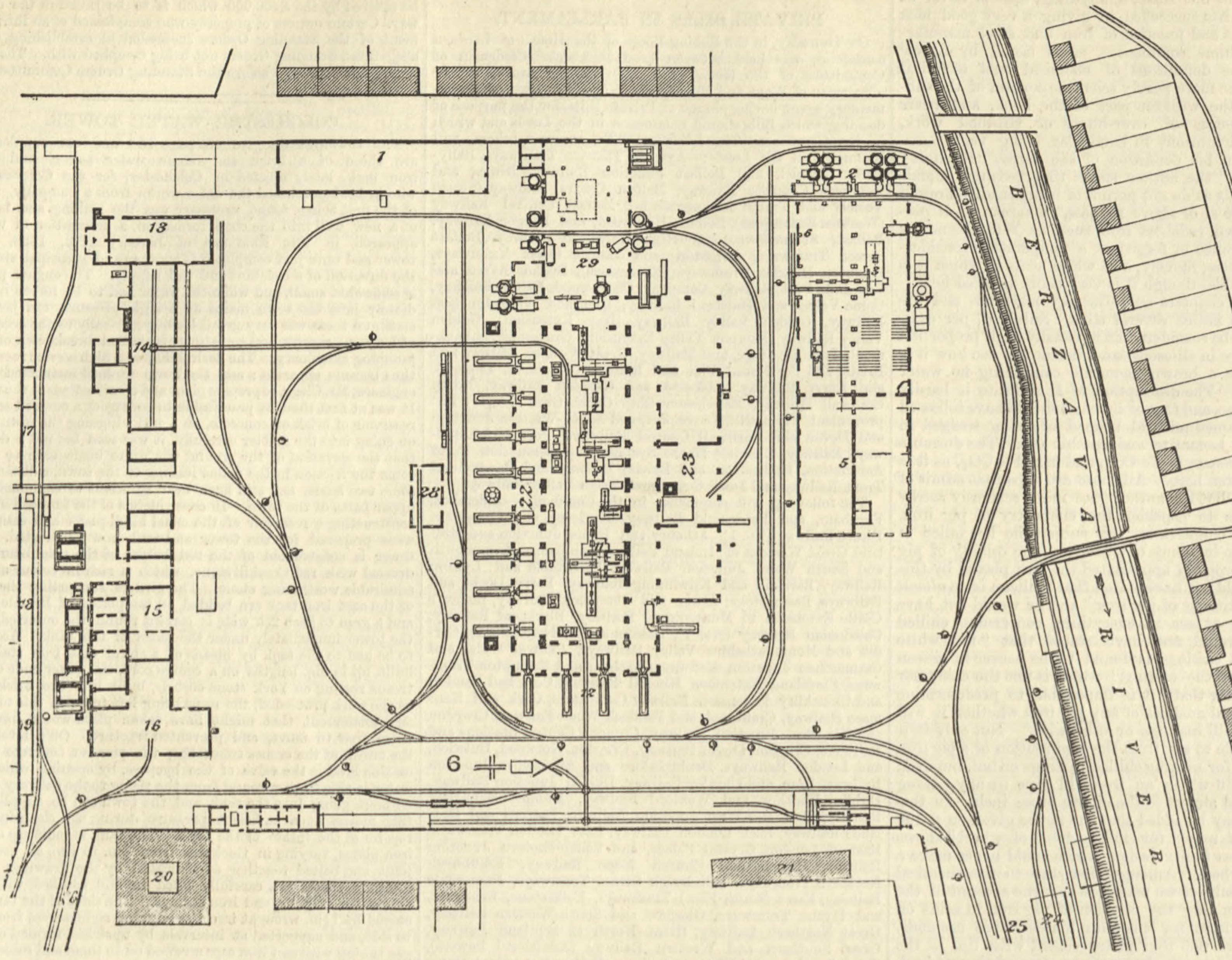


Fig. 9.—GROUND PLAN OF PUDDLING FURNACES, STEAM HAMMERS, ROLLING MILL, FIRE-BRICK WORKS, AND REPAIR SHOPS.

1. Boiler shop.
2. Heating furnaces for rail mill.
3. 700-H.P. high-speed engine for [driving 3-high rail mill.
4. Saw.
5. Rail finishing shops.
6. Testing machines.
7. Universal mill.
8. Plate mill.
9. Sheet mill.
10. Merchant mill.
11. Blooming trains.
12. Puddling furnaces and boilers.
13. Smithy.
14. Repair shop.
15. Fire-brick works.
16. Roll foundry.
17, 18, 19, and 26. Stores.
20 and 21. Workmen's barracks.
22. Heating furnaces.
23. Finishing machines.
24. Locomotive running shed.
25. Railway station.
27. Tubular boilers.
28. Shearing machines.
29. 17-ton steam hammer.

IRON AND STEEL WORKS, RESCHITZA, HUNGARY.

No. IV.

Rolling mill.—It is the misfortune rather than the fault of the Reschitza Works, owing to their having grown up gradually round a nucleus, that the rolling mill, a ground plan of which is given at Fig. 9, above, is not contiguous to the steel works. The ingots, after being allowed to cool, are brought by small locomotives and then heated in furnaces provided with hydraulic press, rack, chain, and pulley for withdrawing them. The mill serves indifferently for steel and iron; but whereas 28,000 tons of Bessemer and Martin steel are turned out yearly, only 7000 tons of finished iron are now produced. The latter is supplied by three double and five single puddling furnaces, all worked by hand. The former treat four charges of 600 kilogs.—12 cwt.—each every twelve hours, with 10 per cent. of loss; and the latter five charges of 300 kilogs. =6 cwt. in the same time, with a loss of only 9½ per cent. The waste heat from each double furnace, and each pair of single furnaces, fires a horizontal steam boiler, 11 m. long, by 1·42 m. diameter—36ft. by 4ft. 8in. All the puddling furnaces, and nearly all the heating furnaces, have stepped grates, for admitting a large quantity of atmospheric air, and so permitting of the consumption of inferior coal. Frequently the whole charge of the puddling furnace is worked in a single ball, shingled under a 3-ton steam hammer, for making the covers of plate piles. First-class plates are rolled from a pile consisting of covers and mill bars; while the piles for second-class plates consist of covers and old rails or other scrap. There is a special furnace for heating old rails, in order to be flattened into the covers of rail and other piles, which are prepared with more than ordinary care, and bound with stout wire.

There are in this department seven steam hammers, varying from 6 to 17 tons, the two largest of which are of the type shown at Fig. 10, supplied by the Märkische Maschinenbau Anstalt, of Wetter-on-the-Ruhr. The nearly cylindrical uprights and the cross-beam are composed of wrought iron plates. In the case of the 17-ton hammer—29 on the plan—the fall is 2½ m.=8ft. 3in., while the weight of the anvil block, cast at the works, is 185 tons. The clear width between uprights is 6·28 m. or 20ft. 7in. The hammer is single-acting, and hand-worked by means of double-beat valves. The diameter of cylinder is 1·1 m., or 3ft. 8in.

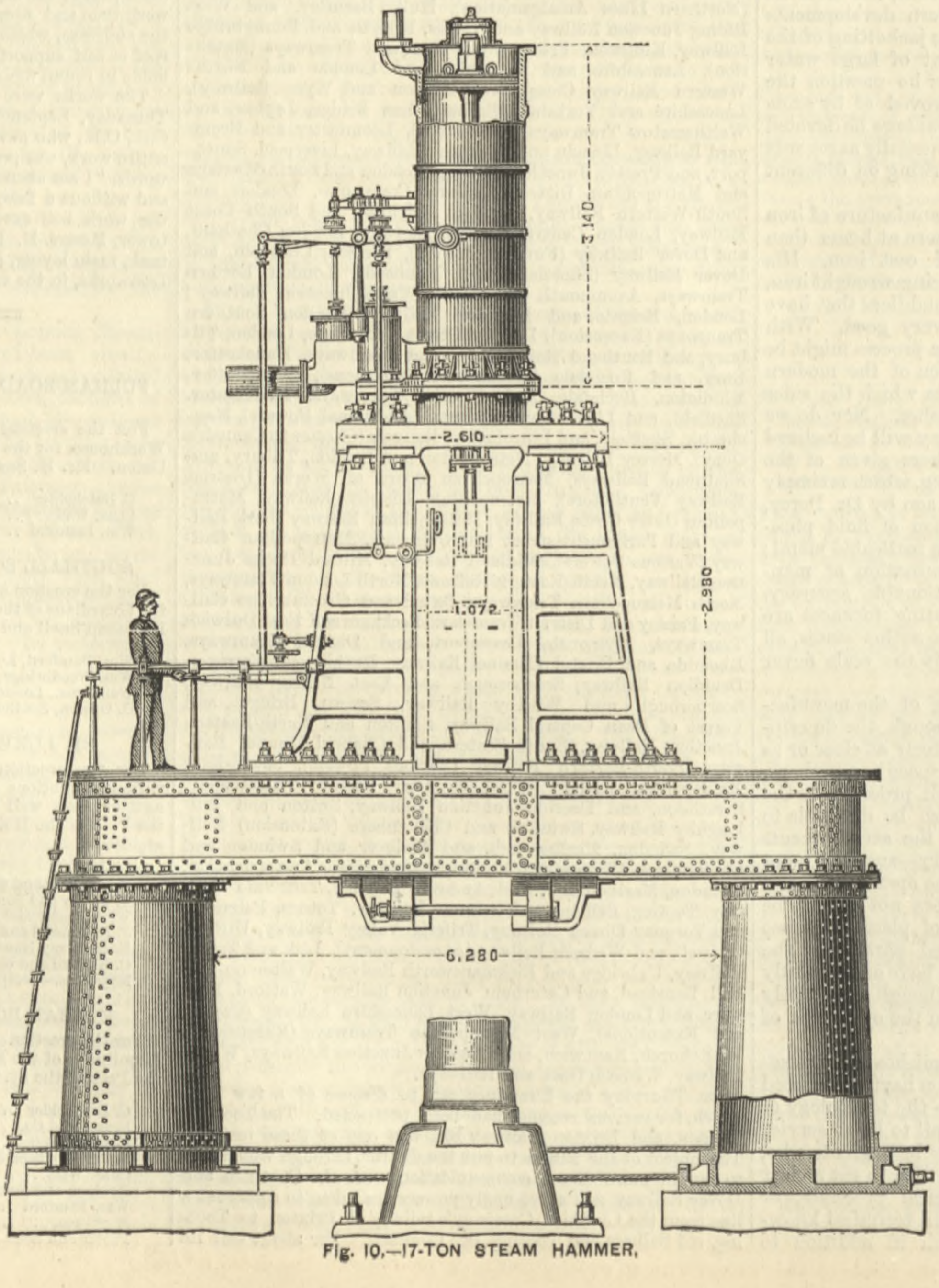


Fig. 10.—17-TON STEAM HAMMER.

Besides the tire mill, which will be referred to below, there are eight roll trains, the gear of which has mitre-shaped teeth, so as to work smoothly and avoid breakage as far as possible. Taking these trains in the upward direction, from the bottom of the plan, Fig. 9, the first is the blooming train, and the second a similar train used for rolling the mill bars for piling, and also small rails, &c. Each of these trains is driven by a 45-horse power beam engine. Next comes the small merchant mill, marked 10 on the plan. In this are also rolled the special bars with projections, for being afterwards cut into lengths to form the dogs for fastening down flange rails. No. 8 is the plate, and No. 9 the sheet mill, the two driven by a 100-horse power horizontal engine. About 1500 tons of plates up to 2 m.= 6ft. 6in. wide, and weighing a ton after shearing, are turned out yearly, and are as highly esteemed as those of the far-famed Styrian iron. Mild steel plates, capable of being pressed into form, are also produced. No. 7 is the universal mill, in which wide flat bars for bridge and girder work are rolled to the amount of about 1500 tons annually. A bar may be rolled in this mill up to 70 cm. = 2ft. 3½in., wide, and from 1 cm. to 13 cm.—⅜in. to 5in. —thick. This mill, and that adjoining, which was formerly used for rails, but now produces large merchant iron and H bars, are driven by a 200-horse power horizontal engine with 40-ton fly-wheel.

Steel rails are now rolled in the new three-high mill—marked 3 on plan—erected in a separate building between the forge and the river, and capable of producing 300 rails in twelve hours. The engine has a single horizontal cylinder of 1·1 m. = 3ft. 7in. diameter and 1·57 m. = 5ft. 2in. stroke, and makes from 60 to 70 revolutions a minute with steam of 52 lb. pressure. The steam is supplied by eight vertical boilers, 11·4 m. high by 1·6 m. in diameter—37ft. 5in. by 5ft. 3in.—four of which are fired by the waste heat of the furnaces—marked 2 on the plan—for heating the ingots. The peculiarity of these boilers is that the flames or gases, which circulate freely outside them, are in direct contact with the plates of the upper portion or steam space, though at this height they have already given up a large portion of their heat. The engine is provided with the Kamp arrangement of double valve gear, but has neither expansion nor condensation. A skilful driver, however, constantly regulates the stop valve according to the work; and the last passes are often made without steam, the engine being provided with a 40-ton fly-wheel. The large ingots are cogged and rolled off at one heat, and in from twenty-one to twenty-five passes, into bars over 21 m. long. The mill, 18 m. = 59ft. long, has three sets of rolls, the first of which is provided with steam lifts, one on each side, while a travelling crane permits of readily changing the rolls. The bar is fed up by live rollers to the circular saw, which, by means of rack and hand wheel, advances to meet it and cuts it into two or three lengths. The rails are passed on from the bench to the straightening presses, the double paring machines, which reduce them to dead lengths, and the drilling machines, which drill the four holes at once; these are all arranged in a direct line, so that the ingots are converted into rails, and these loaded upon railway wagons, without travelling over the same ground twice. With regard to the quality of the rails, the engineer-in-chief to one of the French railway companies, who has tested them, reported that they stand and wear well, and that the steel is better than that produced by French works. At the time of the Iron and Steel Institute visit, 6-metre and 8-metre rails were being rolled for the Hungarian State Railway, and these were followed by orders for the Siebenbürgen and other Hungarian railways, and 20,000 tons of rails for renewals and extensions of the company's own system.

A horizontal tire-mill, by the Märkische Maschinenbau Anstalt, is contained in a prolongation of the forge, shown at the top of the plan. It is driven by a horizontal engine, with pair of cylinders, 0·63 m. diameter and 1·42 m. stroke—2ft. by 4ft. 8in.—representing at 90 revolutions 500 horse-power, erected underground, so as to leave the space all round free for working. The engines work by means of mitre gear on to a vertical shaft, carrying the female roll with a single groove. The male roll is pressed against the inside of the tire by hydraulic pressure of 200 atmospheres. These two rolls and two others, set in and out by screws, for guiding the tire and keeping it round, are all that appear above the floor. Special ingots of a conical shape, 56 cm. = 22in. high, and 31 cm. = 1ft. in diameter at the base, are reduced, under the 17-ton steam hammer, to discs 14 cm. = 5½in. thick, with a hole in the middle, and are then, at the same heat, hammered on the beak of a 6-ton hammer. They are then re-heated and rolled off in a single heat in the mill, which is capable of producing forty in twelve hours. The tire mill is served by a large furnace in close proximity, which is also used to anneal steel plates and axles. It is shown, with dimensions in millimetres, by Figs. 11, 12, and 13, below. It is

Fig. 11

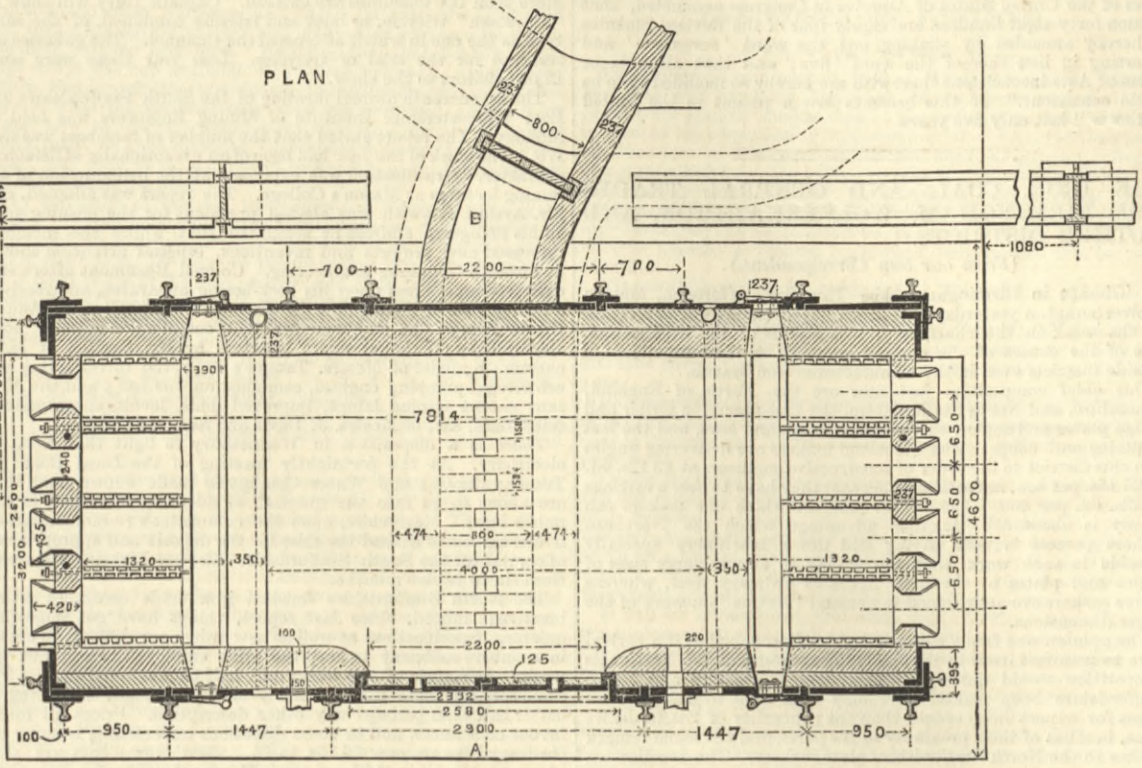
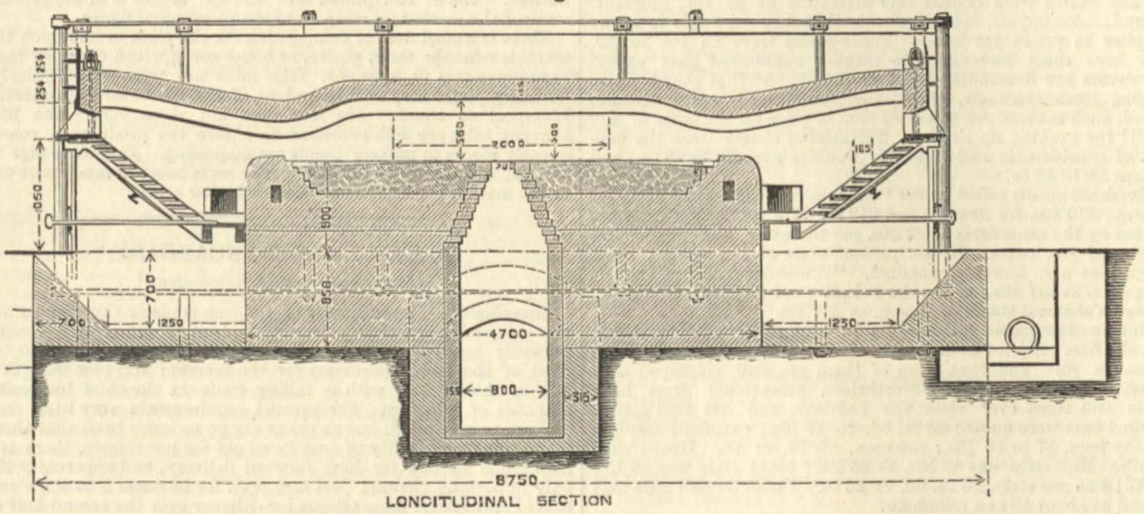


Fig. 12



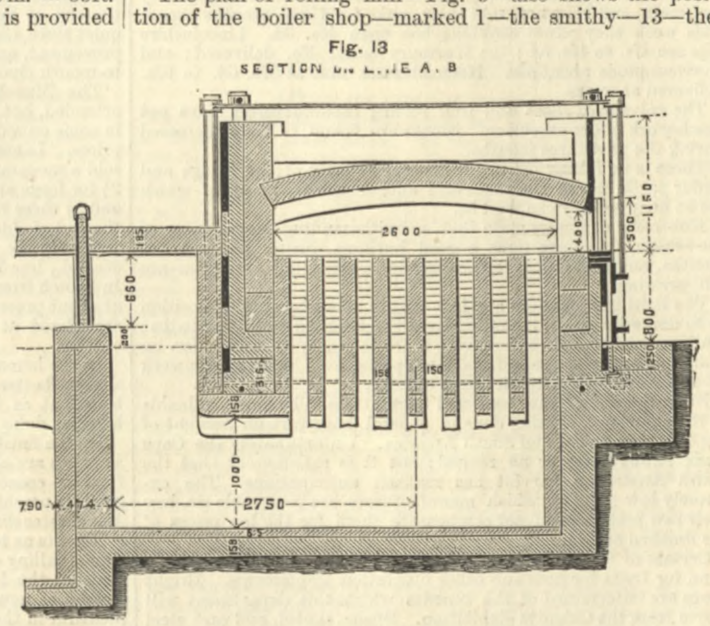
LONGITUDINAL SECTION

fired by two stepped grates, one on either side; and the flames from each pass over half the hearth, descending together by a central passage, whence the products of combustion are led to the chimney by a horizontal flue provided with a damper.

