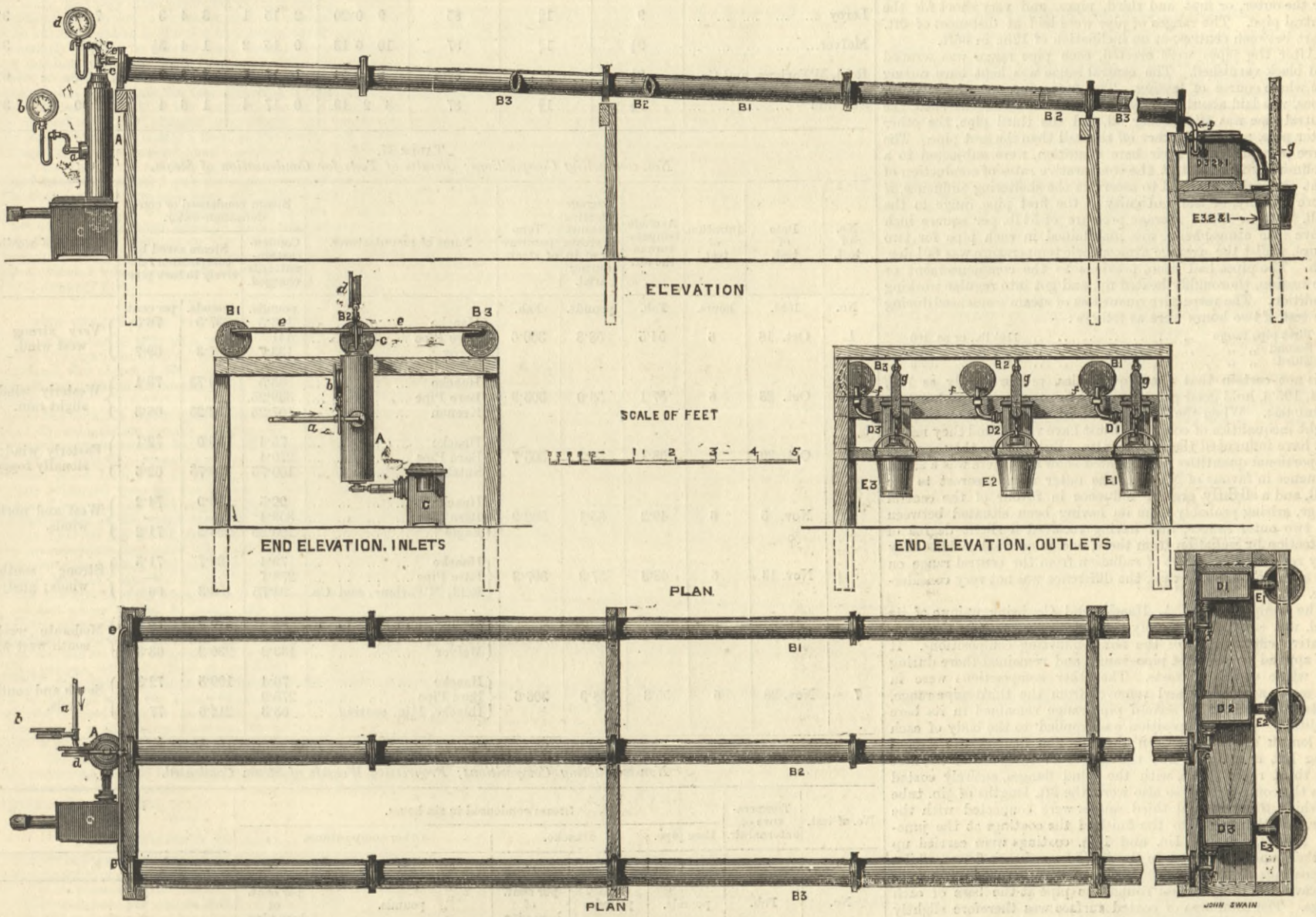
THE UNITED STATES CRUISERS.