The plan of rolling mill—Fig. 9—also shows the position of the boiler shop—marked 1—the smithy—13—the

Fig. 13

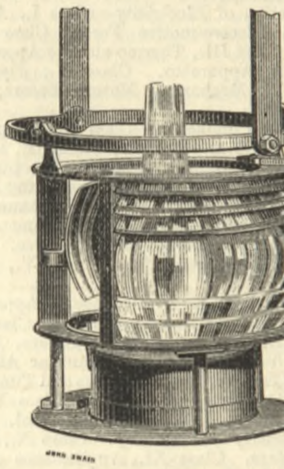
SECTION ON LINE A. B



repair shop—14—the fire-brick works—15—and the roll foundry—16. The last-named department was originally the Imperial cannon foundry; and the pits formerly used for casting guns are now utilised for casting the rolling-mill rolls and steam cylinders. The moulds for the former are made in loam with a template. All the moulds are dried in ovens, no green sand being employed. Powdered charcoal is here used for coating the moulds, instead of powdered coal; and for the finer castings it is mixed with an equal quantity of plumbago. The metal is melted in six reverberatory furnaces instead of cupolas, the castings being found more homogeneous; and these furnaces also serve to calcine the refractory earth for making fire-bricks, &c., in the department adjoining. The silica bricks for lining furnaces are made with a very pure quartz, obtained from Budirisk in Austria, which is burnt by wood in heaps, covered with earth, to render it friable. It is then crushed in a Blake stone-breaker, further reduced by rolls, screened, and then ground by edge-runners with a certain proportion of old fire-brick. This powder is mixed with 2 per cent. of lime and sufficient water to render it plastic, when the clay is moulded by hand into the desired form. The various articles are then subjected to hydraulic pressure of 1500 lb. per square inch, excepting Bessemer tuyeres, stoppers and sockets, and such like small articles which are only subjected to a pressure of 225 lb. per square inch. They are dried in stoves and afterwards burnt in rectangular furnaces.

IMPROVED SHIPS' LIGHTS.

WE have recently had an opportunity of inspecting at the works of Mr. Peter Brotherhood, Lambeth, a set of ship lights constructed according to some improvements introduced by Messrs. Chance Bros. and Co., of Birmingham. The set consisted of port and starboard lights showing over angles of 112½ deg., a masthead light of 225 deg., and an all-round anchor or riding light. All these lights are truly dioptric, formed not of moulded or pressed glass, but of pure optical glass accurately curved, ground, and polished, having a focal distance of 125 millimetres, or 4·92in., and comprising a cylindrical belt with five lens-rings—six pieces in all, the height being about 6·5in. When the side lights are used without shelter the glass is framed in gun-metal, and mounted in a cylindrical lantern of copper and gun-metal about 27in. high and 12in. in diameter, with a domed top. Messrs. Chance have, however, introduced a method of mounting the lenses of side lights in an open gimbal framing without



the lantern top, and placing them in small iron turrets on the ship, having suitable plate-glass windows and a trimming stage for service. The beam is thus always directed in a horizontal plane, and the steady maintenance and easy management of the light secured. We have illustrated in the accompanying engraving this form of side light.

The lights may, of course, be used with any illuminant. Those which we saw in use, with the exception of the anchor light, were lit with Swan incandescent lamps of 100-candles each. It is a little difficult to say with certainty whether a lamp of this kind or power would be the best under all circumstances at sea. On the night of our inspection they were shown across the Thames, and the weather was clear. The lights were very bright indeed. In our opinion they were too bright, and might, with lamps of the above power, be embarassing at sea should the vessels bearing them come fairly close to one another. This, however, is a matter capable of easy adjustment, and in no way affects the design and fitting of the lights, which are excellent.

EXHIBITION OF METEOROLOGICAL INSTRUMENTS.—The Council of the Royal Meteorological Society have arranged to hold at 25, Great George-street, S.W., by permission of the President and Council of the Institution of Civil Engineers, on the evening of March 19th next, an Exhibition of Thermometers. The Exhibition Committee invite co-operation, as they are anxious to obtain as large a collection as possible of such instruments. The committee will be glad to show any new meteorological apparatus invented or first constructed since last March, as well as photographs and drawing possessing meteorological interest.

ELECTRICAL ENGINEERING.—The fifth lecture of a series on "Electrical Engineering," by Mr. John C. Fell, was delivered in the reading-room of the Society of Engineers, 6, Westminster-chambers, on Monday last, Mr. Jabez Church, past president, in the chair. The lecturer again took up the subject of circuit arrangements, and the optional methods for the disposal of lamps for electric lighting, either in series or in parallel arc. A large number of the best known arc lamps, such as the Siemens, the Brush, the Joel, the Werdermann, and the Brockie, dating back as far as 1846, were illustrated by diagrams and explained. The different methods by which the respective feeds are controlled was fully gone into, and the value of controlling the feed by the varying resistance of shunt currents was pointed out. The relative advantages of the arc and semi-incandescent lamps were compared, and the peculiarities of their structure detailed. In conclusion, Mr. Fell enlarged upon the absolute necessity for commercial success of a lamp being so constructed that it would not go out or flicker.

THE INTERNATIONAL RAIL MANUFACTURERS' CONVENTION FOR THE REGULATION OF PRICES.—With reference to this convention, the *Rheinisch Westphalische Zeitung* says:—"Such an arrangement between the larger English, Belgian, and German railmakers appears to be a *fait accompli*. It has been agreed that in quoting prices for export these works shall not compete against each other, but according to a fixed arrangement distribute the quantities amongst themselves, compensating those who do not obtain orders by some means or other. The difference in freight from the different shipping ports cannot offer a serious obstacle to such an international agreement and its duration, as the prices given in the various tenders are always calculated on a basis price at works. At all events such a measure, which long ago has proved of practical value in Germany, will put an end to the internecine competition for foreign orders and cannot fail to exercise an important influence on the course of prices, and thus create a favourable change in the position of the industrial establishments of the Rhenish and Westphalian works. The larger ones engaged in the rail trade are mostly concerned, such as Krupp, Bochum, Dortmunder Union, Rhenish Steel Works, &c., and of these the two first have hitherto played the most important part in the export trade."

THE ELECTRICAL EXHIBITION IN PHILADELPHIA.

THE committee of the International Electrical Exhibition to be held in Philadelphia, commencing Tuesday, September 2nd next, and closing Saturday, October 11th following, under the auspices of the Franklin Institute, have issued a pamphlet containing full information to intending exhibitors. By a joint resolution of Congress, approved February 26th, 1883, all articles which shall be imported for the sole purpose of exhibition shall be admitted without the payment of duty or customs fees or charges, under certain regulations. The building will be located at Thirty-second-street and Lancaster-avenue. Each exhibitor will be required to pay an entrance fee of 5 dols., for which a season ticket of admission will be issued. All applications for space must be made before August 30th, on printed blank forms to be furnished by the committee. Whenever the articles will admit, exhibitors are requested to display them in glass cases. The committee reserve the right to exclude from the building and premises all articles of a dangerous or offensive or otherwise objectionable character. Power will be furnished to drive machines at a fixed rate. No awards or prizes are offered by the Institute, but in place thereof a report to the Institute will be prepared by a Board of Examiners, which report will be as full as the time and opportunity will permit. The examiners shall be appointed by the Board of Managers, and shall be men of acknowledged integrity, skill and experience in the line of articles assigned to them.

The following railroads and steamship companies have agreed to return free over their own lines to the point of shipment articles which they have carried intended for the Exhibition upon which freight to Philadelphia shall have been prepaid:—Pennsylvania Railroad Company—embracing the Philadelphia, Wilmington, and Baltimore, Northern Central, West Jersey, and Camden and Atlantic roads; Philadelphia and Reading; Lehigh Valley Railroad Company; American and Red Star Steamship lines; Clyde's Coastwise and West India steam lines; Ocean Steamship Company; Boston and Philadelphia; Providence, Fall River, and Ericsson steamship lines.

Exhibitors who cannot attend in person can authorise the secretary of the Franklin Institute to place their goods in charge of a suitable person who will represent the exhibitor. The following is a synopsis of classification:—

Section I.—Production of Electricity—Class I., Apparatus for Electricity of High Electro-motive Force. Class II., Voltaic Electric Apparatus. Class III., Thermo-electric Apparatus. Class IV., Magneto-electric Apparatus. Class V., Dynamo-electric Apparatus. Class VI., Mechanical Motors—Steam, Gas, Water, Heat, and Wind Engines.

Section II.—Electric Conductors—Class I., Telegraph Wires. Class II., Telephone Wires and Cables. Class III., Electric Light Circuits. Class IV., Underground Conduits for Electric Conductors. Class V., Submarine Cables. Class VI., Insulating Materials for Conductors. Class VII., Electrical Joints and Connections.

Section III.—Measurements—Class I., Measurements of Dimensions. Class II., Measurements of Speed, Force, and Energy. Class III., Electrical Measurements. Class IV., Photometric Measurements.

Section IV.—A.—Applications of Electricity—Apparatus requiring electric currents of comparatively low power. Class I., Electric Telegraphs. Class II., Telephones, Microphones, Photophones, and Radiaphones. Class III., Fire and Burglar Alarms. Class IV., Annunciators. Class V., Electric Clocks and Time Telegraphs. Class VI., Electric Registering Apparatus. Class VII., Electric Signal Apparatus. Class VIII., Electro-medical. Class IX., Applications of Electricity to Dentistry. Class X., Applications of Electricity to Warfare. Class XI., Applications of Electricity to Mining and Blasting. Class XII., Applications of Electricity to Spinning and Weaving. Class XIII., Electrical Traps and Snares. Class XIV., Applications of Electricity to Pneumatic Apparatus. Class XV., Applications of Electricity to Musical Instruments. Class XVI., Applications of Electricity to Writing and Printing. Class XVII., Electrical Toys. Class XVIII., Electrical Conjuring Apparatus. Class XIX., Miscellaneous Applications of Small Currents.

Section IV.—B.—Applications of Electricity—Apparatus requiring electric currents of comparatively great power. Class I., Electrical Illumination. Class II., Electro-metallurgy. Class III., other Applications of Electro-chemistry. Class IV., Storage Batteries and Accumulators. Class V., Electric Motors, Transmission of Power. Class VI., Electro-magnetic Brakes. Class VII., Miscellaneous Applications of Large Currents.

Section V.—Terrestrial Physics.—Class I., Atmospheric Electricity. Class II., Terrestrial Magnetism. Class III., Apparatus used by Governments for Weather Signal Stations.

Section VI.—Historical Apparatus.

Section VII.—Educational and Bibliographical.

Committee on Exhibitions—Charles H. Banes, chairman; William P. Tatham, Charles Bullock, Frederick Graff, Joseph E. Mitchell, Samuel Sartain, Washington Jones, A. E. Outerbridge, jun., William D. Marks, Cyrus Chambers, jun., Addison B. Burk, E. Alex. Scott, G. Morgan Eldridge, Lewis S. Ware, Wm. V. McKean, C. Wesley Lyons, Edward Longstreth, William Sellers, Frederick Fraley, John J. Weaver, Joseph M. Wilson, Coleman Sellers, Isaac Norris, jun., Theodore D. Rand, J. Vaughan Merrick, Henry R. Heyl, William B. Cooper, Hugo Bilgram, Charles Fraser, John Baird, Charles M. Cresson, Horace W. Sellers, David Brooks, Edwin J. Houston, William H. Thorne, Persifor Frazer, Enoch Lewis, William Helme, C. Chabot, Pliny E. Chase, Hector Orr, Robert E. Rogers, Jules Viennot, Luigi D'Auria, S. R. Marshall, M. B. Snyder, Raphael Estrada, N. H. Edgerton, Coleman Sellers, jun., William H. Wahl, secretary.

Special Committees—On Finance, Fred. Fraley, chairman. On Space, Charles Bullock, chairman. On Transportation, Enoch Lewis, chairman. On Classification, Pliny E. Chase, chairman. On Buildings and Machinery, Frederick Graff, chairman. On Rules and Regulations, Coleman Sellers, chairman. On Custom House Regulations, Charles Bullock, chairman. On Correspondence and Publication, William H. Wahl, chairman.

AMERICAN PATENT AFFAIRS.

ON the 22nd ult., the House of Representatives passed two Bills, which seriously affect the value of all patents or inventions not directly used for manufacturing purposes. The first, No. 3925, to regulate practice in patent suits, throws the burden of costs upon the plaintiff in all suits for infringement by purchasers "in good faith," where the damages recovered are not 20 dols. or over; and further compels the plaintiff to give bond at the beginning of the suit to pay all costs that may be adjudged against him, and also a sum not exceeding 50 dols. for the defendant's counsel fees in case the defendant prevails. The second, No. 3934—submitted by the Patent Committee as a substitute for Bills numbered 311, 419, 1134, 1250, and 1956—provides that the use of a patented article, purchased in open market for personal benefit, and not for manufacturing purposes, shall not be liable for damages or profits, but in all cases the manufacturer and vendor only shall be held liable. It further provides that when the infringement lies in the use of an article made by the defendant or his *employé*, for his own benefit and not in the manufacture of an article for sale, the measure of recovery shall be a license fee, to be fixed by a jury in case no license fee has previously been established.

The effects of a law of the nature of the Bill first mentioned would, says the *Scientific American*, be very bad. The number of valuable patents that would be practically nullified by it is very great, and would include a majority of all patents on household conveniences, stoves, lamps, and others articles of domestic utility and ornament; agricultural tools and implements; mechanics' and machinists' tools; electrical batteries and appliances; carriage trimming and saddlery hardware; "notions" of every sort, toys and so on almost endlessly. Should the second Bill pass the Senate and become a law, it would by its first section make it extremely difficult for a patentee to protect himself against infringement in connection with any article of easy manufacture and wide utility. He could not reach the market of the fraudulent manufacturer or vendor, for the purchasers and users would be "innocent;" and as a rule he would find it equally hard to discover the actual trespasser, or collect from him if found. By its second section the proposed law would take away from the patentee all real control of inventions that anybody might choose to manufacture for his own use, and express, when sued, a willingness to pay a "reasonable" license fee for the privilege; a provision that would cover all devices used not only by individuals but by all corporations, as railway companies and the like, where it would be to the user's advantage to manufacture the article for himself. A Bill has been introduced by the Hon. J. A. Anderson, of Kansas, being R. H. 3617. The full text is as follows:—"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section forty-eight hundred and eighty-four of the Revised Statutes is hereby amended by striking out the word 'seventeen' and inserting in lieu thereof the word 'five;' and that all Acts or parts of Acts inconsistent therewith are hereby so modified as to be made consistent." If this becomes law a patent in the United States will last only five years.

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

(*From our own Correspondent.*)

ON 'Change in Birmingham this—Thursday—afternoon, and in Wolverhampton yesterday, not much improvement was observable on the week in the character of the reports of the ironmasters. One of the causes of the current quietude is the competition of outside districts even in the manufactured iron branch.

Our chief competitors just now are the North of England, Lancashire, and North Staffordshire, the first-named in girder and bridge plates and angles, the second in hoops and bars, and the last in plates and hoops. The Cleveland makers are delivering angles into this district to the order of constructive engineers at £5 12s. 6d. or £5 15s. per ton, notwithstanding that they have to bear a carriage of 12s. 6d. per ton. The lowest price at which our makers can supply is about £6. Another advantage which the Northern makers possess is that having laid down machinery specially suitable to such work, they are willing to supply large sizes of angles and plates at the same figure as ordinary sizes, whereas native makers are accustomed to demand "extras" on work of the larger dimensions.

The opinion was freely expressed this afternoon that if a revival were to manifest itself in the shipbuilding trades of the North this competition would quickly subside. The Lancashire and North Staffordshire hoop makers have only been able to accept lower prices for export hoop orders than the generality of Staffordshire firms, because of their proximity to the ports, and the same remark applies to the North Staffordshire plate makers. The recollection of this makes ironmasters hereabouts more than ever dissatisfied with the present excessive railway freightage charges.

Tank plates were quoted this afternoon at £7 10s. upwards. Some London buyers, indeed, affirmed that they were able to secure supplies at prices yet lower. Boiler-plates were £8 10s. to £9. The best sheet and tin-plate makers announced that export merchants are demanding rapid deliveries, and that they are also placing fresh contracts. Able, therefore, to see some distance ahead, such makers are tolerably firm in price on the basis of £10 to £11 for working up singles. Galvanising sheets were the subject of considerable underselling. Doubles were £8 to £8 5s., and lattens £9 to £9 5s.

Merchant sheets rolled by the "list" houses are quoted at £9 for 20 w.g., £10 10s. for 24 w.g., and £12 for 27 w.g. Best sheets are quoted by the same firms at £1 10s. per ton extra, and double best sheets £2 10s. extra. In the present state of the market these quotations are, however, nominal. "Monmoor" charcoal sheets are priced at £17 10s., whilst the Pelsall Coal and Iron Company, quote its charcoal sheets of 20 w.g. at £14 10s.

Makers of merchant sections of iron, such as bars, hoops, strips, and the like, reported to-day that orders continue of a rather hand-to-mouth sort, and that some of them are still employed only about two-thirds time. Nevertheless, exceptional firms have made full time ever since the holidays, and are still active. Marked bars were quoted £8 2s. 6d. to £7 10s.; excellent medium quality bars, £7 to £6 10s.; common, £6 5s. to £6. Hoops were £6 10s. Nail strip was £5 10s. to £6 10s.; hinge strip was £6 15s. to £7; and gas strip, £6 2s. 6d. to £6 5s. Common nail rods may be had at about £6 as a minimum.

In the pig iron trade preparations are in hand for further increasing the output of part-mine sorts. These are the pigs upon which for months past there has been most demand running. They range from 50s. to 45s. per ton in price. Cinder pigs are an average of 40s.; all-mines are 62s. 6d. to 60s. for hot blast sorts. Stocks in smelters' hands continue large.

Foreign pigs are changing hands in small parcels. One or two vendors of Derbyshire descriptions have recently been exceptionally fortunate, and have now sold their make for three months ahead. This week they refuse anything less than 46s. 3d. Lincolnshire pigs are 47s. to 46s. 6d.; the Westbury brand 45s. delivered; and Northamptons about 44s. Hematites are tame at 57s. 6d. to 60s. delivered at works.

The galvanised sheet and iron roofing manufacturers have not much work under execution. Stocks are found to have increased during the past three months.

There is no falling off in the general activity of the bridge and girder yards, nor of the chain and anchor works, many of which are as busy as they can well be.

Hot-water engineers state that, notwithstanding the mildness of the season, they have done a good business during the last few months, and that orders for heating and ventilating apparatus are still arriving.

The light ironfounders are in a rather more favourable position as to domestic goods, including large three-legged pots and baths; whilst at the heavy ironfoundries there is plenty of occupation on mill and forge castings, pillars, lamp-posts, &c. Railway ironwork of all kinds meets with an active inquiry.

Notwithstanding the occasional fluctuations, a business, valuable in the aggregate, is being done in general hardware on account of the Colonies, India, and South America. Unfortunately the Cape trade shows little or no revival; but it is satisfactory that the South Australian harvest has realised anticipations. The extremely low rates at which manufacturers are now able to buy their raw materials do not compensate them for the low prices of the finished article.

Certain of the cultivating toolmakers have considerable orders in hand for India for hoes and other plantation implements. Bright hopes are entertained of the benefits which this department will derive from the Calcutta Exhibition. Spade, shovel, and cast steel forkmakers, who cater principally for home trade, report themselves fairly well engaged, but find competition still severe.

The question of railway freights is still uppermost in the minds of traders in this district. The greater importance, therefore, attaches to the remarks upon this question in the annual report of the Council of the Wolverhampton Chamber of Commerce. The Council remark that, in the present time of close competition in every branch of industry, it is absolutely essential that there should be cheap communication with the ports of embarkation; otherwise we shall find the heavy hardware manufactures drop off one by one, and the population gradually follow. When it is too late, the report goes on, the railway companies will see the folly of the suicidal course they are pursuing; for if any manufacture be once shifted to the port of embarkation, and the works inland be dismantled, no reduction in rates will suffice to bring back again the absent industry. The rates at the present time for the conveyance of the manufactured products in this district to the ports are, the Council allege, for the most part double those charged from any other great manufacturing centre in the world.

The South Staffordshire Railway and Canal Freighters' Association have appointed as their secretary Mr. J. J. Blood, lately officially connected with the Manchester Ship Canal scheme, and the offices of the Association will be in Wolverhampton. In addition to the funds already announced, other promises of substantial support, described as "most satisfactory," have come in.

Manufacturers of cycles and cycle fittings are looking for a sensible fillip to business by the third annual show of bicycles, tricycles, and accessories, promoted by the Speedwell Bicycle Club for February 20th, and the three following days, in Bingley Hall, Birmingham. All the chief firms in the Birmingham and Coventry district, and several from other parts of the country, will exhibit. More than 500 machines are entered. Captain Terry will show an "Oarsman" tricycle, or boat and tricycle combined, of the same type as the one in which he crossed the Channel. The galleries are reserved for the trial of tricycles. Last year there were some 13,000 visitors to the show.

The seventeenth annual meeting of the South Staffordshire and East Worcestershire Institute of Mining Engineers was held on Monday. The report stated that the number of members was now 179. The work of the year had been of an exceptionally satisfactory character. Gratification was expressed at the inauguration of the mining lectures at Mason's College. The report was adopted, and Mr. Arthur Sopwith was elected president for the ensuing year. In his inaugural address he suggested that whilst the members discussed new projects and inventions, especial attention should be directed to mining engineering. Colonel Beaumont afterwards delivered an address upon his rock-boring apparatus, and received a hearty vote of thanks, but the discussion was postponed. Among the exhibits of the day were Mr. S. Woodall's "Windmill" portable railway; exhaust steam injectors by Mr. Saville, of Manchester; a model of Messrs. Tangye's improved direct-acting and centrifugal pumping engines, combined on one bed; and the Marsant patent mining lamps, improved dials, levels, anemometers, telephones, &c., of Messrs. J. Davis and Son, of Derby.

There is a disposition in Wednesbury to light that town by electricity. At the fortnightly meeting of the Local Board on Tuesday the Gas and Water Committee made known that they are about to go into the question of adopting electricity as the public light. Meanwhile, upon the committee's recommendation, it was agreed to extend the time for the deposit and appropriation of capital for the South Staffordshire Electric Lighting Company from six to twelve months.

The North Staffordshire finished iron trade continues rather inactive; indeed, since last report, things have got somewhat quieter. Specifications as well as new orders are difficult to obtain in numbers sufficient to keep the mills employed throughout the week. At certain of the works only half time is being made. For some sections there exists a fairly steady demand, bars being in better call than perhaps any other description. Prices all round favour consumers, and in some directions underselling is going on. Ordinary bars are now £6 10s. to £6. Best crown bars are slow of sale on the basis of £7 per ton. Merchant orders for hoops are not an average at date, whilst the call for local consumption is limited. The £7 10s. quoted for "Crown" angles is in the present state of the market scarcely more than a nominal figure.

There is a good deal of competition for the plate orders upon the market, whether tank, girder, or boiler sorts, which does not tend to improve this department. The mills are working irregularly. Ordinary plates may still be had at £7 12s. 6d. to £8 5s. delivered Liverpool or equal. Pig iron does not show very much life. Current sales are not sufficient to absorb the production, consequently stocks in makers' hands are increasing. Part-mine pigs at 45s. per ton are in most sale, superior sorts being in much part out of the market consequent upon their higher price.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—The prospects of the iron trade in this district are not of a very encouraging character. Last month there was some tolerably heavy buying, which has covered the requirements of most of the large consumers for the present; and now there is a lull in the market, with a falling trade in the chief iron-using branches of industry. For present requirements very little iron appears to be wanted, but as prices are on so low a basis that there is not much probability of iron being got for less money, there is a disposition to buy for long forward delivery, and apparently the only important channel just now open for business is in the direction of speculative transactions for delivery over the second half of the year at about present rates. There is not at present much disposition on the part of local and district makers to entertain offers for such extended delivery at the unremunerative rates now ruling; but the tendency of business is unquestionably to drift in this direction. Some of the outside brands of pig iron are to be bought for delivery up to the end of the year, and although it is only in exceptional cases that district makers will go so far ahead, Lincolnshire brands have been sold pretty freely for delivery up to the end of September. The finished iron trade, which has been quiet since the commencement of the year, shows no signs of improvement, and the business doing continues generally of a hand-to-mouth character.

The Manchester iron market on Tuesday was fairly well attended, but the business reported as actually done was small, and in some outside brands of pig iron there was a shade easier tone in prices. Lancashire makers of pig iron have during the past week sold a moderate weight of iron on the basis of 44s. 6d. to 45s., less 2½ for forge and foundry qualities delivered equal to Manchester, and at these figures they are very firm, with deliveries limited to the end of June. In district brands there have been sales for delivery over the next four or five months on the basis of 44s. 6d. to 45s. 6d., less 2½ for forge and foundry Lincolnshire delivered here. In Scotch iron a few fairly large lots have been sold over the year at about present rates, and good foundry brands of Middlesbrough are offered at about 45s. 4d. net cash, delivered equal to Manchester.

In the hematite trade, buyers are reported to have been offering slightly better prices than they were willing to give a week or so back, but as they are still below what makers want, the actual business doing continues very small.

In the finished iron trade orders come forward very slowly, but as prices are already so low that there is practically no margin for further concession, quotations are unchanged, £6 per ton for good Lancashire and North Staffordshire bars delivered into the Manchester district remaining about the basis of values.

Reports as to the condition of the engineering trades show a continued falling off in all branches. Work in hand, which is keeping some of the local firms busy, is running out with only a small weight of new business coming forward, and labour is becoming plentiful in the market.

The branches of industry which are largely dependent upon engineers for their activity are also feeling the falling off in trade. Nut and bolt makers are only moderately employed, and brass founders report a decreasing weight of orders for all classes of engineers' fittings, locomotive work being practically the only branch in which activity is maintained.

Sir Joseph Whitworth and Co., of Openshaw, near Manchester, have received orders from the United States Government for the whole of the material requisite for the construction of a number of 8in. and 10in. guns, and also for a new converted breech-loading gun known as Mann's patent. They are also very busy in their fluid pressed steel hollow forgings for marine work, and have in hand for the English Government the whole of the shafting, cranks, liners, and forgings generally required for the two steam ships the Mersey and the Severn now building.

The members of the Manchester Association of Employers, Foremen and Draughtsmen, held their twenty-eighth annual dinner at the Grand Hotel, Manchester, on Saturday last, Mr. Daniel Adamson, occupying the chair. The report, read by the secretary, congratulated the members upon the amount of work achieved during the past year, and the general soundness and stability of the Association. The finances were in a very satisfactory condition, and the balance to the credit of the society at the close of 1883 was £2492, being an increase on the year of £109. During the twelve months forty-two new members had been admitted, and taking into account losses by resignation and death, the effective addition to the membership list amounted to thirty-seven, and the total number of members now on the books to 223. The chairman, in proposing the toast of the evening, prosperity to the Association, delivered an address on the importance of a thorough knowledge of the composition and capabilities of the metals with which the engineer had to deal for constructive and other purposes, and urged the adaptability of mild steel for bridge and girder work and many other purposes for which iron had hitherto been used. He hoped that the scientific knowledge which was now available with regard to metals, which placed within their reach the knowledge—indispensable in the present day—of what the material they used was composed, how to treat it and how to load it, would have such an influence that men would insist on good materials that would not come to grief when tested, and they would not have a recurrence of the disasters that had occurred in the past.

The condition of the coal trade shows no improvement. With most of the pits working short time, supplies of all classes of round coal are largely in excess of the demand, and there is so much coal in stock being forced upon the market at low figures that any really fixed prices in the open market are exceptional. In engine classes of fuel a steady tone is maintained, owing to the present very limited production of slack, the better sorts of which are getting scarce. At the pit the average quoted rates remain at 9s. 6d. to 10s. for best coals; 7s. 6d. to 8s. seconds; 6s. to 6s. 6d. common coal; 4s. 6d. to 5s. burgy; 3s. 9d. to 4s. 3d. best slack; and 3s. 3d. to 3s. 6d. good ordinary qualities.

There have been a few more inquiries for shipment, but vessels continue scarce, and low prices are still quoted at Liverpool and Garston.

Barrow.—I notice that the slight change in the position of the hematite pig iron market which I reported last week still continues, and has every sign of becoming permanent. The state of the trade is very low, although a change for the better has occurred, and it will be many months before it will be in a profitable condition. The business that has been transacted during the past week was greater than for weeks previous, and several good orders have come to hands of makers. The foreign trade also shows an appreciable improvement. Stocks of metal are not so heavy as they have been, and they are weekly decreasing since the output was reduced. Prices have risen a little, and are firmer. 48s. per ton net at works represents the quotations this week for the ordinary samples of No. 1 Bessemer iron; merchants' No. 2 is selling at 47s.; and No. 3, 46s. per ton; while inferior samples are in demand at from 44s. per ton and upwards. The steel trade has not improved much, but the outlook is certainly brighter. Few orders are coming to hand. The demand for rails is inconsiderable, and they are offered at from £4 10s. to £5 per ton net at works. Greater activity is displayed in the merchant department. Steel shipbuilders are a little better employed, and one or two good orders for steel ships and steamers have been booked. Iron ore is in quiet demand at from 9s. 6d. to 12s. per ton net at mines. Large stocks of ore are held all round. Coal and coke steady. Shipping dull.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

MESSRS. NEWTON, CHAMBERS, AND CO., Limited, of Thorncliffe, again take first place in the tonnage of coal sent by rail from South Yorkshire and Derbyshire to London, their delivery during January last having amounted to 23,835 tons, as compared with 20,664 tons for January, 1883. The Clay Cross Company comes next with 16,716 tons, a slight decrease on last January, and Blackwell Colliery third with 15,479 tons; the Sheffield Coal Company, 14,790 tons; J. and G. Wells, Limited, 13,480; Langley Mill, 12,722; Pilsley, 12,439; Grassmore, 12,042. The Thorncliffe, Blackwell, and Sheffield Coal Company has increased its tonnage, while Clay Cross, Wells, Langley Mill, Pilsley, and Grassmore, show a decrease. The tonnage sent by rail to the metropolis during January is 569,675 tons, as compared with 558,146 and 553,263 tons in 1883 and 1882. These figures do not show any brisk trade, as last year at this time trade was also very dull in consequence of the mild weather. Large stores are still held by the London merchants.

There is no appreciable change in the iron trade. A leading iron merchant here, who, at my request, made an examination of values in January, 1882, and January, 1883, tells me that the comparison shows remarkably little difference; in no class of iron is it more than 2s. per ton, and it is chiefly in the qualities required for Bessemer purposes that change has taken place. Ironmasters are generally very indifferently employed. Messrs. Newton, Chambers, and Co., Limited, are an exception to the rule. They are fortunate enough to have sufficient contracts in hand to keep them fully at work. A singular and very unusual circumstance is that, notwithstanding the depressed state of the market for pig iron, their Thorncliffe brand has been in such brisk demand, and still continues to be so freely called for, that they are entirely without stock.

The Midland Railway Company is slowly but surely acquiring the wagon business. Its latest acquisition is the entire wagon plant of the Clay Cross Coal Company. The number is said to exceed 2000 coal trucks, and the price is believed to be between £80,000 and £90,000. Other collieries are certain to follow suit. The railway company by this step is able to diminish its staff at Clay Cross, which is also favourably situated for the working of the wagons both ways. Many hours' shunting operations will be saved. The time is approaching when the Midland Company will own every truck which carries coal on its system. It must be admitted, too, that their scale of charges for the hire of trucks is reasonable enough to tempt collieries to abandon that expensive part of their stock-in-trade.

The miners are bent on a new departure. At a largely-attended meeting at Wombwell, Mr. Pickard, Mr. Parrott, and other union leaders supported the extension of the franchise, and Mr. Parrott moved a resolution pledging the meeting to make the Yorkshire Miners' Association "not only a means to secure wages directly, but by legislative measures as well, and when they obtained an extension of the franchise, to make as effective a use of it as they can for the purpose of getting labour representation." The motion was carried. To get an Act of Parliament passed to raise wages would be a short road to more money, but how long would it last?

A pleasing incident of the week is the announcement that Mr. Samuel Osborn, of the Clyde Steelworks, who filed his petition in 1874, with liabilities amounting to £70,000, has forwarded cheques to his creditors, all of whom have now received 20s. in the £. Mr. Osborn, who was Master-Cutler at the time of his failure, bought back the estate at 12s. in the £, and to pay off the remaining 8s. a sum of nearly £28,000 was required. Mr. Osborn, who has always been highly respected as a Christian gentleman and a man of honour, has given great satisfaction in commercial circles by his high-principled conduct.

The Cutlers' Company and the Sheffield Town Council have decided to support the application to Parliament for a new railway in Derbyshire. The new line will leave the Midland Railway at Dore Station, follow the Totley-road for nearly two miles, and then pass under the moors in the direction of Longshaw by a tunnel three miles long, and emerge at the saw mill in Padley Wood, not far from Grindleford Bridge; it then follows the Derwent Valley by Huthersage to Mytham Bridge, and forward by the valley of the Noe to Hope and Edale, when it again passes into a tunnel of upwards of one and a-half miles long, and shortly beyond terminates by a junction in the direction of Manchester with the Midland main line at Chinley, near Chapel-en-le-Frith. There is also a junction in a southerly direction for the accommodation of Brixton traffic. The total length of the railway is about twenty miles, and the curves and gradients are very favourable, and designed for a first-class line. The line is promoted by an independent undertaking, and is believed to be favourably received by the Midland Company. It will afford a new route to Manchester and Liverpool. To Manchester the distance will be three-quarters of a mile longer than the Manchester, Sheffield, and Lincolnshire, and to Liverpool one mile shorter.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

THE Cleveland iron market, held at Middlesbrough on Tuesday last, was well attended, but want of confidence prevailed, and prices were slightly weaker than at the previous market. Makers, in view of the approaching fulfilment of the restriction compact, continue firm at 37s. per ton for No. 3 g.m.b., prompt delivery. Merchants, however, are willing to take 36s. 9d. for small lots for delivery this month, and 37s. for March delivery. Owing to the continuance of depression in the finished iron trade, the price of grey forge iron has fallen about 6d. per ton, business having been done on Tuesday at 34s. 6d. for prompt delivery, and 35s. for next month.

Warrants have been freely offered at 37s. per ton, but without result.

The stock of Cleveland iron in Messrs. Connal's Middlesbrough store amounted on Monday last to 62,144 tons, being a reduction of 200 tons during the week. This is the first decrease reported this year.

Shipments from the Tees continue above the average, 26,783 tons of pig iron having been sent away up to Monday last, against 23,565 tons in January and 17,844 tons in February, 1883, corresponding periods.