OUR criticisms on the proposed United States cruisers still evoke comment in the pages of the American press. We have been accused of all manner of evil motives, we need hardly say, by one party, while others support us and take our side. Of course we have no animus in the matter whatever. In the matter of fleets, Great Britain could not possibly have anything to fear from the United States for years to come. Brother Jonathan has made up his mind that the star-spangled banner is not to wave over a fleet worthy its reputation; but certain cruisers are to be built, and it seems a great pity that these, like too many other American war ships, should be total failures; and we have spoken our minds freely, according to the light that is in us. So far, no one has said much in favour of the engines of the new boats; for while it is agreed that beam engines have done very well, no one seems to like these beam engines in particular. It is about the boilers that the greatest difference of opinion exists. On the rivers externally fired tubes are used, and with success. These are small in diameter, say 3ft., and from $\frac{1}{4}$in. to $\frac{5}{16}$in. thick. The Naval Advisory Board magnifies the dimensions and imagines that the results will not be altered. A correspondent of the *Mechanical Engineer* writes so much to the point that we quote some of his statements:—

> Within the past few weeks frequent criticisms have appeared upon the merits of the new steel cruisers now in course of construction for the United States Navy from plans and specifications prepared by the Naval Advisory Board, which may be capable of advising on other questions than naval construction and marine engineering, if we are to take the boilers and machinery of the Chicago as an example. This vessel is to have fourteen externally fired cylindrical boilers, 9ft. 10in. long, and 9ft. diameter, made of steel $\frac{5}{8}$in. thick, each being set on an independent brick furnace. The leading English mechanical paper, THE ENGINEER, says:—"To go to sea with such boilers is to simply court destruction," and we fully agree with its editor in this particular, for experience has shown in this country, as it would in all others if the experiment was tried, that to apply heat externally to the shell of a boiler over $\frac{1}{4}$in. in thickness is impracticable on account of the liability of the iron to blister and buckle. This can be seen by reference to many externally-fired boilers on Western river steamers in this country. Congress also has made recognition of the fact in the United States steamboat laws, by specifically providing that heat shall not be applied externally to any boiler, whether made of iron or steel, which is externally fired, of more than $\frac{2}{100}$in. in thickness. Yet in the face of this experience and requirement the Naval Advisory Board proposes to make the boilers of the Chicago $\frac{5}{8}$in. thick and apply heat to the outside of them, with an internal pressure of 100 lb. per square inch. This seems bad enough, but it is worse that in the construction the girth seams of these boilers will be $1\frac{1}{4}$in. thick, and exposed to the direct action of the heat of the furnace for a distance of half the circumference of the shell, say for 14ft., which will be equalled if not exceeded in intensity on the lap of the sheet at the back end of the furnace, where the crown sheet joins the back tube head. At this point the most intense heat will be continually acting directly on the two thicknesses of metal $1\frac{1}{4}$in. thick, and burn them out in a remarkably short space of time. The boilers of the Chicago, however, have not only to carry the proposed increased pressure of 100 lb., but resist all the known difficulties due and common to the inequalities of expansion, contraction, and bad mechanical execution of flanging, rivetting, &c. To make the boilers of the Chicago still less desirable they will have two direct rising currents of circulation on the sides of the shells, which will cause the water in them to be in a thorough state of agitation incessantly, thus ensuring complete entrainment of all the water thrown into the steam space—by the two rising currents from the lower portion of the shells—directly over the centre of the furnaces, which receive the most intense heat The effort to overcome the above difficulties by passing the saturated steam through the steam chimneys or superheaters might accomplish the desired result in a merchant steamer, but in naval vessels in action the use of these steam chimneys or superheaters must be dispensed with, on account of their position above the water-line, and consequent extreme liability to puncture by an enemy's shot or shell. It is extremely doubtful if it will be in the power of any engineer, however careful he might be, to work the engines of the Chicago at half-speed with the steam chimneys or superheaters shut off, for the engines would be literally flooded by entrained water from the boilers. High pressure of steam and boilers below the water-line are a necessity for the successful man-of-war, and the Naval Advisory Board have certainly not been guided by the light of the best practical experience attainable in the direction of marine engineering.