Orders for finished iron are exceedingly scarce notwithstanding the low prices now quoted, but few manufacturers can keep their mills running full time. For ordinary specifications for prompt delivery ship-plates are now £5 5s. to £5 10s. per ton; angles, £5 to £5 5s.; and common bars, £5 5s. to £5 10s., free on trucks at makers' works, cash 10th less $2\frac{1}{2}$ per cent. Large quantities and favourable specifications could be placed at even lower rates.

It will be remembered that when the Cleveland blast furnace proprietors asked their men to agree to continue the sliding scale for the regulation of wages, they informed them that notice of a reduction would be given unless their request was attended to. No consent having been handed in, the employers at the various works issued the following notice on the 8th inst:—"Notice.—All engagements now existing with the workmen at these works will terminate on Saturday, 1st March next. The wages at these works after that date will be reduced 5 per cent." In opposition to this, those of the men who belong to the Cleveland Blast Furnacemen's Association gave a counter notice to their employers that they would cease work at the end of the month, as their demand for extra pay for Saturday afternoon, Sunday work, and for the abolition of Sunday labour had been refused. About 2500 men are affected.

The puddlers who came out on strike at two of the Stockton ironworks last week, owing to the stoppage of "level hand money," returned to work on the 6th inst., having made an amicable arrangement with their employers.

The Stockton Malleable Iron Company, who has had two plate mills standing for some time owing to the giving way of the engine foundations, has this week been forced to stop yet another mill for want of specifications. It has now only one mill working. Between 200 and 300 additional men are thrown out of employment. At all the Stockton rolling mills the men have been put under twenty-four hours' notice.

A large number of men have recently been discharged from the shipyards at Stockton, owing to slackness in the shipbuilding trade. The remaining hands who are still kept on are under notice of reduction of wages varying from 10 to 20 per cent., and to take effect on the 18th inst.

Messrs. Palmer's Shipbuilding Company, of Jarrow-on-Tyne, has received an order from Government for two unarmoured despatch boats, 250ft. in length, and fitted with twin screws. The hulls are to be of mild steel.

Messrs. Bell Brothers are sinking a third bore-hole for salt at Port Clarence, a short distance from their "No. 1" hole. Salt has not yet been reached at "No. 2" bore-hole.

It is expected that the Associated Iron Manufacturers will give notice of a reduction of wages to the extent of at least 1s. on puddling and 10 per cent. on mill wages, to come into force at the expiration of Mr. Watson's award on the 31st of March. There is no doubt but that the prices at present obtainable for finished iron involve a loss of some shillings per ton, and unless relief in the shape of cheaper labour is afforded, the present tendency to lay off works will increase to an alarming extent.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

THE pig iron trade continues quiet, but the tendency is still in the direction of lower prices. In the warrant market this week there has been little animation. The past week's exports of Scotch pigs were unsatisfactory in bulk, being 8900 tons, as compared with 9079 in the preceding week, and 12,530 in the corresponding week of last year. But while the shipments are thus below the mark, the inquiries from the United States and the Continent are reported to be rather more favourable, so that there is a probability of larger quantities of iron being despatched in coming weeks. In the course of the week about 950 tons of pigs have been added to the stock in Messrs. Connal and Co.'s Glasgow stores. There are 97 furnaces in blast, against 110 at the same date last year, the two that were out at Kinneil being again put in operation.

Business was done in the warrant market on Friday forenoon at 42s. 6d. cash, and in the afternoon at 42s. 7d. to 42s. $7\frac{1}{2}$d. cash, and 42s. $8\frac{1}{2}$d. to 42s. 9d. one month. On Monday the market was firmer at 42s. 8d. to 42s. $9\frac{1}{2}$d. cash, and 42s. 10d. to 42s. 11d. one month, the afternoon figures being 42s. 9d. to 42s. $7\frac{1}{2}$d. and 42s. $8\frac{1}{2}$d. cash, also 42s. 10d., 42s. 9d. and 42s. 10d. one month. The market was quiet on Tuesday, with business at 42s. $7\frac{1}{2}$d. to 42s. 6d. cash, and 42s. 9d. to 42s. 8d. one month. Business was done on Wednesday at 42s. 6d. to 42s. 8d. cash, and 42s. 8d. to 42s. $9\frac{1}{2}$d. one month. To-day—Thursday—business was done at 42s. $9\frac{1}{2}$d. cash, and 42s. 11d. one month.

The values of makers' iron are as follows:—Gartsherrie, f.o.b., at Glasgow, per ton, No. 1, 54s.; No. 3, 51s. 6d.; Coltness, 58s. and 51s. 6d.; Langloan, 55s. and 51s.; Summerlee, 52s. 6d. and 48s. 6d.; Calder, 54s. 6d. and 48s.; Carnbroe, 52s. 6d. and 48s. 6d.; Clyde, 48s. and 45s. 6d.; Monkland, 44s. 6d. and 42s.; Quarter, 44s. and 41s. 6d.; Govan, at Broomielaw, 44s. 6d. and 42s.; Shotts, at Leith, 54s. and 52s.; Carron, at Grangemouth, 49s.—specially selected, 56s. 6d.—and 47s. 6d.; Kinneil, at Bo'ness, 46s. 6d. and 45s. 6d.; Glengarnock, at Ardrossan, 52s. 6d. and 46s. 6d.; Eglinton, 46s. 9d. and 43s. 6d.; Dalmellington, 49s. 6d. and 47s. 6d.

The manufactured iron trade is quiet, and the dispute at the steel works is now at an end, the men having been obliged to return at the employers' terms. The shipments in the past week of iron manufactures from the Clyde embrace £18,455 worth of machinery, £6600 steel manufactures, £21,000 iron manufactures, and £1800 worth of sewing machines.

A further reduction has taken place in the values of shipping coals, and the trade at present is anything but satisfactory in the West of Scotland. On Monday the coalmasters of the Hamilton district reduced their miners' wages a second time since the beginning of the year by 6d. a day, making 1s. in all. The example is likely to be followed in other districts. In the Lothians, which is less affected than any other colliery district by the fluctuations in the shipping department of the trade, a considerable proportion of the coals recently brought up the pits have had to be stored in "bings," a practice which is only resorted to when it cannot be avoided, on account of the coals getting much deteriorated while thus exposed. The colliers in Fife and Clackmannan, at a mass meeting on Monday, protested against the latest reduction of wages as unjustifiable; but their protest is likely to be of no avail, as the demand just now is very slack. The amount of coals shipped from Burntisland in January last was 32,462, as compared with 37,791 tons in the same month of last year.

The iron making companies are also gradually curtailing the wages of the hands in their employment. Notices have been posted, for example, at the works and pits belonging to the Shotts Iron Company, intimating that a general reduction of wages will come into effect on the 16th current.

About 12,000 tons of new shipping have, as far as can be ascertained, been contracted for on the Clyde since the beginning of the year. This is much less than has been usual in the same period, but still above what might have been confidently looked for in these dull times.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

I HEAR that there has been a falling off in the output of Dowlais collieries of late, and that some changes are contemplated. The slackness of the iron trade, too, has told in a marked manner upon the working of the upper coals. Both Dowlais and Powell Duffryn companies contemplate new sinkings into the deep measures of Monmouthshire. Those of Dowlais will be in the Deri Valley, those of Powell Duffryn, which are actually beginning, are at Cwmsyfiog, and are being pushed as well. This new effort will revive the semi-deserted districts of Fleur de Lis and Pengam, where large quantities of house coal were formerly worked—Tir Philkin, for example.

Mr. Picard, favourably known in connection with the Northern Provident Fund for colliers, is in the district with a view of still further developing the principle. We have had 20,000 colliers enrolled out of 50,000, and there is no reason in the world that every one of the 50,000 should not be in it. Mr. Picard is exhibiting a patent safety lamp, which has double glasses, and gives out more light than any I have yet seen. It bids well for the prize competition. With respect to the fund, a striking illustration of its need has been shown by the Garnant catastrophe. Here, among the anthracite miners, there appears to be no provision, and the result is all the old appeals, formation of relief funds, &c., which used to be common in Glamorgan and Monmouth. Now a calamity occurs, and the public are not called upon to subscribe. Still, the public should subscribe to the established fund, as its beneficial action lessens the poor rates.

With regard to the Penygraig Colliery, where Daniel Thomas lost his life, the work of restoration is going steadily on. The inquest will be one of marked interest, and one point—that of blasting in fiery mines—will be certain to have rigid investigation.

Some little upset has taken place at Cwmpennar amongst the colliers, though not likely to be of long continuance.

The state of the coal trade is, as regards steam coal, all that can be desired. Some lessening of export has taken place, on account of the storms, and overdue steamers form the cry at Swansea and Cardiff; yet coalowners and shippers have no cause for complaint. I have no doubt an increased briskness and firmness of tone in the price have been due to a little Egyptian speculation. The greater energy shown by the Government during this week has told upon the pulse of trade at Cardiff especially, and nothing would be more likely than an advance of price. The great demand is for the Merthyr four-feet variety, a term used freely all through the district. The more marked anthracite coal in the neighbourhood of Neath is not in such good demand, and some pits of late have been only partially worked. House coal, too, is not quite so vigorously worked. The extreme openness of the season has evidently told upon this class of coal.

There is considerable slackness in the make of coke, notwithstanding the excellent arrangements in many districts for turning out the best quality and quantity. This slackness is, however, not to be wondered at, considering the depression in the iron trade, which still continues. Very little movement has taken place this week. At Newport there is a more favourable view held of the iron trade, but I confess I do not see any prospects, and the comment of all engaged in iron manufacture with whom I come in contact is that there is no vitality in any branch. Even the tinplate works are showing less signs of animation, and some descriptions of coke-plate have been sold under 15s. Patent fuel works are busy, Swansea, as usual, having a better trade than its neighbours.

The Swansea Bay and Rhondda Railway is being pushed on well, and a good piece of the permanent way is ready. The Great Western branch also at Quakers'-yard looks forward, and the river foundations of the viaduct are secure.

Preparations continue for the struggle in the House of Commons. Evidence *pro* and *con.* is being prepared especially for the Barry Bill, and the struggle will be keen.

The Cardiff opinion has now gone steadily against the Barry scheme; but it s a narrow one. Cardiff objects because a great slice of coal traffic will be exported from Barry, and as ships will go into Barry and not touch Cardiff, ship chandlers and all other industries will spring up around Barry, and the income of Cardiff will be lessened by one-third. Probably the committee will not hold this as of much weight; "new docks, new industries, more scope for population," &c. A broader view, and one which Cardiff should support as a measure of common justice is, that the Marquis of Bute has invested an enormous amount in meeting the needs of coalowners, and until these new docks are complete, and shown to be inadequate, it would be unjust to sanction a rival undertaking. This is the plain Englishman's view of the question, apart from all speculative conjecture.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty: John L. Stevenson, chief engineer, to the Woodlark; and Alexander Kerr and Frederick H. Dart, assistant engineers, to the Audacious, additional, for disposal.

EXPLOSION OF A LOCOMOTIVE.—A Great Western Railway locomotive exploded on the morning of the 13th at Exeter, within ten yards of the north end of St. David's station, with terrific force. It is miraculous that no lives were lost—the fireman only being injured—as the whole of crown plate of shell of the firebox, with dome and safety valves, was carried away. The largest piece, weighing about 3 cwt., was hurled against brick wall of the running shed, which is about fifty yards distant, and pierced a hole about two square feet in area, but did not go through. Other portions of the boiler, weighing from 50 lb. to 1 cwt., were found a great distance away. The engine was one of the old Bristol and Exeter class of tank engine, the tanks being fixed on top of boiler. Had the explosion occurred inside the station the consequences must have been disastrous. The Elmfield Hotel is situated about 100 yards from where explosion occurred, and the foundations were fairly shaken.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

5th February, 1884.

2705. Potato Diggers, J. Wallace, Glasgow.
2706. Combing Machines, F. T. Pollard, Leeds.
2707. Automatic Telegraphy, W. P. Thompson.—(*T. F. Taylor, New York, U.S.*)
2708. Telephonic Receivers, W. P. Thompson.—(*T. F. Taylor, New York, U.S.*)
2709. Producer Gas Heating Water and Generating Steam, B. C. Sykes and J. Briggs, Cleckheaton.
2710. Covering Steam Boilers, J. Groome, Darwen.
2711. Washing Clothes, J. Hopperton, Malton.
2712. Furniture Castors, B. Boothroyd.—(*W. F. Main, Chicago.*)
2713. Lubricators, W. P. Thompson.—(*L. E. Kane, Cincinnati, U.S.*)
2714. Toy as a Sun and Cloud Reflector, E. Newton, King's Lynn.
2715. Gas Motor Engines, J. R. Woodhead, Leeds.
2716. Casting Steel, &c., E. Webers, Manchester.
2717. Air Filtering Apparatus, T. Clarke, Liverpool.
2718. Boot-toe Protectors, J. H. Ashton, W. Moss, and J. Darwin, Leeds.
2719. Hat Boxes, P. Blyth, Guide Bridge.
2720. Wrought Iron Wheels, P. Edwards, Openshaw.
2721. Safety Lifts, W. C. Hearn, New Malden.
2722. Enveloping Insulated Conductors, J. J. Harrop, Manchester.
2723. Combined Bedstead and Mattress, J. B. Rowcliffe, Glossop.
2724. Strengthening the Lids of Metallic Travelling Trunks, &c., A. Uttley, Hebden Bridge.
2725. Carding Wool, &c., I. Bailey, Keighley.
2726. Stoves, H. J. Allison.—(*C. Rathbone, Albany, U.S.*)
2727. Electric Water Alarm, N. Frère.—(*C. Schoofs, Brussels.*)
2728. Stone Dressing Machines, H. D. Wallace, St. George, New Brunswick.
2729. Pianofortes, D. and M. Makinson, Horwich.
2730. Ploughs, J. and R. Henshaw, Chester.
2731. Iron Safes, H. P. Lavender, Wolverhampton.
2732. Steam Traction Engines, W. Morton, Coleshill.
2733. Brick Kilns, G. Pitt, Leamington.
2734. Tops of Chimneys, S. N. C. Thompson, London.
2735. Nut-lock, R. Kennedy, Glasgow, and H. Williams, Mount Florida.
2736. Engines, J. Hamilton, Succoth.
2737. Storing Oil on Board Ship, &c., J. C. Mewburn.—(*J. B. J. Boisgard, Paris.*)
2738. Shaft Loops for Harness, H. H. Lake.—(*P. M'Fadden, Philadelphia, U.S.*)
2739. Controlling, &c., the Supply of Gas, A. G. Henderson, London.
2740. Generating Electricity, R. Disher, London, and W. Lichfield, Leytonstone.
2741. Engines, A. M. Clark.—(*W. Golding, U.S.*)
2742. Canteen, E. G. Hulett, London.
2743. Preserving Cut Flowers, H. Harris, London.
2744. Registering Games, A. Ellis, London.
2745. Life-saving Apparatus, E. S. Swainson, Old Farleigh, near Chorley.
2746. Galvanic Cells, S. H. Emmens, O. March, and the United Patents Corporation, Limited, London.
2747. Galvanic Batteries, S. H. Emmens, O. March, & the United Patents Corporation, Limited, London.
2748. Electrolytes, S. H. Emmens and the United Patents Corporation, Limited, London.
2749. Saving Life at Sea, A. E. Greville, Towcester.
2750. Galvanic Batteries, S. H. Emmens and the United Patents Corporation, Limited, London.
2751. Saving Fuel, &c., in Open Fireplaces, J. Shaw, London.
2752. Safety Suspender, A. E. Emdin, London.
2753. Weaving Cloth, W. B. Robinson, Brampton.
2754. Facilitating Communication, &c., in Railway Trains, T. J. Mortin, Woking.
2755. India-rubber Waterproof Fabrics, W. Currie, Edinburgh.
2756. Injectors, H. Holden, R. G. Brooke, and T. H. White, Salford.
2757. Generating Heat, W. Walker, Leeds.
2758. Electric Conductors, A. A. Cowles, New York.
2759. Preventing the Abstraction of Letters from Pillar, &c., Boxes, H. Millington, Reading.
2760. Axle-boxes, H. J. Haddan.—(*L. Raymond and A. Henrard, Bruxelles.*)
2761. Sewing Needles, D. H. Brandon.—(*J. A. Fresco, Paris.*)
2762. Secondary Batteries, E. U. Parod, Paris.
2763. Furnaces, J. Sawyer, London.
2764. Entrenching Tool, W. A. F. Blakeney, Dublin.
2765. Treating Leather, W. Brown, Bramley.
2766. Photographic Shutters, F. W. Branson, Leeds.
2767. Photographic Shutters, F. W. Branson, Leeds.
2768. Woven Fabrics, J. Helliwell, Leeds.
2769. Taps or Valves, F. W. Gritten, London.
2770. Ball Bearings for Velocipedes, R. E. Phillips, South Norwood, and M. D. Rucker, London.
2771. Mounting the Springs and Seats of Velocipedes, M. D. Rucker and H. S. Jackson, London.
2772. Couch, J. Mutch, Walthamstow.
2773. Circular Frame Knitters, R. Shelly, London.
2774. Spring Hooks for Window Blind Cords, T. H. Williams, London.
2775. Ornamenting Lace, R. Scott, Nottingham.
2776. Pianoforte Actions, A. Squire, London.
2777. Wall Ties, W. Monnery, London.
2778. Protecting Fence Posts, R. Griffiths, London.
2779. Laying-out Courts for Lawn Tennis, T. S. Howie, London.
2780. Penstaff and Hand Support, A. J. Boult.—(*W. Lamson, Lynn, U.S.*)
2781. Lubricators, R. Baird Glasgow, and C. Boult, Liverpool.
2782. Producing Spiral Grooves in Wire, A. J. Boult.—(*G. Gray, Boston, U.S.*)
2783. Inlet, &c., Sash-frame Ventilator, W. J. Penny, Southend.
2784. Hold-fast for Work Benches, E. Edwards.—(*M. Giraud, Paris.*)
2785. Safety Lamps, J. Dixon and M. Waddle, Blyth.
2786. Casting Steel, A. M. Clark.—(*M. Brustlein, Paris.*)
2787. Marble, A. Guattari.—(*M. Soderini, Italy.*)

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2788. Folding Boxes, &c., A. Chandler, Torquay.
2789. Candlesticks, J. Swain, London.
2790. Pleasure Boat, A. T. Archer, Southampton.
2791. Ventilating, &c., Steering Gear, A. T. Archer, Southampton.
2792. Pneumatic Propulsion, &c., of Floating Vessels, A. T. Archer, Southampton.
2793. Safety Catch for Colliery Cages, J. Aldred and R. Boardman, Lancashire.
2794. Self-acting Catches, G. Williams, Liverpool.
2795. Fastenings for Attaching Traces, J. S. Walley, Whitchurch.
2796. Treating Certain Residual Salts, W. H. Swim, Runcorn, and G. Pryde and J. Hedley, Liverpool.
2797. Window Reflector, J. A. Slater, Birmingham.
2798. Damping Apparatus, W. H. Chubb, West Bromwich.
2799. Securing Railway Rails to Chairs, M. Stevens, Bath, and W. Stevens, India.
2800. Driving Apparatus for Tricycles, J. Frost, Alvaston, near Derby.
2801. Boots, T. B. Mottram, Stafford.
2802. Imparting Pressure to the Contents of Silos, J. Maude, Greetland, near Halifax.
2803. Cutting Cloth, T. Birkhead, Netherton, near Huddersfield.
2804. Hoists, J. Clayton, Bradford.
2805. Cutting or Turning Tools, H. Renold, Manchester.
2806. Floating Decoys, T. W. Deane, Manchester.
2807. Voting Gear, &c., J. J. Butcher, Newcastle-upon-Tyne.
2808. Military Rifles, I. D.E. Ll. Lloyd-Jones. Beauchamp, Dorset.
2809. Lasts, T. and B. Hartley, Accrington.
2810. Planting Flowers, R. Taylor, Rutherglen.
2811. Self-feeding Atmospheric Stoves, J. E. Spratt, London.
2812. "Pyrogen," F. Iles and C. Wakeman, Birmingham.
2813. Lubricating Crank Pins, S. Marsland and J. Cush, Bolton.
2814. Electric Governors, A. Jamieson, Glasgow, and S. Alley, Polmandie, N.B.
2815. Cigar Holders, R. Paulson, London.
2816. Preventing Down Draught in Smokey Chimneys, E. Taylor, Blackburn.
2817. Shaping, &c., Metals, G. Pickersgill, Halifax.
2818. Automatic Brake Mechanism, M. Lawlor, U.S.
2819. Gas Ovens, &c., J. West.—(*G. J. Cox, Melbourne.*)
2820. Telephone Receivers, G. H. Bassano, A. E. Slater, and F. T. Hollins, Derby.
2821. Differential Driving Gear for Velocipedes, I. T. Townsend, Coventry.
2822. Steam Ploughs, W. C. Morton, Coleshill.
2823. Safety Gear for Starting Engines, J. Musgrave and A. Walsh, Bolton.
2824. Washing Machines, J. Hunt, Bolton.
2825. Hats, &c., J. Williams, Manchester.
2826. Shears for Cutting Grass Borders, S. de Wilde, Hammersmith.
2827. Steam Traps, G. G. Picking and W. Hopkins, London.
2828. Air and Water Beds, G. C. Phillips, Chelmsford.
2829. Removing Obstructions in Sewers, J. Birch, London.
2830. Coffins, W. Jones, Hengoed.
2831. Making Retorts, W. P. Ingham and A. C. Hill, Middlesbrough-on-Tees.
2832. Cutting, &c., Metal, J. Craven, Leeds, and G. B. Wood, Sheffield.
2833. Steam Distributing Devices, A. J. Boult.—(*L. Protte, Vendeuvre.*)
2834. Tobacco Pipes, J. Koppel, Leytonstone.
2835. Bicycles, &c., F. H. License and C. S. Downs, Dover.
2836. Dynamo-electric Machines, A. F. and C. J. Oppermann, London.
2837. Dyeing Wool, &c., C. Holliday and E. W. Hirst, Huddersfield.
2838. Frames for Portemonnaies, J. C. Mewburn.—(*H. Didout, fils, Paris.*)
2839. Metallic Brackets for Supporting Cornice Poles, W. H. Richards, Birmingham.
2840. Attaching Handles to Saucepans, E. T. Lucock, Stourport.
2841. Ornamenting Metallic Surfaces, C. F. Hirons, Birmingham.
2842. Carpet-cleaning Machines, &c., T. Alderman, London.
2843. Manufacture of Size from Wet Calf White Leather Shavings, I. Cripps, jun., Brixton.
2844. Instruments for Recording the Distance travelled by Velocipedes, T. Dunn, London.
2845. Corkscrew, J. E. Walton, Stoke Newington.
2846. Oil Cans, G. A. J. Schott, Bradford.
2847. Imitation Marble, A. Guattari, London.
2848. Feeding Lambs, G. Hale, Middleton Cheney.
2849. Facilitating the Transfer of Coin between the Public and Cashiers, A. M. Clark.—(*A. Lego and H. Depau, Paris.*)
2850. Placing Fog Signals on Railways, D. Grant, London.
2851. Umbrellas, &c., G. W. Langdon, Clapham.
2852. Pedal Action for Velocipedes, C. M. Linley and J. Biggs, London.
2853. Pulleys and Drums, H. Simon, Manchester, and A. B. Perkins, Bradford.
2854. Gas Motor Engines, S. Clayton, Bradford.
2855. Optical Instruments, P. Ward, Greenwich.
2856. Swing Bridges, J. Hofman, Berlin.
2857. Registering the Distance Travelled by Tricycles, &c., J. and W. Cockburn, Richmond.
2858. Producing Electric Currents, &c., L. Gaulard and J. Gibbs, London.
2859. Generating Portable Lamps, C. Whitfield, Kettering.
2860. Regulating Digitoriums, &c., T. Horn, Croydon.
2861. Sheet-metal Boxes, T. Allen, Reading.
2862. Producing Pigments, P. C. Bunn, Norwich.
2863. Velocipedes, A. C. Hickling, Maidenhead, and H. Martin and W. Bourdon, London.

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2864. Tricycles, T. B. Lofey, Gosport.
2865. Couplings in Lamps, &c., T. Whitehead, Aston.
2866. Paddle, &c., Arm, S. Orme, Chesterton.
2867. Erasing Knives, W. Steen, Belfast.
2868. Plumber's Cramp, J. Jackson, Kirkdale.
2869. Teaching, &c., Music, W. Johnson, Scalloway.
2870. Playing on Organs, &c., W. Johnson, Scalloway.
2871. Signal Indicating Letter-box, J. D. Duckett, Mount Pottinger.
2872. Couplings for Hose Pipes, &c., G. Glydon, Birmingham.
2873. Galvanic Batteries, J. Gray, Gateshead-on-Tyne.
2874. Drying Grain, J. Black, Dumfries.
2875. Water Cocks, H. Ratcliffe, Pembury.
2876. Regulating Gas in Bed-rooms, R. Grimmond, Fallowfield.
2877. Black Lead, J. Johnson, Liverpool.
2878. Road Wheels of Traction Engines, W. Box, Liverpool.
2879. Discharging Projectiles, R. L. Duff, Chowbent.
2880. Lock-nut, J. Heap, Ashton-under-Lyne.
2881. Sewer Gas Preventer, J. H. Yeo, Furzeham.
2882. Cranes, &c., F. Service, Ebbw Vale.
2883. Cleaning the Bottoms of Vessels, G. Weeks, Stonehouse.
2884. Heating Buildings, W. Cowell, Burnley.
2885. Asbestos Mill-board, R. Kirlew, Manchester.
2886. Latch Locks, J. Baker, Willenhall.
2887. Fastening Blades of Knives, H. Wallis, Ryde.
2888. Perpetual Motion, J. Searson, Garrettsmill.
2889. Cocks and Valves, G. Teideman, London.
2890. Supplying Lubricating Material to Steam Engines, T. Oxley, Manchester.
2891. Ventilating the Interior of Vans, W. Whiteley, London.
2892. Treatment of Cellulose, A. Sadée, Bonn-on-the-Rhine, and F. Schneider, Struth, Prussia.
2893. Oil Can Stoppers, H. Webster, Horsforth.
2894. Tricycle Frames, H. Moore, jun., Brighton, and M. D. Rucker, London.
2895. Two-speed Gears for Tricycles, H. E. Stanley, Catford.
2896. Weather-proof Oil Colours, O. Wolff.—(*A. T. Bergh, Dresden.*)
2897. Flush Handle Socket, S. Cranmore, Birmingham.
2898. Cinder Sifters, J. R. Brailsford, Smallheath.
2899. Dredging and Excavating, A. F. Link.—(*C. van der Elst, Paris.*)
2900. Preserving Fish, B. Azulay, London.
2901. Coupling Apparatus, J. T. Rose, London.
2902. Harness, G. Bray, Deptford.
2903. Tubular Steam Boilers R Marchant, London.
2904. Fire-lighters, J. Johnson, London.
2905. Soil, &c., Traps, J. Wilson, jun., Manchester.
2906. Distillator for Steam Engines, H. Howaldt. Dietrichsdorf.
2907. Bricks, H. W. Hart, London.
2908. Boilers, C. J. Appleby, London.
2909. Velocipedes, A. H. Williams, London.
2910. Tricycles, &c., J. I Mitchell, London.
2911. Freezing Machines, A. W. Marshall, London.
2912. Heating Gas Retorts, J. W. C. Holmes, Huddersfield, and B. Midgley, Milnsbridge.
2913. Gas Bag Pressure Frames, J. A. Dalén, West Hartlepool.
2914. Iron Scraper Door-mat, J. S. Willway, Bristol.
2915. Bottle-rack, J. S. Willway, Bristol.
2916. Brick Coverings, J. Rooke, Stratford.
2917. Velocipedes, W. Townsend, London.
2918. Locks, &c., J. H. Johnson.—(*A. L. Becht, Paris.*)
2919. Tricycles, &c., F. J. Rooker, London.
2920. Ventilators, J. G. Lorrain, London.
2921. Vessels for Liquids, W. R. Lake.—(*A. J. Gay, Coulaure, France.*)
2922. Signalling Apparatus, J. Farquharson, Fulham, and D. W. Lane, Southsea.
2923. Speed Indicator, J. Farquharson, Fulham, and D. W. Lane, Southsea.

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2924. Registering the Opening of Doors, &c., J. H. Faulkner, London.
2925. Knife Sharpeners, H. Scott, Liverpool.
2926. Barring Engines, W. Hargreaves and W. Inglis, Bolton.
2927. Preventing Corrosion, J. Hannay, Loch Long.
2928. Winding Yarn, G. Keighley, Burnley.
2929. Yarn-sizing Machines, G. Keighley, Burnley.
2930. Low-water Alarm, &c., J. Kenyon, Manchester.
2931. Electric Gas-lighting Apparatus, J. Blake and S. Moorhouse, Manchester.
2932. Steering Gear, W. Adair, Liverpool.
2933. Gas Motor Engines, J. Fielding, Gloucester.
2934. Cranes, J. Fielding, Gloucester.
2935. Hydraulic Machines, J. Fielding, Gloucester.
2936. Automatic Valves, J. Fielding, Gloucester.
2937. Two-wheeled Carriages, J. Pinnock, Bristol.
2938. Protecting Letters in Pillar-boxes, &c., J. T. Masey, London.
2939. Fixing Metallic Uprights of Fencing, W. Bailey, Wolverhampton.
2940. Cutting Slates, &c., J. Blain, Carlisle.
2941. Dyeing a Fast Yellow Colour on Cotton, &c., J. K. Kaye, Moldgreen.
2942. Increasing the Illuminating Power of Gas, D. G. Stansbie and J. Parton, Birmingham.
2943. Self-acting Vents, C. Hollamby, Hailsham.
2944. Hammerless Weapons, J. Smallman, Nuneaton.
2945. Harness, J. Cottrell, jun., Bristol.
2946. Altering the Heights of Stools, &c., M. J. Rowcliffe, London.
2947. Steam Boilers, J. and H. Layfield, Burnley.
2948. Steam Boilers, E. T. Sykes, Huddersfield, G. Garside and E. S. Hellawell, Milnsbridge.
2949. Ornamenting Vitreous Surfaces, &c., B. Tupholme and W. Edwards, Sheffield.
2950. Fireplaces, W. Fawcett, Burton Salmon, and H. M. Ashley, Knottingley.
2951. Forks, H. Vaughan and J. Ball, Sheffield.
2952. Ships' Harbours, D. T. Gordon, Maryfield.
2953. Mechanical Musical Instrument, C. Pieper.—(*P. Ehrlich, Gohlis, Saxony.*)
2954. Fittings for Shafts of Two-wheeled Vehicles, J. G. Harrison, Edgbaston.
2955. Carriage Wheels, &c., J. Harrison, Edgbaston.
2956. Cap or Shield to be used in Conjunction with Paper Fasteners, W. Outtrim, London.
2957. Pianofortes, W. S. Nosworthy, London.
2958. Papering up Needles, H. Thomas, Redditch.
2959. Coal Fire and Gas Grates, H. Scott, Liverpool.
2960. Grooved Tires for Wheels, R. Kearsley, Hightown.
2961. Double and Single Pessaries, E. Bevan, West Dulwich.
2962. Portable Fire-escape, A. Hewens, Hayes.
2963. Corkscrews, J. H Johnson.—(*J. Perille, Paris.*)
2964. Preventing Screws from Working Loose, R. Burford, Wanstead.
2965. Distributing Steam, &c., E. de Pass.—(*H. Tenting and F. Salamon, Paris.*)
2966. Treating Gelatine, &c., C. E. Thierry, London.
2967. Gas Lamps, F. Wirth.—(*R. Gruis, Germany.*)
2968. Boots, R. Mountford, London.
2969. Penholders, F. M. Libby, Portland, U.S.
2970. Silvering and Polishing Plate Powder, J. Finley, Devonport.
2971. Hydraulic Presses, F. Wirth.—(*R. Soldau and J. L. Posen, Germany.*)
2972. Material Suitable for Trunks, &c., H. A. Silver, London.
2973. Bedsteads, &c., T. W. Stidolph, Dartford.
2974. Bicycles, J. Roots, London.
2975. Electrical Tell-tale Alarm Apparatus, T. F. Hind and R. Lund, Preston.
2976. Steam Boilers, G. Criner, Paris.
2977. Locking Nuts, R. D. Sanders, Norwood.
2978. Filter-presses, B. H. Remmers, Glasgow.
2979. Thrust-block Bearings, R. Hamilton, Glasgow.
2980. Pipes for Smoking Tobacco, T. Cook, Kettering.
2981. Producing Printing Blocks, W. B. Woodbury, South Norwood.
2982. Utilising Spent Lime, &c., C H. Roeckner, Newcastle-upon-Tyne.
2983. Steam Boilers, G. Fenwick, Gateshead.
2984. Gas Connections, F. George, London.
2985. Folding Picture Frame, J. Reynolds, London.
2986. Stopping Horizontal Spinning Machines, A. S. Macpherson and G. Wilkinson, Leeds.
2987. Easy Copying and Toning of Photographic and other Prints, A. M. F. Caspar, London.
2988. Indicating Variations in Electric Currents, &c., T. Handford.—(*T. A. Edison, Menlo Park, U.S.*)
2989. Spring Hook Appliances for Harness, P. Jensen.—(*J. T. B. Sidén, Sweden.*)
2980. Shearing Sheep, &c., A. D. Renshaw, London.
2991. Locking Railway Signals, &c., S. C. C. Currie and I. A. Timmis, London.

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2992. Working, &c., Butter, J. Maude, Greetland.
2993. Shuttle and Pickers, W. Dawson, Burnley.
2994. Self-acting Fire Extinguisher, &c., T. Harrison, Bradford.
2995. Driving Gear for Tricycles, &c., T. Shakespear, Allesley.
2996. Sodium Bicarbonate, L. Mond and G. Jármay, Winnington.
2997. Couplings for Railway Stock, J. and G. Gaskell, Pemberton.
2998. Speed, &c., Indicators, C. Stout, Liverpool.
2999. Navigation of Ships, J. Whiteley, Leeds.
3000. Safety Key for Railway Chairs, J. Huddleston, Barrow-in-Furness.
3001. Lubricating, &c., Spindles for Spinning Machinery, J. Macqueen, Bury.
3002. Breech-loading Small-arms, C. Pryse and E. J. Cashmore, Birmingham.
3003. Self-closing Stop-cocks, J. Barr, Kilmarnock.
3004. Knobs for Doors, &c., C. Priestland, E. H. Cashmore, and F. W. Mole, Birmingham.
3005. Lock-up Apparatus for Bottles, C. S. Young, Birmingham.
3006. Glazing Roofs, G. Deacon, Northampton.
3007. Stamping Machine, T. Isley, Norwich.
3008. Cat-proof Entrances, &c., for Pigeon Houses, W. J. M. Gregory, Weston-super-Mare.
3009. Ventilating Railway Carriages, W. Stamper, Ulverstone.
3010. Steam Tramway Cars, T. Hunt, Manchester.
3011. Cigarettes, W. Bradford, Liverpool.
3012. Friction Clutches, W. Bagshaw, Batley.
3013. Paper, J. Dixon, Oughtibridge.
3014. Ratchet-braces, B. Godfrey and R. Garratt, Sheffield.
3015. Salt, G. S. Hazlehurst, Rhyl.
3016. Expanding Section Block, &c., J. H. Watson, and J. Crompton, Bolton.
3017. Ornamental Tiles, J. Norris, Birmingham.
3018. Crushing Coal, &c., G. H. Stowe, Dronfield, T. Nicholson, Chester, and G. Dawson, Sheffield.
3019. Forceps, C. M. C. Black, Sheffield.
3020. Seats of Velocipedes, G. Aston, London
3021. Taps or Cocks, &c., E. H. Liversedge, Huddersfield.
3022. Apparatus to Facilitate Reading in Railway, &c., Carriages, J. F. Hoyne and F. Merry, London.
3023. Curry-combs, W. H. Tildesley, Willenhall.
3024. Bearings for Velocipedes, J. Bradbury, Braintree.
3025. Inorganic Bottle-stoppers, O. E. Pohl, L'pool.
3026. Exposing Photographic Plates, J. and A. G. Hopkins, Hoddesdon.
3027. Pile-drivers, T. Whitaker, Horsforth.
3028. Pressing Bricks, &c., G. Richards, Ruabon.
3029. Portable Show Cases, J. R. C. Taunton and W. Bardell, Balsall Heath.
3030. Kilns, W. L. J. Ellis.—(*F. Raffinetti, New York.*)
3031. Reversible Perambulators, W. C. Benediet, London.
3032. Pencil Cases, G. R. Hughes, Hampstead.
3033. Cooking Apparatus, C. Portway, Halstead.
3034. Electrically Controlling Signals, C. Hodgson, London.
3035. Scaling, &c., Tubes, W. Boaz, London.
3036. Chimney-pot, T. Anwyl, Balham.
3037. Hypodermic Syringes, G. Whyte, Elgin.
3038. Eliminating Dissolved Matter from Water, P. A. Maignen, London.
3039. Gas Engines, J. Atkinson, Hampstead.
3040. Safety Lamps, W. J. H. Ryder, Newcastle.
3041. Curing Rheumatism, H. Spencer, France.
3042. Fountains, E. C. Gee, Lewisham.
3043. Shoes for Animals, H. W. Ford, London.
3044. Washing Machines, T. Fletcher, Warrington.
3045. Gas Stove, &c., T. Fletcher, Warrington.
3046. Gas-heated Ovens, T. Fletcher, Warrington.
3047. Shells for Ordnance, J. Baldie, Plumstead.
3048. Galvanic Batteries, C. W. Harrison, London.
3049. Pianofortes, W. R. Lake.—(*L. Caldera, Milan.*)
3050. Rope-clamping Apparatus, W. R. Lake.—(*H. R. Taylor, Oakland, U.S.*)
3051. Ventilator for Hats, J. Baber, Liverpool.