Although the editor of our contemporary gives this communication all the honours of large type, he appears to be quite unable to make up his own mind on the subject. In another page of the same issue as that from which we have already quoted, we find the following:—

> Universal interest is centred in the machinery of the new cruisers now building, and if the vessels are not a success, it certainly will not be for want of advice on their weak points. We made some remarks on the subject of these vessels last year, Nos. 11, 12, vol. vi., taking issue with our contemporary, the London ENGINEER, as to the fitness of the type of engine adopted. In support of our remarks, we instanced the Louisiana, of the Cromwell Line S.S., which vessel has had as hard service as a cruiser would have—except as regards her being shot full of holes. Her record is in all respects creditable and encouraging. Our contemporary, above mentioned, quotes our last article and says: "We had no thought of the Louisiana when we wrote. What we said was based on experience acquired in this country. We are quite content to let facts speak for themselves. If the Chicago is not a failure she will form a glorious exception to the rest of the experimental craft built in the United States. We would ask our contemporaries one question; we put it to them as sensible men—Is it not more likely that the engineers of this country, with their unparalleled experience in the construction of ships-of-war, should know what is and what is not right, than the members of a naval advisory board, who have had no experience whatever with such machinery and boilers as they propose to put into the Chicago? If they are right and we are wrong, then experience is worth nothing; and the merest tyro from the shops who can design an engine is as good as the man whose life experiences have taught him what it is and what it is not expedient to use at sea." We regret that we cannot answer our contemporary as, possibly, it would like to have us. It also embarrasses us by calling us sensible men, and disarms any criticism we might have to offer. All we can say is to repeat what we have already said.
>
> As regards the Naval Advisory Board, the London ENGINEER does not know the individuals composing it, or it would not have asserted that the members of it have never had any experience with the types they recommend. It is by reason of their experience that they have recommended them. Miers Coryell, Esq., is chiefly responsible for the beam engine and the brick furnace, *as he would build them*. In regard to his experience, he has had over forty years of it, actively engaged in the profession. Twenty odd years of this was as superintendent of one of the oldest marine engine shops in this city. Many years of it were in China, in charge of an English line of steamers. Mr. Coryell is very well known at the Messrs. Inglis, and to continental engineers with whom he has come in contact professionally. Probably no one man has ever had a more extended and generally successful career than Mr. Coryell, who, by the way, will not thank us in the least for these remarks. If the Chicago's machinery is a failure, it will be because his advice has not been followed as regards details. The other members of the Advisory Board we have not the pleasure of an acquaintance with. Mr. Alexander Henderson we know by reputation only, and he is a naval engineer of very wide experience and high standing. We hardly think that these gentlemen should be ranked with tyros from the shops. A man sixty years of age, who has buffetted the ocean in nearly every quarter of the globe, who has had the advantages of observation and actual experience that few have had, even in England, can scarcely be called a tyro. A personal acquaintance since the year 1850 entitles us to speak *ex cathedra* concerning at least one member of the Advisory Board. Our contemporary will not understand us as deriding the value of experience, or desiring to make odious comparisons. We believe it to be sincere, and devoid of any intent other than friendly service in its criticisms, for we have noticed that it is quite as zealous and outspoken in regard to engineering shortcomings in its own country.
>
> It will be seen that our contemporary fails to understand us. We did not mean to assert that the members of the Naval Advisory Board had not experience as engineers; but we did assert, and repeat, that neither they nor anyone else has had any experience with such engines and boilers as it is proposed to put into the Chicago. They are purely experimental, and if they succeed, then they will also be purely exceptional, and all the experience which has been acquired in this country must go for nothing. Why should experimental engines and boilers, condemned alike by English and American engineers, be put into the Chicago is a puzzle to us. It is also a puzzle to us how Mr. Coryell, who is to build the engines and boilers, is allowed to have a seat at the board at all, or, having a seat, why he should be allowed to supply the machinery in question. It is, to say the least, unusual for any member of such a Board to recommend the adoption, we shall not say of his own designs, but the giving of a large contract to himself or the firm to which he belongs. They manage some things, however, in the United States as they are managed nowhere else.



APPARATUS FOR TESTING NON-CONDUCTING COMPOSITIONS

NON-CONDUCTING COATINGS FOR STEAM PIPES.