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3052. Flushing Water-closets, J. Newton, Staffordshire.
3053. Automatically Closing Gas Taps, P. W. Joyce, Ireland.
3054. Buckles, T. Evans and W. Deayman, Walsall.
3055. Screws, &c., T. Grason, Emley, near Wakefield.
3056. Locks, R. Whitaker, Wolverhampton.
3057. Balancing Apparatus for Window Sashes, J. Adams, Liverpool.
3058. Mechanism Applicable to such Purposes as those for which Pistons are Required, J. Naylor, Derby, and T. G. Gell, Cheadle, Chester.
3059. Sulphurous Acid, &c., H. E. Scholefield, Manchester.
3960. Connecting Coal Tubs, &c., to a Hauling Rope, W. Rutherford and T. Thompson, Durham.
3061. Securing Stair Rods, R. C. Christian, Ireland.
3062. Apparatus for Grilling, A. and F. Rothwell, Liverpool.
3063. Syruping, &c., Aerated Beverages, J. H. and J. W. Galloway, Bolton.
3064. Spinning, &c., Frames, J. Elce, Manchester.
3065. Puddling Furnaces, G. Morris and G. Slater, West Bromwich.
3066. Making Gas from Mineral Oils, F. W. Marsh, Middlesbrough.
3067. Paper Knives, J. Wheeler, Ilfracombe.
3068. Solid Black Ink Copying Pencil, E. Cornelis and G. H. Smith, London.
3069. Propelling Ships, J. Lefeaux and P. Ovenden, Pembrey, Carmarthen.
3070. Oiling the Waves, D. T. Gordon, Dundee.
3071. Looms for Weaving, J. Cowburn and C. Peck, Eccles.
3072. Turning Four or more-sided Objects, W. S. Bemi, London.
3073. Distilling Solutions of Acetic Acid, &c., E. Luck, London.
3074. Distillatory Apparatus, E. Luck, London.
3075. Blocking Tunnels, R. Roper, Lewisham.
3076. Marine Engine Governors, A. J. Marquand and G. S. Lee, Cardiff.
3077. Roasting Coffee, L. H. Clausen, Hamburg.
3078. Securing Handles to Knives, &c., C. G. Gill, London.
3079. Felling Trees, R. Lansdale, Halewood.
3080. Boot Jack, F. G. Myers, Wellingborough.
3081. Paring the Heels, &c., of Boots, F. G. Myers, Wellingborough.
3082. Transporting Persons, &c., G. Tofts, London.
3083. Journals, W. Eastwood, Bradford.
3084. Indicating the Number of Letter of Bedroom, &c., at Hotels, M. Woods, Huntington.
3085. Treating Exterior Maladies of Plants, P. E. Falieres, France.
3086. Sulphuric Acid, M. Finch, Silvertown, and W., J., and S. Willoughby, Plymouth.
3087. Rabbet Tiles, A. G. Brookes.—(*J. P. Jorgensen, Prussia.*)
3088. Twisting Spindles, J. Macfarlane and T. Watson, Belfast.
3089. Moulds, W. Shaw, Wolsingham.
3090. Aluminium Bronze, A. Zdziarski.—(*J. Boguski, Russia.*)
3091. Stoppers for Bottles, L. Glover, Birmingham.
3092. Breech-loading Small-arms, H. Larsen and G. E. Schou, Liege, Belgium.
3093. Planing, &c., Macnines, G. A. Crow and W. H. Crow, Newcastle-upon-Tyne.
3094. Closing Doors, H. H. Lake.—(*L. C. Norton, U.S.*
3095. Unsinkable Boats, W. E. Gedge.—(*MM. Duval Nicholas, and Co., Paris.*)
3096. Stethoscopes, E. T. A. Smith, London.
3097. Oxypyrazols, C. D. Abel.—(*Farbwerke vormals Meister, Lucius, and Bruning, Germany.*)
3098. Electric Signalling, E. B. Bright, London.
3099. Bicycles, &c., A. Brockelbank, London.
3100. Cylinders, A. C. Jameson, Westminster.
3101. Printing Rollers, W. J. A. Donald, Glasgow, and C. S. W. Muir, Kilmarnock.
3102. Wheels, E. Perrett, Westminster.
3103. Drying the Bottoms of Ships, R. Fell, A. M. Cohen, and R. Turnbull, Newcastle-upon-Tyne.
3104. Ensilage, E. Cory, F. W. Reynolds, and G. W. C. Catford, Southwark, London.
3105. Hydraulic Lifts, J. M. Day, W. R. Green, H. C. Walker, and R. Carey, Falmouth-road, London.
3106. Protecting Electric Circuits, H. H. Lake.—(*J. W. Dyer, U.S.*)
3107. Tool Chests, J. Hawkins, jun., Walsall.
3108. Hot-water Apparatus, J. A. Hopkinson and J. Hopkinson, Huddersfield.

ABSTRACTS OF SPECIFICATIONS.

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

2500. Construction of Ambulance Carriages, &c., *R. A. Westhorp, London.—19th May*, 1883. *6d.*

The object is improved means of lighting, of ventilation, of introducing the patients into the carriages, and rendering the patients comparatively free from noise, jolting, and other disturbing influences.

2622. Machinery or Apparatus for Excavating, Delivering, Removing, Tipping, and Depositing Earth, &c., *J. F. Lang, London.—26th May*, 1883. *6d.*

Relates to several improvements in the general construction of the apparatus.

2666. Perambulator Bodies, *G. P. Lee, Manchester.—29th May*, 1883. — (*Provisional protection not allowed.*) *2d.*

Consists in constructing the body of pieces of wood moulded in imitation of wicker work or other convenient design.

2772. SHIRTS, *G. Charlton, Newcastle-on-Tyne.—4th June, 1883.—(Provisional protection not allowed.)* 2d.
The shirt is made to open completely in the manner of a coat.

2804. APPARATUS FOR GENERATING, REGULATING, MEASURING, AND DISTRIBUTING ELECTRIC CURRENTS AND ELECTRIC ENERGY, *A. and T. Gray, Glasgow.—6th June, 1883.* 1s. 4d.
The field magnets are arranged in a number of rows so placed that taking any even number of rows, each row may be imagined to form, as it were, one side of a body of prismatic shape, every section of which, at right angles to the axis of the prism, resembles a polygon of as many sides as there are rows of magnets. Numbering the edges of the supposed prism 1, 2, 3, the first row of magnets gives one row of like poles along the edge 1, and a row of opposite poles along the edge 2, and so on; these poles are overlapped by rows of opposite poles of the magnets of the second row, and similarly with the other rows. The armatures consists of a series of copper strips forming a hollow drum, and shaped as if composed of alternate portions of two cylinders of different diameters with their axes in line, the pieces of larger and smaller diameter being connected by annular discs. The strips are arranged to pass between and across the inner and outer poles of the rows of magnets. In an arc lamp a "continuous endless motor" is used in combination with an "air fly," or vanes in liquid. This specification also relates to an improved counter arrangement for use with a current meter; to an apparatus for automatically introducing resistance into a circuit, and to a system of distribution in which one conductor, formed as a rod, is carried in the other conductor formed as a tube.

2830. TRICYCLES, *W. Bouttell, Colchester.—7th June, 1883.—(Provisional protection not allowed.)* 2d.
Relates to the construction of a tricycle on the principle of a bicycle.

2850. MANUFACTURE OF ELECTRIC INCANDESCENT LAMPS AND APPLIANCES FOR THE REGULATION OF ELECTRIC CURRENTS THEREFOR, &c., *W. J. L. Hamilton, London.—7th June, 1883.* 8d.
The filaments made of bog oak are impregnated with spongy platinum to lower their resistance. The pores are closed by immersing the filaments in a solution of a salt of calcium, or other suitable salt. Intermediate wire loops are used to prevent the "Crooke's effect." A governor solenoid in combination with a "bridge," electro-magnet and a variable resistance is employed to control the speed of the steam engine.

2900. LUBRICATORS, *G. Lindsey, Brighton.—11th June, 1883.—(Not proceeded with.)* 2d.
Relates partly to the arrangement of the spring valve.

2920. COMBINED SEAT OR FORM AND TABLE, AND COMBINED CHAIR AND TABLE, *J. Wigglesworth, Bradford.—12th June, 1883.—(Not proceeded with.)* 2d.
The object is to construct seats or forms that will admit of being transformed into tables.

2923. COMPOUND OR MATERIAL AS A SUBSTITUTE FOR STONES, MARBLE, TORTOISESHELL, CORAL, &c., *A. R. Leask and E. Torrini, London.—12th June, 1883.—(Not proceeded with.)* 2d.
Consists of bone-dust, asbestos in powder, farina, albumen, coal ash, horn cuttings or waste and slate in powder.

2956. BOILERS, AND APPARATUS COMBINED THEREWITH FOR GENERATING STEAM, *E. G. Rock, London.—14th June, 1883.—(A communication from J. Lees, New Zealand, and J. W. Rock, New South Wales.)—(Not proceeded with.)* 2d.
The water is heated to a temperature not greatly exceeding 212 deg. Fah. in a suitable vessel. This water is forced by means of a pump or other mechanical appliance into a pipe or pipes kept at a high degree of heat, by being placed or arranged in a furnace and flue of the fire which heats the boiler.

2958. CONSTRUCTION OF BLEACHING KIERS, *C. L. Jackson and J. Westley, Bolton.—14th June, 1883.* 6d.
The inventors claim the construction of a conical nozzle on the end of the steam pipe, and an internal liquor pipe, with a corresponding throat or contraction at the lower end of the "puffer pipe" of a bleaching kier, whereby a cylindrical jet of steam is produced for the purpose of carrying a continuous stream or column of the hot liquor up the "puffer pipe."

2962. MANUMOTIVE VELOCIPEDES, *W. P. Thompson, Liverpool.—14th June, 1883.—(A communication from S. Krnka, Prague.)—(Not proceeded with.)* 2d.
Relates to the propelling mechanism.

2965. METHOD OF AND APPARATUS FOR STORING AND RETAINING ELECTRIC ENERGY, *F. J. Cheesbrough, Liverpool.—14th June, 1883.—(A communication from C. T. Tomkins, New York, U.S.)* 8d.
The accumulator consists of an ordinary porous cell and a glass jar. The cell is filled with pulverised charcoal and graphite, the former being used as an "absorbent" and the latter as a conductor; a silver rod passing through the centre of the mixture serves to convey the current to and from the cell. A metal brush, composed of fine lead fibres, is placed in the annular space between the cell and jar, which is filled with an electrolytic fluid. The battery is kept charged by sealing it and so preventing the escape of the absorbed hydrogen. The electrodes are immersed more or less in the electrolytic fluid according to the current required to be given out.

2974. PENCILS WITH MOVABLE LEADS, *J. F. Williams, Liverpool.—15th June, 1883.—(Not proceeded with.)* 2d.
The object is to secure a proper passing outwards of the gravity lead from the case only the proper distance, and when so passed outwards, so gripping and holding in position for use.

2980. CONSTRUCTION AND FITTING OF RAILWAY CARRIAGES, *H. E. Newton, London.—15th June, 1883.—(A communication from B. T. Hutchinson, Cape Town.)* 6d.
Relates to the arrangement of sleeping accommodation and to the sanitary appliances.

2982. LIFTS, *H. J. Haddan, London.—15th June, 1883.—(A communication from R. Liebig, Leipzig.)* 4d.
Relates to an arrangement of racks and pawls.

2983. WASHING AND SCOURING WOOL, *H. J. Haddan, London.—15th June, 1883.—(A communication from E. Tremsal, Belgium.)* 6d.
This consists in causing the bath to travel with the wool through suitable troughs or tanks, connected with each other by aprons, gratings or inclined planes, and compressing apparatus or wringers.

2986. TILLS, *J. C. Cox, London.—15th June, 1883.* 6d.
Relates to a till in which the takings are separated.

2987. RETAINING AND FACILITATING THE DELIVERY OR MEASUREMENT OF RIBBON, TAPE, &c., THAT MAY BE WOUND ON CONES OR REELS, *F. Jones, London.—15th June, 1883.—(Not proceeded with.)* 2d.
Relates partly to an elastic fastening for securing the ends.

2988. ELECTRO-MOTORS, *R. D. Bowman, London.—15th June, 1883.—(Not proceeded with.)* 2d.
To increase the magnetic field the pole pieces are made segmental; to reverse the motor the brushes are moved "over to the other side."

2991. PROTECTION OF IRON AND STEEL SURFACES AND IN THE FURNACES OR APPARATUS TO BE EMPLOYED THEREIN, *A. S. Bower, St. Neots.—15th June, 1883.* 6d.
The object is to enable steam and furnace gases to be used in the same furnace together or separately for the production of magnetic oxide upon iron and steel surfaces.

2990. TREATMENT OF NATURAL BASIC PHOSPHATES OF LIME IN THE LEBLANC PROCESS FOR THE MANUFACTURE OF SODA AND POTASH, *J. H. Johnson, London.—15th June, 1883.—(A communication from Messrs. Crespel Brothers and Martin, Lille.)* 4d.
Relates to several improvements in the general process.

2992. APPARATUS USED WITH PLATE ROLLING MILLS FOR TRANSFERRING INGOTS OR SLABS FROM ONE SET OF ROLLS TO ANOTHER, *C. Davy, Sheffield.—15th June, 1883.* 6d.
Consists in the construction, combination, and arrangement of steam (or preferably) hydraulic crane and hoisting apparatus.

2997. PACKING FOR STEAM ENGINES, *H. Montgomerie, Cleadon.—16th June, 1883.—(Not proceeded with.)* 2d.
The packing is composed of fibrous material and coiled lead.

2998. SCREWING APPARATUS, *J. Heap, Ashton-under-Lyne.—16th June, 1883.—(Not proceeded with.)* 2d.
Consists principally in the employment of a hollow cone to press all the dies inward simultaneously.

2999. MACHINERY FOR WASHING, SOAPING, &c., WOVEN FABRICS, *J. and P. Hawthorn and J. P. Liddell.—16th June, 1883.* 6d.
Relates to the combination with washing and scouring or heating apparatus in a machine for the indicated uses of a cistern or compartment or two, three or more cisterns or compartments in which the cloth is permitted to accumulate and to lie in folds or otherwise to be loosely contained in the lye or liquid, so as to give increased time for the cloth to soak in its passage through the machine.

3002. HEAT RETAINING AND LIFE-SAVING DRESSES, *A. W. Ward, London.—16th June, 1883.* 6d.
Relates to the construction of a waterproof dress.

3004. RECOVERING AMMONIA FROM COMBUSTIBLE GASES, *J. and J. Addie, Glasgow.—17th June, 1883.—(Not proceeded with.)* 2d.
Relates partly to adding a proportion of sulphur or sulphurous shale or other substance containing sulphur to the coal or dross or other carbonaceous fuel usually fed into the gas producer, and partly to subjecting the gases to the action of a scrubber.

3005. STEAM BOILERS, *W. Hindson, Gateshead-on-Tyne.—16th June, 1883.—(Not proceeded with.)* 2d.
Relates partly to the arrangement of the fire-box.

3006. MANUFACTURE OF STOCKINGS, *A. P. Sheffield and A. W. Wills, Leicester.—16th June, 1883.* 4d.
Relates to a stocking which has its upper portion divided and furnished with a lace, clasp, or other fastening.

3009. STEAM BOILERS, *T. Carter, Sunderland.—16th June, 1883.* 6d.
The chief objects are to procure a large heating surface and high pressure, to facilitate the cleaning of any part, and to allow of their standing on a small base.

3010. APPARATUS FOR PRODUCING ILLUSORY DRAMATIC EFFECTS AND MOVING STAGE SCENERY, *W. R. Lake, London.—16th June, 1883.—(A communication from J. W. Knell, Boston.)* 6d.
The object is the production on the theatrical stage of the appearance of a person, animal, or vehicle, any or all of these travelling along a road, course, or path of considerable length.

3011. APPARATUS FOR MARKING THE GROUND FOR LAWN TENNIS AND OTHER GAMES, *J. G. Howard, Biddenham.—18th June, 1883.* 6d.
Relates to an apparatus wherein a slide is employed for spreading or smearing the marking material evenly upon the ground, and a valve or other suitable device for controlling the flow of the said material, with or without the brush or brushes.

3012. PROTECTING CORNS, BUNIONS, &c., *E. Holliday, London.—18th June, 1883.* 4d.
Relates to a cushion or buffer of india-rubber.

3013. STENCH TRAPS FOR DRAINS, &c., *W. Ayres, London.—18th June, 1883.* 6d.
The trap is formed with flanges, which drop into channels in the trap frame, such channels containing water or other fluid.

3014. ENGINES TO BE WORKED BY STEAM, *C. Baumgarten, Berlin.—18th June, 1883.* 4d.
Relates to the construction and arrangements of parts whereby, although a crank is used, dead points are avoided.

3015. MANUFACTURE OF RISING HINGES, *G. W. von Nawrocki, Berlin.—18th June, 1883.—(A communication from H. Haltaufderheide, Cassel.)—(Not proceeded with.)* 2d.
Relates especially to the mode of manufacture of the helical hinge pin.

3016. APPARATUS FOR THE MANUFACTURE OF WELDING CHAINS, *J. Imray, London.—18th June, 1883.—(A communication from M. L. A. de Briey, Comtesse de Montebello, Paris.)* 8d.
Relates to a machine for manufacturing weldless chains, by cutting and piercing a continuous bar of iron or steel having the form of a cross in section, so as to produce the successive links engaged with each other, which are afterwards finished to the required shape.

3017. CANDLE WICKS AND APPARATUS FOR THEIR MANUFACTURE, *J. Imray, London.—18th June, 1883.—(A communication from La Société Joly et Cie., Paris.)—(Not proceeded with.)* 2d.
Consists in making the wick with one of the strands hollow.

3019. RESERVOIR PEN SOCKET AND HOLDER FOR USE WITH ANY ORDINARY PEN, *L. B. Bertram, London.—18th June, 1883.—(Not proceeded with.)* 2d.
The object is to form a socket in combination with, and as part of, the barrel which fits the wooden holder in one piece, and to stop that part of the wooden holder so that the barrel may fit the larger diameter, and thus swell or open out the barrel as to permit an ordinary nib being fitted into the space.

3020. FIRE-BOXES, *H. Pataky, Berlin.—18th June, 1883.—(A communication from H. Hempel, Leipsic.)—(Not proceeded with.)* 2d.
The object is to generate gas in fire-boxes of all kinds by burning coal with the access of decomposed steam, and of employing this gas for heating boilers, stoves, or ovens.

3021. STOPPERING OR SEALING BOTTLES, &c., *J. Phillips, London.—19th June, 1883.* 6d.
Relates to improvements in the construction of outside stoppers or lids.

3022. SOLDERING IRONS, *J. O. Fry, Nottingham.—19th June, 1883.—(Not proceeded with.)* 2d.
The copper bit is provided with a recess to receive the solder.

3023. APPARATUS TO BE EMPLOYED IN THE MANUFACTURE OF WHEELS FOR LOCOMOTIVE ENGINES, RAILWAY, AND OTHER CARRIAGES, *W. Brierley, Halifax.—19th June, 1883.—(A communication from Messrs. Deffassieux Brothers, Paris.)—(Not proceeded with.)* 2d.
Relates to the arrangement of furnaces.

3024. MACHINERY FOR DIVIDING RAILS OR RAIL ENDS INTO SECTIONS, *H. Britten, Sheffield.—19th June, 1883.* 6d.
Consists essentially of a machine with a pair or set of circular cutters for nicking the cold rail, and a press for breaking the cold nicked rail.

3025. ADJUSTABLE SPRING FOR LOCKS, LATCHES, OR BOLTS, *E. Edwards, London.—19th June, 1883.—(A communication from L. Bourrié, Lyon.)—(Not proceeded with.)* 2d.
Relates to the form of a spiral spring.

3027. HULLS OF SHIPS, &c., *H. J. F. Russell, London.—19th June, 1883.—(A communication from M. Marzan, Havannah.)—(Not proceeded with.)* 2d.
Relates to the shape of the hull, the object being to increase the speed of the vessel.

3028. SEWING MACHINERY, *A. G. Brookes, London.—19th June, 1883.—(A communication from R. Whitehill, New York.)* 8d.
Relates to several improvements in the general construction of sewing machines.

3030. APPARATUS FOR PROPELLING AND VENTILATING BOATS, VESSELS, AND SHIPS, *J. Robinson, Coleraine, Ireland.—19th June, 1883.* 4d.
Consists in the arrangement of two series of pipes connected to any suitable air pumping or forcing apparatus, to be worked by steam, electricity, or compressed gas.

3031. PRODUCTION OF LIGHT BY ELECTRICITY AND APPARATUS THEREFOR, *W. P. Thompson, Liverpool. 19th June, 1883.—(A communication from R. J. Sheehy, New York, U.S.)* 6d.
This relates to a lamp in which the carbons, fed together by gravity, are controlled by a clutch device operated by an electro-magnet placed in the main circuit, one or more of whose helices are cut out by an automatic bridge situated in a shunt circuit. An automatic cut out for placing the lamp in, or withdrawing it from, the circuit, is also described.

3032. APPARATUS FOR DISTRIBUTING OR SCATTERING SAND, &c., ON ROADWAYS, *C. D. Abel, London.—19th June, 1883.—(A communication from E. Lesur, Paris.)—(Not proceeded with.)* 2d.
Relates to rotary blades or vanes for distributing the sand, &c.

3033. PROCESS FOR THE PREPARATION OF WATERTIGHT FABRICS, *E. A. Brydges, Berlin.—19th June, 1883.—(A communication from F. O. Spielhagen, Berlin.)—(Not proceeded with.)* 2d.
Relates to a process in which india-rubber, linseed oil, and red oxide of iron are employed.

3034. LEVELLING INSTRUMENTS, *B. J. B. Mills, London.—19th June, 1883.—(A communication from J. Macdonald, New York.)* 6d.
A flexible pipe and two liquid-containing graduated portable standards are employed in combination with peculiarly constructed valves and coupling devices.

3036. MANUFACTURE OF BOOTS AND SHOES, *H. J. Morgan, Frome.—19th June, 1883.* 6d.
Relates more particularly to waterproof boots, the object being to properly ventilate them, and to facilitate their attachment to or removal from the foot of the wearer.

3037. SAFETY LAMPS, *H. J. Haddan, London.—19th June, 1883.—(A communication from J. Weig, Dortmund, Germany.)—(Not proceeded with.)* 2d.
Consists in igniting safety lamps, without opening them, by means of a spark produced by percussion, friction, or electricity.

3038. ANNEALING CHILLED AND OTHER CASTINGS, *W. R. Lake, London.—19th June, 1883.—(A communication from E. Jenkins and A. Law, Melbourne, and W. Price, Carlton, Victoria.)* 4d.
Consists in the sudden immersion of chilled and other castings, when at a dull red heat, into a liquid, and preferably into a liquid consisting of treacle and water of a specific gravity of 1·005.

3040. LOOMS FOR WEAVING, *J. Almond, Blackburn.—19th June, 1883.—(Not proceeded with.)* 2d.
Relates to several improvements in the general construction of the loom.

3041. GAS ENGINES, *T. Russom, Leeds.—19th June, 1883—(Not proceeded with.)* 2d.
Relates to improvements in the general construction of the machine.

3042. BREECH-LOADING CANNON AND AMMUNITION THEREFOR, *S. Pitt, Sutton.—19th June, 1883.—(A communication from R. S. Ripley, Charleston, U.S.)* 8d.
Relates, First, to the method of closing the breech of the cannon; Secondly, to the different methods of igniting an elongated cartridge.

3043. DOOR LOCKS OR LATCHES, *W. R. Lake, London. 19th June, 1883.—(A communication from Messrs. Mayer, Langfelder, and Hammerschlag, Vienna.)—(Not proceeded with.)* 2d.
Relates to a door-locking device by means of which the drawing and undrawing of the catch bolts can be effected from a point remote from the door.

3044. BEDSTEADS, *R. B. Evered, London.—19th June, 1883.—(Not proceeded with.)* 2d.
Consists in the manner of constructing a bedstead to contain two separate beds placed side by side with a space between them for ventilation.

3045. PRESERVING ANIMAL LIVERS FOR FOOD, *A. M. Clark, London.—19th June, 1883.—(A communication from I. Le Roux de Bretagne, Paris.)—(Not proceeded with.)* 2d.
Relates to the means of cleaning and salting the liver.

3046. LATHES FOR THE USE OF WATCHMAKERS, JEWELLERS, &c., *A. M. Clark, London.—19th June, 1883.—(A communication from H. M. Potter, Williamsport, U.S.)* 6d.
Consists in lathe attachments for supporting, steadying, and marking various small articles.

3047. LAWN TENNIS BALLS, *R. S. Moss, Manchester.—20th June, 1883.* 2d.
Relates to heating the seams and stitches with a solution of wax or other composition.

3048. SCREW STOPPER FOR BOTTLES, JARS, AND OTHER HOLLOWS, *J. Jackson, London.—20th June, 1883.—(Not proceeded with.)* 2d.
Relates to the construction of a fine thread screw stopper.

3049. BREECH-LOADING SMALL FIRE-ARMS, *T. Perkes, London.—20th June, 1883.* 6d.
The objects are, First, to render the gun perfectly safe until ready for firing; Secondly, to effectually prevent all risk of a live cartridge being ejected from the barrel until the gun is discharged; Thirdly, to an arrangement for locking one or both tumblers on closing the gun; and, Fourthly, to a method of applying a gas check for preventing the gas from entering the locks.

3051. SURVEYORS' PLOTTING AND MEASURING SCALES, *A. R. Cragg, Hereford.—20th June, 1883.—(Not proceeded with.)* 2d.
Relates to improvements in the general construction of the instrument.

3052. HOPPER DREDGERS, *A. Brown and W. Simons, Renfrew.—20th June, 1883.* 8d.
Relates partly to the arrangement of the bucket ladder, which enables the buckets to recoil when meeting with material of a character destructive to the machinery or buckets.

3053. MANUFACTURE OF ANTISEPTIC FLUIDS OR COMPOSITIONS FOR WASHING SHEEP AND OTHER ANIMALS, DESTROYING INSECTS UPON PLANTS OR THE LIKE, OR FOR OTHER ANTISEPTIC OR DISINFECTING PURPOSES, *B. Nickels, London.—20th June, 1883.* 2d.
The inventor takes shale oil or bone oil and renders the same soluble in water by the addition thereto of rosin and an alkali.

3055. RAILWAYS AND TRAMWAYS, *W. P. Thompson, Liverpool.—20th June, 1883.—(A communication from L. Harty, sen., Paris, and L. Harty, jun., Brussels.)* 6d.
The essential and distinctive peculiarity of the invention is the intimate union of the rail with its support, and also relates to the construction of a special form of rail.

3056. TOBACCO-PIPES, *E. Ward, Liverpool.—20th June, 1883.—(Not proceeded with.)* 2d.
Relates to means for preventing the nicotine and moisture from entering the stem of the pipe.

3057. SPRING BEDS, MATTRESSES, COUCHES, &c., *F. Ellisdon, Liverpool.—20th June, 1883.* 6d.
Relates to the construction of spring beds, mattresses, couches, or the like, with a rigid bottom frame and pliant upper frame, and with a parallel motion mechanism so attached to or working in the two, that the upper frame shall be incapable of motion except in a direction practically perpendicular to the lower frame.

3058. PRESERVING MILK, FRUIT, &c., *W. H. Thew, Waterloo.—20th June, 1883.* 4d.
Consists in the employment of successive acts of heating and cooling in germ-proof receptacles for the preservation of organic decomposable substances.

3059. IRONING MACHINE, *R. Mindt, Berlin.—20th June, 1883.—(Complete.)* 6d.
Consists partly in making the table stationary, while the cylinder or drum is caused to roll over the same, the action being directly opposite to that of previous machines.

3060. FEEDING APPARATUS FOR THRASHING MACHINES, *R. R. Holben, Barton, and F. Wilkerson, jun., Bessingbourn.—20th June, 1883.—(Not proceeded with.)* 2d.
The object is to make the rigid tines adjustable according to the desired rate of feed, and to enable the position and motion of the yielding tines to be varied to suit the adjustment of the fixed tines.

3061. CONSTRUCTION AND MANUFACTURE OF CRICKE BATS, *A. J. Altman, London.—20th June, 1883.—(Not proceeded with.)* 2d.
The object is to impart great lightness to a cricket bat without appreciably diminishing either its strength or durability.

3062. APPARATUS FOR PRODUCING INTENSE WHITE LIGHT, *C. D. Abel, London.—20th June, 1883.—(A communication from C. Clamond, Paris.)* 6d.
Relates to the construction of burners or apparatus for the production of intense white light, by heating to incandescence a cage of magnesia filaments, or other suitable refractory material by means of the combustion of a combustible gas or vapour and air.

3064. LATCHES, BOLTS, OR FASTENINGS FOR DOORS, WINDOWS, &c., *J. D. Sprague, Upper Norwood.—20th June, 1883.* 6d.
Relates to the employment of a weighted pivotted tumbler.

3066. GAS MOTOR ENGINES, *C. H. Andrew, Stockport.—20th June, 1883.* 8d.
The object is to produce an explosion at each revolution of the engine, and relates to general arrangement of cylinders and valves.

3068. APPARATUS FOR HEATING AND PURIFYING THE FEED WATER FOR STEAM BOILERS, &c., *W. Baragwanath, Chicago.—20th June, 1883.* 6d.
Relates to feed water heaters and purifiers and steam condensers, and comprises the novel construction and arrangement of parts whereby the water for feeding a boiler is more effectually heated and purified than has heretofore been possible; it also comprises the combination of two heaters in such a manner that a vacuum is formed, whereby an ordinary high-pressure engine may be used as a low-pressure engine.

3069. APPARATUS FOR CONVERTING RECIPROCATORY INTO ROTARY MOTION IN GAS AND OTHER EXPLOSIVE ENGINES, &c., *H. G. Williams, London.—20th June, 1883.* 10d.
Consists chiefly in the method of mounting the cylinders rigidly, whereby connecting rods are dispensed with.

3071. HEATED AIR MOTORS, &c., *L. P. Martin, Vienna, and F. W. Gilles, Cologne.—20th June, 1883.* 8d.
Relates to improvements in the construction and arrangement of heated air motors or hot air engines generally, and in particular to a novel arrangement of the working cylinder and air pump, and the air passages, valves, and mechanism connected therewith.

3072. APPARATUS TO BE USED IN THE CASTING OF IRON, *T. and J. Robinson, Widnes.—21st June, 1883.* 6d.
The object is, First, to so construct apparatus that molten iron in its passage from the furnace to the moulds shall to a very large extent be freed from scum, scoria, or like objectionable matter contained therein; Secondly, to facilitate the treatment of the molten metal with chemical re-agents for the removal of phosphorus, sulphur, and the like.

3074. DYNAMO-ELECTRIC MACHINES, *M. Deprez, Paris.—21st June, 1883.* 1s.
This relates to so constructing a generator that the slow or progressive magnetisation of the electro-magnets and the slow reversal of the poles of either the electro-magnets or the armature may be effected by a commutator and a means of sectional winding. A "distributor" permits of more or less of the field magnets being cut out of the circuit according to the current required.

3075. LOOMS FOR WEAVING, *W. H. Tristram and H. Brereton, Bolton.—21st June, 1883.* 6d.
Consists in connection with Jacquard machines of a yielding or regulating apparatus placed between the card cylinder or barrel, and the point from which it receives its motion from the loom.

3076. FANCY WEAVING AND APPARATUS THEREFOR, *W. H. Tristram and J. Whitehead, Bolton.—21st June, 1883.—(Not proceeded with.)* 2d.
Relates to a particular kind of weaving by means of the jacquard loom.

3077. SCARFS OR NECKTIES, *T. Glegg, Hampton Court.—21st June, 1883.—(Not proceeded with.)* 2d.
Relates to means of constructing scarfs, so that they may be reversed or washed without taking the parts to pieces.

3078. TANKS FOR MELTING GLASS, *E. Brooke, Huddersfield.—21st June, 1883.* 4d.
Relates to the building or constructing of glass tanks, having the inner parts composed of a more refractory material than the outer parts.

3079. GAS MOTOR ENGINES, *F. W. Crossley, Manchester.—21st June, 1883.* 6d.
Relates to an arrangement and construction of double or multiple gas motor engines of the kind commonly known as the "Otto" type, the main object being to equalise the action of such engines whilst retaining a compact and simple form.

3080. TELEPHONES, *A. W. Rose, London.—21st June, 1883.* 6d.
This relates to so mounting and connecting the transmitter and receiver that they form one instrument. A curved carrier is used, so shaped that whilst one end is opposite the mouth the other end is opposite the ear.

3081. VENTILATING SEWER TRAP, *J. Moyes, Pollokshields, N.B.—21st June, 1883.—(Not proceeded with.)* 2d.
Consists in constructing the part which contains the ventilator and the connection, or coupling, with the pipes at the interior of houses or other buildings in a piece separate from the cesspool.

3083. BALING PRESSES, *J. Watson, London.—21st June, 1883.* 6d.
Relates to the general construction of baling boxes.

3085. HYDRO-CARBON HEATING STOVES, *C. Butler, Birmingham.—21st June, 1883.—(Not proceeded with.)* 2d.
The object is to displace the chimney mainly constructed of metal, and to substitute in its place an independent arrangement of glass.

3086. RAILWAY CHAIRS, *J. Hopkinson, Rowsley.—21st June, 1883.* 6d.
Relates to the construction of railway chairs with fixed and loose jaws.

3087. CONSTRUCTION AND ARRANGEMENT OF MECHANICAL RETORTS FOR THE DESTRUCTIVE DISTILLATION OR THE REVIVIFICATION OF ANIMAL AND VEGETABLE MATTERS, *J. Lyle, London.—21st June, 1883.* 6d.
Consists partly of a circular retort, which by suitable mechanical means is made to keep the stuff under treatment in continual progression or agitation, from the point of its entrance until it has traversed the

retort and is discharged into the furnace or other receptacle.

3088. Producing Colouring Matters from Phenol, *H. J. Haddan, London.—21st June*, 1883.—(*A communication from The Leipziger Anilinfabrik* (*Beyer and Kegel*), *Leipzig.*)—(*Not proceeded with.*) 2*d.*
Relates to improvements in the general process and to the salts employed.

3089. Manufacture of Ammoniacal Products and Apparatus therefor, *L. Q. and A. Brin, Paris.—21st June*, 1883. 6*d.*
Relates to the process and apparatus for the production of ammoniacal products, the said process consisting in treating nitrogen in the presence of "barytic coke" and steam or watery vapour.

3090. Manufacture of Portable Fuel and Fire Lighters, *L. J. Cayé, Montreuil, France.—21st June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates to fatty matters mixed with sawdust and adhesive matter.

3091. Construction of Ropes used for Hauling and Transmitting Power, *F. W. Walker, Leeds.—21st June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates to the arrangement of steel wire with flax, &c.

3092. Machines for Finishing or Polishing Mouldings, *W. R. Lake, London.—21st June*, 1883.—(*A communication from J. Grossejambe, Evreux, France.*)—(*Not proceeded with.*) 2*d.*
Relates to the general construction of the machine.

3093. Extracting Sugar from Molasses, &c., *J. H. Johnson, London.—21st June*, 1883 —(*A communication from J. E. Boivin and M. D. Loiseau, Paris.*) 8*d.*
Consists in treating the molasses with hydrocarbonate of lime in a series of operations.

3094. Friction Gearing, *W. E. Ayrton and J. Perry, London.—21st June*, 1883. 1*s.*
Relates to the means of driving from one shaft to another.

3095. Red Colouring Matters, *F. Wirth, Frankfort.—21st June*, 1883.—(*A communication from Messrs. Kalle and Co., Germany.*)—(*Not proceeded with.*) 2*d.*
Consists in the production of red colouring matters by the combination of the paradiamines with the amidated ethers of the phenols by oxidation (in a similar way to the production of the red colouring matter Brazilin from sapan wood), which consists in the oxidation of a mixture of the paradiamines with primary monamines of the benzol series (aniline, toluidine, &c.).

3099. Building Vehicles, &c., *R. Sunyé, London.—22nd June*, 1883.—(*Not proceeded with.*) 2*d.*
The wheels are formed of thin slips or patterns of wood, combined with and secured to thin plates or slips of iron or steel, or other metal.

3101. Apparatus in connection with Porter Pumps or Cocks for Cooling or Warming Beer, &c., *M. Cleary, Dublin.—22nd June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates to an arrangement of pipes containing cold water or ice or heated water.

3103. Refining Jute, *E. T. Hughes, London.—22nd June*, 1883.—(*A communication from W. Lukacs, Budapest.*) 4*d.*
The object of the invention is a process by means of which jute fibres or jute fabrics, whether spun or woven, are converted into a material similar to sheeps' wool.

3105. Steam Generator or Water Heater, *H. J. Haddan, London.—22nd June*, 1883.—(*A communication from J. M. H. Menay, Havre.*) 4*d.*
Relates to the arrangement of metallic walls provided with cross stays, and a reservoir in combination with heating tubes.

3106. Perambulators, *C. Thompson, London.—22nd June*, 1883. 4*d.*
Relates to making the carriages to revolve and become reversed by means of and in combination with certain appliances affixed to the body or underframe of the carriage.

3107. Multiple Cylinder Engines, *H. J. Haddan, London.—22nd June*, 1883.—(*A communication from H. Toussaint, Paniers, France.*)—(*Not proceeded with.*) 2*d.*
Relates particularly to the lubrication of the moving parts.