As inventions for the conservation of heat, as well as for its production and application come within the scope of the tests of the National Smoke Abatement Institution, a series of practical trials have recently been carried out at the works of Messrs. Samuel Hodge and Sons, Millwall, to determine the efficiency of the chief non-conducting compositions now in general use. We append the report furnished to the Council by Mr. D. K. Clark, M. Inst. C.E., testing engineer to the Institution. It may be remarked that general improvement is shown in the compositions tested, and the maximum economy—*i.e.*, the saving on steam condensed in a bare pipe—is higher than in the case of any previous test made by the Institution.

Several non-conducting compositions, seven in number, were tested for efficiency as non-conductors on a system of steam pipes specially erected at the works of Messrs. S. Hodge and Sons, boiler-makers, Millwall. The place selected for the tests was under a large boiler-making shed, open on three sides, surrounded by walls, where the winds were free to circulate, giving rise to plunging draughts. Under these circumstances, the tests were really more severe and exhaustive than they would have been under the conditions usually ordered for such tests, although they were subject to the disadvantage of the varying states of weather that prevailed during the tests, which extended over six weeks. In order to compensate for such varying conditions, one of the compositions was selected for comparison with each of the six others, and for this purpose it was tested on each day of trial at the same time with one of the others, not necessarily as a standard, but as a datum for direct comparison, where, in each case, the surrounding conditions were identical.

The following are the manufacturers, named alphabetically, whose compositions were tested:—The Eagle Non-conducting Cement Company, Canning Town: The composition consists for

the most part of clay. A. Haacke and Co., London: W. Berkefeld's fossil meal composition, consisting of the fossil shells of diatomacea, ground and mixed with fibre and mucilaginous extract of several vegetable matters. Matthew Keenan, North Bow: Keenan's papier mâché, containing ends of hemp rope, hair, charcoal, tar, and clay. F. Leroy and Co., London: Non-conducting composition, similar to Keenan's composition. Robert McIvor, Birkenhead: Adhesive fibrous non-conducting composition, chiefly of clay. Reid, M'Farlane, and Co., Glasgow: Non-conducting incombustible composition, containing clay and hemp refuse. Sutcliffe Brothers, Manchester: Telluric cement, containing flour, rope ends, hemp refuse, and clay.

The testing apparatus consisted of three parallel lines of cast iron pipes laid on a slope, to each of which steam of the same pressure was supplied, and which were fitted with Lancaster traps at the lower ends, one trap to each pipe, and a pail to each trap for collecting the condensation water discharged from the trap. Each pail was hung from a spring balance, which had been carefully tested, by means of which, deducting the tare, the weight of condensation water collected from each pipe at any time could be ascertained. Steam was supplied from a boiler in an adjacent boiler house by one pipe, which was laid to the upper end of the central pipe, and from which branch junctions were made with the outer pipes. The steam was passed through one of Dr. Moëller's steam filters, from which it was delivered in a dry condition to each pipe. The pipes were 5in. in diameter and $\frac{5}{16}$in thick. Each range of pipe consisted of six 6ft. lengths of flanged pipes bolted together, with asbestos joints, making a total length of 36ft. each. The flanges were 10$\frac{1}{2}$in. in diameter and $\frac{5}{8}$in. thick. The ends of each range were closed, each with a blank flange 1in. in thickness. Steam was conducted into each pipe by a $\frac{1}{2}$in. wrought iron tube, 3ft. long for the outer, or first and third, pipes, and very short for the central pipe. The ranges of pipe were laid at distances of 3ft. apart between centres, at an inclination of 12in. in 36ft.

After the pipes were erected, each pipe range was scraped and black varnished. The central range was kept bare during the whole course of testing. The first pipe, one of the outer pipes, was laid about 2ft. distant from a wall of the shed, the central pipe was 3ft. further off, and the third pipe, the other outer pipe, was 6ft. further off the wall than the first pipe. The three pipe ranges, in their bare condition, were subjected to a preliminary trial, to test the comparative rates of conduction of heat through them, and to ascertain the sheltering influence, if there was any, of the contiguity of the first pipe range to the wall. Steam of the average pressure of 54 lb. per square inch above the atmosphere was maintained in each pipe for two hours, whilst the average atmospheric temperature was 60$\frac{1}{4}$ deg. Fah. The pipes had been, previous to the commencement of the testing, thoroughly heated up, and got into regular working condition. The respective quantities of steam condensed during the test of two hours were as follows:—