3113. Wheeled Carriages and Wheels for Carriages, &c., *J. G. Harrison, Birmingham.—22nd June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates partly to the construction of the folding heads of wheeled carriages, and also to the construction of the wheels.

3114. Mariners' Compass, *W. R. Lake, London.—22nd June*, 1883.—(*A communication from E. Bisson, Paris.*) 6*d.*
Relates to mariners' compass, showing the direction of the magnetic meridian upon iron ships, and comprises the novel construction and arrangement of the parts.

3115. Dynamo-electric Machines, *G. Forbes, London.—22nd June*, 1883. 6*d.*
The armature is simply a disc of iron mounted on a shaft. The field magnet completely encloses the armature and presents a continuous north pole on one side and a continuous south pole on the other. The disc rotates in a cavity of only sufficient width to permit of its doing so without actual contact. The periphery of the disc is surrounded by a ring serving as the conductor by which the current is drawn off. Contact is made by this conductor by mercury which is kept in place by centrifugal force, the circuit connections being made with the ring and a metal bearing on the axis of the disc. The magnetising coils are immediately exterior to the ring and enclosed in the box-like mass.

3116. Arrangement of Circuits and Apparatus to be used in Connection with Telephonic Communication, *S. Pitt, Sutton, Surrey.—22nd June*, 1883.—(*A communication from C. E. Scribner, Chicago, U.S.*) 8*d.*
This relates to testing apparatus for multiple switch boards, an automatic system of circuits for connecting the "spring jack" switches of two subscribers together, a system of circuits, to a light telephone to be worn at the ear, a polarised annunciator, and to a combination of a condenser and an ordinary annunciator.

3117. Exhaust or Blast Fans or Ventilators, &c., *G. M. Capell, Passenham.—22nd June*, 1883. 1*s.* 2*d.*
Relates to the construction of a collecting cylinder closed at one end, and provided with port-holes and wings joining the edge on one side of the port-holes, and dipping towards or meeting at the centre or boss, the curve of said blades corresponding or nearly so with the radius of the cylinder in which the ports are formed, or when such blades are straight, the angle may be determined by bisecting the points formed, as in the case of radial blades. Other improvements are claimed.

3118. Stop Motions of Drawing Frames for Cotton and other Fibrous Substances, *J. Macqueen, Bury.—23rd June*, 1883. 6*d.*
Relates partly to the arrangement for stopping the frame when the can gets full.

3121. Saddle-bar, *J. Passmore and E. C. Cole, Exeter.—23rd June*, 1883. 6*d.*
The bar is suspended from two staples, preferably placed one towards each end of the upper limb of the bar, and secured to the plate attached to the saddle-tree.

3123. Electrical Apparatus and Circuit Connections to Storage or Secondary Batteries, &c., *W. Hochhausen, New York, U.S.—23rd June*, 1883. 6*d.*
This relates to a means of charging and discharging secondary batteries, and to rendering them available as a means of changing the circuit connections automatically, so that the translating devices may be supplied with current either direct from the generators or the batteries.

3127. Preparation and Manufacture of a Compound from Vegetable Materials suitable for Electro Non-conductors and Insulators, &c., *E. C. T. Blake, London.—23rd June*, 1883. 4*d.*
The material is made from a combination of pulp, or waste vegetable fibre, and cork shavings, mixed with the "colloid of fabrine of animal blood," and pressed into cakes of the desired shape. The cakes are then soaked in boiling linseed oil, pressed and baked, this operation being repeated twice.

3129. Kilns for Drying Malt, &c., *E. Edwards, London.—23rd June*, 1883.—(*A communication from J. Beumier, Jemappes, France.*) 6*d.*
Relates to improvements in the general construc tion of the kilns.

3133. Coupling Hoses, &c., *J. C. Hudson, London.—23rd June*, 1883. 6*d.*
The couplings consist of male and female parts united by a screw or bayonet joint, and having a spring or sliding stop on the female part entering a recess in the male part, and so locking the parts when engaged that they cannot turn until the stop is first withdrawn.

3135. Construction and Arrangement of Gas Engines, *P. Niel, London.—23rd June*, 1883. 6*d.*
Relates to improvements in the construction and arrangement of gas engines, and has for its object to vary automatically the volume of mixture of gas and air, and its compression before ignition, the mixture being in each case in the same proportions.

3137. Steam Boilers, *G. C. and J. Hazell, Bromley-by-Bow.—25th June*, 1883. 6*d.*
Relates to the combination and use with an upright boiler (tubular or otherwise) of a horizontal or "Cornish" portion.

3138. Construction of Velocipedes, &c., *W. Wright, Droylsden.—25th June*, 1883. 6*d.*
Relates partly to the arrangement of the gearing and partly to the seat.

3139. Construction of Steam Engine Indicators, *S. Moorhouse, Stalybridge.—25th June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates to improvements in the general construction of indicators.

3140. Apparatus for Scraping and Cleaning Boots and Shoes, *J. H. B. Wigglesworth, Batley.—25th June*, 1883.—(*Not proceeded with.*) 2*d.*
The object is to provide an arrangement of scrapers and brushes in combination, so that the soles and other parts of boots and shoes may be cleansed and scraped simultaneously whilst on the feet of the wearer.

3142. Rolling Mills for Rolling Metal, *W. H. Ellis, Leeds.—25th June*, 1883. 6*d.*
Relates to the provision of a wedge-piece in the chock or block between the setting-down screw and the neck of the roll, such wedge-piece being securely held in place whilst the mill is in ordinary use, and capable of being withdrawn to release the rolls when a stall or stoppage occurs.

3144. Mounting and Lubricating the Spindles of Textile Fabrics, *J. Marsh, Ashton-under-Lyne.—25th June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates to improvements in the general arrangement of the spindles.

3145. Manufacture of Saddle-cloths, *H. H. Lake, London.—25th June*, 1883.—(*A communication from G. Hüttemann and C. Wackerow, Vienna.*) 4*d.*
Relates to a saddle-cloth made of horsehair, and consisting of two halves joined together and forming one single piece.

3147. Appliances for Supplying Charges for Refilling Cartridge Cases, *R. Morris, London.—25th June*, 1883. 2*d.*
Relates to the method and appliance for supplying portable measure charges for refilling cartridge cases.

3150. Preparation of Tannic Extracts, *J. H. Johnson, London.—26th June*, 1883.—(*A communication from E. L. P. and G. C. Coez, St. Denis, France.*) 4*d.*
Relates to the employment of alumina.

3159. Apparatus for Planing or Chamfering Metal Plates, *J. Imray, London.—26th June*, 1883.—(*A communication from E. Bouhey, Paris.*) 4*d.*
Consists in the use of a balanced tool-holder in combination with guides embracing the plate operated on.

3161. Appliances for Shoeing Horses to Prevent Speedy Cutting, *J. B. E. T. Lacombe, Chatillon-sur-Loing, France.—26th June*, 1883. 6*d.*
Relates to the employment of an elastic projecting pad secured to the shoe or the hoof between the shoe and the hoof.

3163. Compasses or Dividers and Callipers, *A. M. Clark, London.—26th June*, 1883.—(*A communication from W. H. Mitchell, Boston, U.S.*) 6*d.*
Relates to means for adjusting the legs.

3164. Manufacture of Paper with Relief Designs on the Surface, *A. O. A. Feret, C. L. V. Ladame, and A. H. Feret, Paris.—26th June*, 1883. 2*d.*
Relates partly to the method of staining or colouring the pulp before manufacture into paper, so that when the paper is made it is of one colour throughout.

3165. Attaching Rails to Metallic Sleepers, *R. H. Brandon, Paris.—26th June*, 1883.—(*A communication from E. Tölcke, Elberfeld, and C. Eichhorn, Julich, Germany.*) 8*d.*
Relates to the arrangement of clamps and wedges.

3166. Thread Winding Attachment for Sewing Machines, *H. J. Haddan, London.—26th June*, 1883.—(*A communication from A. Tabour-Moisson, Paris.*)—(*Not proceeded with.*) 2*d.*
The object is to automatically wind the thread on the bobbins intended for the shuttles of sewing machines.

3169. Manufacture of Matting or Similar Material for Covering Floors, *W. R. Lake, London.—26th June*, 1883.—(*A communication from J. Bray, Washington, U.S.*) 4*d.*
Relates to the manufacture of matting, &c., from paper.

3172. Machinery for Manufacturing Yarns, Threads, or Strands to be used in the Production of Fabrics to Imitate the Fur of Animals and for other Purposes, *W. R. Lake, London.—26th June*, 1883.—(*A communication from J. T. Waring, New York.*) 6*d.*
Relates to a process of producing napped or filled yarns and threads, which consists in depositing a nap or filling material between or upon two or more separate rovings, yarns, threads, or strands while they are moving together towards a spindle or twisting device, and then doubling and twisting the said threads or strands together to secure the nap or filling in the yarn.

3175. Steam Engines having Revolving Cylinders, *W. P. Thompson, Liverpool.—26th June*, 1883.—(*A communication from E. A. Corbin and G. W. Hunter, Philadelphia.*) 6*d.*
Relates partly to the combination of a plurality of cylinders and pistons, and driving shaft arranged at an angle with the engine and a universal joint for coupling the engine with the shaft, the object being to obtain direct action of the reciprocating pistons upon the shaft, and thereby dispense with cranks and pitmans. Other improvements are described.

3179. Tricycles, Bicycles, &c., *C. Harvey, jun., Yardley, and W. Paddock, Birmingham.—26th June*, 1883. 10*d.*
The object is to enable the rider on a tricycle, bicycle, or other velocipede, to drive it at different speeds at pleasure, and also to ungear the crank shaft from the driving wheels at pleasure, so that the vehicle may advance while the cranks are at rest.

3181. Holding and Adjusting Roller-blind Cords, *C. W. H. Brock, Bishops Waltham.—26th June*, 1883.—(*Not proceeded with.*) 2*d.*
Relates to the arrangement of a pulley and disc.

3221. Corkscrew or Cork Drawer, *R. W. Bradnock, Moseley.—29th June*, 1883. 6*d.*
Consists in the combination of two or more curved or helical pins or prongs, each pin or prong being so bent as to make about half a convolution.

3232. Boxes Made from Paper, Cardboard, &c., *H. J. Haddan, London.—29th June*, 1883.—(*A communication from A. Brehmer, Leipzig.*)—(*Complete.*) 4*d.*
Relates to the construction of a folding box made from one piece of cardboard or similar material.

3234 Gas Burners, and Chimneys for Use with the Same, *H. H. Lake, London.—29th June*, 1883.—(*A communication from A. B. Lipsey, West Hoboken, U.S.*) 6*d.*
The chief object is to produce a gas burner in which the gas will be very thoroughly heated before arriving at the point of combustion.

3241. Gas Burners, *H. H. Lake, London.—29th June*, 1883.—(*A communication from A. B. Lipsey, West Hoboken, U.S.*) 6*d.*
Relates to the construction of gas burners, wherein the gas and air which are supplied to support combustion are heated before arriving at the point where combustion takes place.

3250. Safety Saddle Bars, *H. Rees-Philipps, Birmingham.—30th June*, 1883. 6*d.*
Relates to the general arrangement of the parts.

3259. Arrangements and Combinations of Escape Water Valves for Steam Engine Cylinders, &c., *W. Carrington, Openshaw.—2nd July*. 1883.—(*Not proceeded with.*) 2*d.*
Relates to improvements in the general arrangement of the valves.

3303. Machinery for Stitching or Binding Books by means of Wire Staples, *H. J. Haddan, London. 3rd July*, 1883.—(*A communication from A. Brehmer, Leipzig.*)—(*Complete.*) 6*d.*
Relates to several improvements in the details of construction.

3375. Jointing Lead or Soft Metal Pipes and their Connections and Apparatus for that Purpose, *T. P. Wilson, London.—7th July*, 1883.—(*A communication from F. Coney, Antwerp.*) 4*d.*
Relates to a screwed ring and socket.

3573. Manufacturing Slabs, Blocks, &c., in Hydraulic Mosaic Marble, *L. A. Groth, London.—20th July*, 1883.—(*A communication from S. Paul, Bilbao.*) 6*d.*
Consists of small pieces of marble (or any other stone of whatsoever colour capable of being polished) and Portland cement and sand.

3380. Tricycles, *J. Cornforth, Birmingham.—5th July*, 1883. 6*d.*
The object is to facilitate the conversion of a sociable tricycle into a single tricycle.

3684. Iron Ships' Compasses and Binnacles, *B. Biggs, Cardiff.—27th July*, 1883. 6*d.*
The compass card is fitted in a tube of great depth, and the tube is supported by gimballs upon a tripod stand or other equivalent support from near the upper part so as to be suspended. The lower part of the tube is provided with one or more springs connected also with the supports, and in the interior a weight is arranged as a counterpoise, the weight being attached to rods.

3933. Treating Lead to Impart to it the Property of Adhering to and Amalgamating with other Metals, *P. M. Justice, London.—14th August*, 1883.—(*A communication from F. J. Clamer, Philadelphia.*) 4*d.*
This relates to the process of purifying lead, tin, zinc, and similar metals, and preparing them for metal coating and amalgamating with other metals, which consists in providing a molten bath of the metal and subjecting it to the action of sal ammoniac, arsenic, and phosphorus.

3939. Couplings for Railway Carriages, &c., *L. Anderson, Paris, U.S.—14th August*, 1883. 6*d.*
Relates to the general construction of automatic couplings.

4746. Apparatus for Raising Water from Wells having Water-bearing Strata of Different Hydrostatic Levels, *A. J. Boult, London.—5th October*, 1883.—(*A communication from J. B. Yeagley, Indianapolis, U.S.*)—(*Complete.*) 5*d.*
This relates to the general construction of the apparatus.

4804. Machinery for Making Nails, *H. J. Haddan, London.—9th October*, 1883.—(*A communication from A. F. Tenney, Rhode Island, U.S.*)—(*Complete.*) 6*d.*
Relates to improvements in the general construction of machines for manufacturing horseshoe nails.

4806. Pulverising Machines, *W. R. Lake, London.—9th October*, 1883.—(*A communication from R. D. Gates, Chicago.*)—(*Complete.*) 6*d.*
Relates partly to the arrangement of the rollers, and also to the arrangement of the parts.

4915. Carpet Cleaners, *A. J. Boult, London.—16th October*, 1883.—(*A communication from S. B. Ryder, Elizabeth, U.S.*)—(*Complete.*) 4*d.*
Relates to the construction of a journalled revolving cage, provided with rollers.

4916. Wood Turning Machines, *A. J. Boult, London.—16th October*, 1884.—(*A communication from E. Gerry, jun., and F. Hanson, Hollis, U.S.*)—(*Complete.*) 6*d.*
Relates to several improvements in the general construction and arrangement of the parts.

5028. Shoddy Pickers, *S. Pitt, Sutton.—23rd October*, 1883.—(*A communication from E. S. Dodge, Lowell, U.S.*)—(*Complete.*) 6*d.*
Consists in an improved form of pin or picker, which is to be secured in a suitable bag and mounted on the cylinder of a shoddy picker.

5049. Instrument for Setting Buttons upon Boots and Shoes, &c., *R. H. Brandon, Paris.—24th October*, 1883.—(*A communication from S. L. Pratt, Hingham, U.S.*)—(*Complete.*) 6*d.*
Relates to the general construction of the instrument.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

291,186. Hot Blast Stove, *Fred W. Gordon, Pittsburg, Pa.—Filed September 24th*, 1883.
Claim.—A multiflue regenerator for hot blast stoves, formed of closed-sided flues constructed of bricks of uniform size, each brick abutting with one end against

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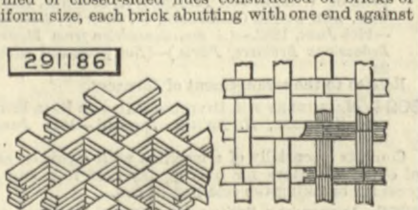

the end of another brick, and with its other end against the side joint of two similarly-abutting bricks, as shown and described.

291,353. Automatic Bilge Pump, *Jos. R. Jobin, St. Louis, No.—Filed March 12th*, 1883.
Claim.—(1) The combination, with a water craft, of the inclined projection or bustle on the outside of the side or bottom of the hull, and an aperture at the rear of the salient rear end of the bustle, extending from outside to inside of the hull and provided with an inwardly-closing valve. (2) The combination of metal bustle D, secured to the bottom of a water craft, with recess at the rear end of the bustle and orifice in the bottom of the craft in communication with said recess, the valve H, closing inwardly against its seat, to close the orifice against entering water. (3) The combination with the bottom of a water craft, of bustle D, orifice through the bottom in connection therewith, inwardly-closing valve H, and screw cap K, for the purpose set forth. (4) A bilge pump consisting of a lower plate E, having an orifice E^1, a cylindrical outer shell F, and radial wings G, an upper plate I, having an orifice J, a cylindrical inner shell beneath said upper plate, having suitable orifices L^1, and concentric with the outer shell, and a float valve within the inner shell and adapted to be supported by the wings, as set forth. (5) In combination with a bilge

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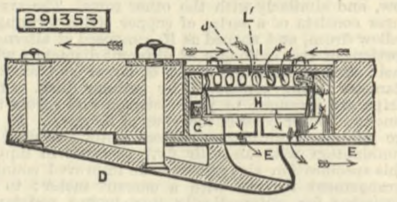

pump having lower plate E, and orifice E^1, the bustle D, gently inclined downwardly from its forward end to its rear end D^1, having cup D^2, open at rear and at top beneath the orifice of the plate, and corners D^3, to bear against the front edge of the plate, as set forth. (6) The combination of a suitable bustle to cause a vacuum, a lower plate E, formed with orifice E^1, a cylindrical shell F, surrounding the orifice, radial wings G between the orifice and shell, upper plate I, formed with orifice J, a cylindrical shell L, within the outer shell, having openings L^1, wings M between the shells, and a float H, to rest on the radial wings when in operation, as set forth.

291,406. Device for Protecting the Ends and Corners of Rolls of Paper in Shipment, *Herbert Sanger, Franklin, N.H.—Filed July 5th*, 1883.
Claim.—(1) The paper roll protector herein described, consisting of a circular disc or head, and a flanged binding strip formed of a series of connected metallic

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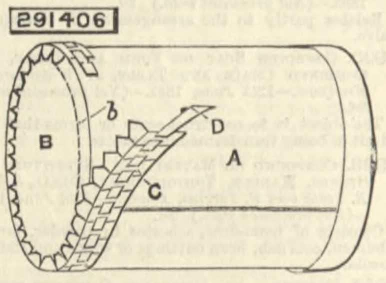

segments adapted to fit the sides of the roll and extend over its end to engage with the disc, for the purpose set forth. (2) The combination, with the roll A and slotted heads B *b*, of the series of segments C C, and the band D, provided with suitable fastening devices, for the purposes set forth.

CONTENTS.

"INK-PHOTO", SPRAGUE & CO. LONDON.

WATER TOWER, COLCHESTER.

MR CHARLES CLEGG, M.I.C.E. ENGINEER, COLCHESTER.