First pipe range	110$\frac{1}{2}$ lb., or as	100
Second ,, ,,	108$\frac{3}{4}$,,	98·4
Third ,, ,,	116$\frac{3}{4}$,,	105·6

It is not certain that these quantities, proportionally as 100, 98·4, 105·6, hold good proportionally for the case of each subsequent test. When the first and third pipes were coated, the slight inequalities of condition must have varied, and they might not have influenced the final results. But, such as they are, the proportional quantities above stated show that there was a slight influence in favour of No. 1, or the outer range nearest to the wall, and a slightly greater influence in favour of the central range, arising probably from its having been situated between the two outer ranges, and having received a slight degree of protection by radiation from these, one on each side, whilst they only received the benefit of radiation from the central range on one side each. In any case, the difference was not very considerable.

The composition of A. Haacke and Co. being unique of its kind, was selected to supply the datum for gauging the comparative effectiveness of the non-conducting compositions. It was applied to the first pipe range, and remained there during the whole course of tests. The other compositions were in succession applied to and removed from the third pipe range, whilst the central or second pipe range remained in its bare condition. Each composition was applied to the body of each 6ft. length of pipe, between the junction flanges, the flanges being left uncovered; but the flanges at the ends of the first and third ranges were, with the blind flanges, entirely coated with the composition; so also were the 3ft. lengths of $\frac{1}{2}$in. tube by which the first and third ranges were connected with the filter. With respect to the finish of the coatings at the junction flanges, Haacke's 1in. and 1$\frac{1}{2}$in. coatings were carried up for their whole thickness to the outer face of each flange, whilst the coatings of the other compositions were bevelled down so as to leave 1in. of thickness round the pipe at the base of each flange. The total area of coated surface was therefore slightly greater on the third range, when covered with Haacke's composition 1$\frac{1}{2}$in. thick, than for other compositions, whilst the area of uncovered flange surface was slightly less. The sums of the covered and uncovered superfices of the first and third ranges were equal, whilst each of these was slightly greater than the superfices of the central range by as much as the surface of the $\frac{1}{2}$in. connecting pipe. With these explanations the following summaries of superfices of pipe for each range are intelligible:—

Pipe surface.	First range. Haacke 1in. coating.	Third range. Haacke 1$\frac{1}{2}$in. coating.	Third range. Other compositions.	Sec. range. Bare.
	sq. ft.	sq. ft.	sq. ft.	sq. ft.
Covered area	57·92	58·82	57·92	—
Uncovered area ..	4·17	3·27	4·17	61·50
	62·09	62·09	62·09	61·50

Table 1 contains particulars of the dimensions, weight, and invoice cost of each composition as applied for the purpose of the test. The cost is that of the composition alone, exclusive of, as well as inclusive of, the cost of the casks in which the materials were delivered, and exclusive of charges for transport, dressing, finishing, or labour. These costs for material represent proportionally the comparative costs of the several compositions. The exceptionally small weight of Haacke and Co.'s composition is due to the fact that the material is sold in the dry state in bags, whereas the other compositions are sold ready mixed with water in casks for immediate application; and this composition, being supplied in inexpensive bags, there is no additional cost for packing.

Each day's test lasted for six hours. All the ranges of pipes were got into regular working order under steam before the test was held to commence. The pails were filled and emptied in due course, and the weights noted as indicated by the spring balances. The pressure of steam delivered from the filter was also noted at intervals of ten minutes or fifteen minutes.

In Table 2 are given the results of the observations of the quantity of steam condensed, the steam pressure, and the external atmospheric temperature.

The variation in the quantity of condensed steam produced ranges widely. For the bare pipe the quantity for six hours ranges from 270·4 lb. to 441 lb. in the ratio of 3 to 5. Correspondingly, for Haacke's composition the quantity in six hours ranges from 75·4 lb. to 103·5 lb. in the ratio of 2 to 3 nearly. To place this correspondence clearly, the weights of steam condensed, or condensation water, are arranged according to the order of progression for the bare pipe in Table 3 following.

The variations in the quantities of steam condensed, here exhibited, were caused, no doubt chiefly, if not entirely, by the varying winds. The variations of atmospheric temperature, column 2, are evidently not sufficient to have caused those variations. It is shown—columns 3 and 4—that there is a regular correspondence throughout between the condensations in the bare pipe and the pipe covered with the same material.

In the order of efficiency for preventing condensation of steam, the compositions stand as follows:—

	Condensation.
A. Haacke and Co. (1$\frac{1}{2}$in. covering) ..	23·0 per cent. of bare pipe.
Ditto (1in. covering)	26·7 ,, ,,
Eagle Non-Conducting Cement Company	28·8 ,, ,,
F. Leroy and Co.	31·0 ,, ,,
Matthew Keenan	31·7 ,, ,,
Reid, M'Farlane and Co.	34·0 ,, ,,
Robert McIvor	36·7 ,, ,,
Sutcliffe Brothers	37·4 ,, ,,

D. K. CLARK, M. Inst. C.E.,
Testing Engineer.

The National Smoke Abatement Institution,
44, Berners-street, London, January 15th, 1884.

TABLE I.
Non-conducting Compositions; Weight and Cost of Material, exclusive of Transport and Labour.

Manufacturer.	External diameter of covering when dry.	Thickness of covering when dry.	Superfices of covering when dry.	Material applied. Weight, excluding casks.	Cost of material, exclusive of casks.	Cost of material, inclusive of casks.	Cost per superficial foot of covering. Exclusive of casks.	Inclusive of casks.
	inches.	inches.	sq. feet.	cwt. qr. lb.	£ s. d.	£ s. d.	pence.	pence.
Eagle Company	9$\frac{1}{2}$	1$\frac{7}{8}$	90	10 3 26	1 18 0	2 11 6	5·07	6·87
Haacke	7$\frac{3}{8}$	1$\frac{5}{16}$	72	1 1 22	1 16 2	1 16 2	6·03	6·03
Do.	8$\frac{3}{4}$	1$\frac{1}{2}$	83	2 1 7	2 17 10	2 17 10	8·36	8·36
Keenan	9$\frac{3}{8}$	1$\frac{13}{16}$	88	8 3 5	2 12 9	3 1 4	7·20	8·36
Leroy	9	1$\frac{5}{8}$	85	9 0 20	2 15 1	3 4 3	7·77	9·07
McIvor...	9$\frac{1}{4}$	1$\frac{3}{4}$	87	10 0 13	0 15 2	1 4 3$\frac{1}{2}$	2·09	3·35
Reid, M'Farlane, and Co...	9$\frac{1}{8}$	1$\frac{11}{16}$	86·4	9 3 24	1 17 6	2 8 2	5·21	6·69
Sutcliffe	9$\frac{1}{4}$	1$\frac{3}{4}$	87	8 2 19	0 17 4	1 6 4	2·40	3·63

TABLE II.
Non-conducting Compositions; Results of Tests for Condensation of Steam.

No. of test.	Date of test.	Duration of test.	Average temperature of the air.	Average effective pressure of steam per sq. in. during trial.	Temperature of steam.	Name of manufacturer.	Steam condensed or condensation-water. Condensation-water discharged.	Steam saved by composition relatively to bare pipe.		State of weather.
No.	1883.	hours.	Fah.	pounds.	Fah.		pounds.	pounds.	per cent.	
1	Oct. 18	6	54·5	58·8	306·6	Haacke	103·5	337·5	76·5	Very strong south-west wind.
						Bare Pipe	441	—	—	
						Leroy	133·7	307·3	69·7	
2	Oct. 23	6	57·1	56·0	303·9	Haacke	88·5	250·75	73·1	Westerly wind, with slight rain.
						Bare Pipe	339·25	—	—	
						Keenan	107·25	232·25	68·3	
3	Oct. 29	6	58·1	58·3	305·7	Haacke	75·4	195·0	72·1	Easterly wind; occasionally foggy.
						Bare Pipe	270·4	—	—	
						Sutcliffe	100·75	169·75	62·6	
4	Nov. 5	6	49·2	55·1	302·9	Haacke	92·5	266·9	74·2	West and north-west winds.
						Bare Pipe	359·4	—	—	
						Eagle	103·25	256·2	71·2	
5	Nov. 13	6	43·8	57·3	307·3	Haacke	79·4	198·7	71·5	Strong south-west winds; gusty.
						Bare Pipe	278·1	—	—	
						Reid, M'Farlane, and Co.	94·75	183·3	66	
6	Nov. 20	6	48·4	52·8	300·9	Haacke	97·5	265·9	73·2	Moderate west and south-west winds.
						Bare Pipe	363·4	—	—	
						McIvor	133·2	230·2	63·3	
7	Nov. 28	6	55·3	58·9	306·6	Haacke	76·4	199·5	72·3	South and south-west winds.
						Bare Pipe	275·9	—	—	
						Haacke, 1$\frac{1}{2}$in. coating ...	63·3	212·6	77	

TABLE III.
Non-conducting Compositions; Progressive Weights of Steam Condensed.

No. of test.	Temperature of external air.	Steam condensed in six hours. Bare pipe.	Haacke.		Other compositions.		Weather.
1.	2.	3.	4.	5.	6.	7.	8.
No.	Fah.	pounds.	pounds.	per cent. of bare pipe.	pounds.	per cent. of bare pipe.	
3	58·1	270·4	75·4	27·9	Sutcliffe, 100·75	37·4	East winds; foggy.
7	55·3	275·9	76·4	27·7	Haacke (1$\frac{1}{2}$in.), 63·3	23·0	S. and S.W. winds.
5	43·8	278·1	79·4	28·5	Reid, 94·75	34·0	Strong S.W. wind.
2	57·1	339·2	88·5	26·9	Keenan, 107·25	31·7	W. wind: slight rain.
4	49·2	359·4	92·5	25·8	Eagle, 103·25	28·8	W. and N.W. winds.
6	48·4	363·4	97·5	26·8	McIvor, 133·2	36·7	Moderate W. and S.W. winds.
1	54·5	441	103·5	23·5	Leroy, 133·7	31·0	Very strong S.W. winds.
Averages		332·5	87·6	26·3	*128·0	34·7	

* Not including Haacke.

LETTERS TO THE EDITOR.

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

RAILWAY RATES.

SIR,—Your article on railway rates, at page 55, refers to a most important subject, and as I have in former times dealt with it, I venture to offer a few remarks.

You observe that a train between London and Liverpool at a 10s. fare might produce £750, and that the profits would be enormous. You go on to say, "Whether it would be possible to fill such a train regularly day by day we have not sufficient data to say." This is one practical point in the investigation, for there is too good reason to believe that sufficient data are not available. To obtain such data the statistics must be worked out for every train, as in France, by a distinct department, the cost of which would be very small. In France they do this, as described by me some thirty years ago; and although since then the statistical work on English railways is better, it is evidently not effective. One cause why railways pay so well in France is to be found in this statistical working, which shows on what days and at what hours a train pays in passengers and goods between particular points, and when it does not.

Without going widely into the discussion, or covering your ground, it may be suggested that such arguments as those presented by you do not commend themselves to railway managers. The schools in which they are trained are the booking office and the parcels office, and in those schools some very good managers are trained who conduct their traffic on the established lines with efficiency and ability, so far as getting the trains in and out of the station is concerned. When it comes to dealing with leading problems in political economy or commercial science, on which railway rates depend for their determination in general, or in particular cases, the booking office and the goods yard have not provided them with a solution or modes of argument. Indeed railway managers have no more training for this purpose than railway directors; though anybody thinks he is competent to draw the pay of a railway manager.

The probability is that railway management now is on a lower footing in this respect than it was forty years ago, when railway administration was worked into shape. The men who so worked it into shape were taken from the outside, from merchants and men of business, some of whom possessed wide experience and much administrative capacity. Now, in the nature of things, each company promotes its own men, and very few direct appointments are made, unless occasionally of a secretary or resident engineer.

One of the best practical comments on what has been going on is

suggested by the late proposal to recognise the services of a very able man, Mr. Allport, in promoting third-class traffic on the Midland. Considering that the result was successful, and that Mr. Allport did not adopt it when before his notice for many years, but at the end of time made an experiment upon it, it is very difficult to arrive at the conclusion that this leading administrator can have had any determinate ideas on the subject. As to his brethren, they waited for him to risk the experiment, when, on the principles that you have expounded, there was very little of an experiment in the matter.

Unless the railway companies do bestir themselves, they will, by their neglect, give another help to the cause of State control. As you show, the industrial interests of the country are so materially concerned that we cannot wait much longer for the exertion of railway volition. The Governments of Europe are directing the railways as industrial machines to facilitate transport, and to reduce its cost—one great element of the price of commodities—and already our people are subjected to a most severe competition. In the United States legislative action has been brought to bear on the railways, so as to reduce the freights of agricultural produce and manufactures far below what our managers tell us are the only possible standards. HYDE CLARKE.

32, St. George's-square, S.W.,
January 19th.

SIR,—It is high time the attention of the railway companies was directed to railway rates as applied to second-hand machinery. There has existed an anomaly in the matter too long already. Is there any sense in having to pay 18s. 4d. per ton for second-hand machinery from Manchester to Bradford—besides being obliged to consign it at owner's risk—while makers can send new at the same prices at company's risk? If I buy a loom, say, at Manchester or vicinity, at 30s.—or thereabouts—and bring it to Bradford, it will cost me 12s. carriage, and in many cases it will have to go all or part of the way back again when sold, costing another 6s. to 12s. It is more expense than a loom will carry, and very often precludes us from buying. Iron of all descriptions is very low at present, and of necessity will not carry much expense, either in the raw or manufactured state, and this particularly applies to second-hand manufactured, because when new machinery is cheap there is a great difficulty in selling second-hand at any price. I scarcely ever dare buy machinery if above twelve miles from home, for fear of having to encounter the railway companies. I think if the companies paid due regard to the value of machinery, and charged accordingly, they would find it to their own interest and confer a boon on the trade. Of course they will say that a ton of second-hand machinery is as heavy as a ton of new, but they must not lose sight of the differences on the risk, as, as I have said before, I pay the same carriage on a loom worth 30s. that a maker pays on a loom worth £9, besides the disadvantage of being forced to consign at owner's risk. I shall be glad if you will give the above space in your valuable paper, and should be glad to have opinions on the subject. I notice a very able article in "Phillips's Monthly Register" for January last on this subject, which I would advise any one interested to peruse.

Bradford, January 21st. JOSEPH BENTLEY.

THE CREATORS OF THE AGE OF STEEL.

SIR,—The above is the title of a volume by Mr. W. T. Jeans published at Chapman and Hall's, London, price 7s. 6d. As far as I am concerned, the object of Mr. Jeans appears to have been to show that, if not quite an impostor, I am merely an inventor at second-hand.

Mr. Jeans has done his best to prove that I am not the original inventor of the spiegeleisen process, by means of which I rendered the Bessemer process a success, but that Mr. Bessemer was that inventor. Now, I ask Mr. Jeans why the president and Council of the Iron and Steel Institute, at their meeting in March, 1876, unanimously conferred upon me the Bessemer gold medal for that year, because I was the sole and original inventor of the spiegeleisen process, whilst at the same meeting Mr. Bessemer declared that I richly deserved the medal, and that beyond a shadow of a doubt my invention supplemented his great invention. Well, the rudder supplements a ship, and our legs supplement our bodies. "Mr. Robert Mushet," says Mr. Jeans, "never ceased to proclaim that he was the first to apply manganese to Bessemer steel." Mr. Robert Mushet never needed to make any such proclamation. On 22nd September, 1856, I took out a patent—No. 2219—of that year for adding to melted cast iron, decarbonised by blowing air through it, a triple metallic compound of iron, carbon, and manganese. This process, which has been in universal use ever since at all Bessemer steelworks, and cannot be dispensed with, is not even so much as alluded to in Sir Henry Bessemer's patents. I am, therefore, the original inventor, and as much one of the creators of the age of steel as Sir Henry Bessemer, Sir William Siemens, or Sir Joseph Whitworth. With cool contempt, Mr. Jeans terms my invention "the manganese incident." He says very little about me or my process at all, and in that little betrays his own ignorance of the subject he treats of. R. T. MUSHET.

Cheltenham, January 24th.

THE EFFICIENCY OF FANS.

SIR,—In your impression of last week your correspondent "G.T.H." has published a table of comparisons of rotary fans. He has brought forward what he pleases to call the Blackman air propeller to discharge at 600 revolutions per minute 38,000 cubic feet of air; he also gives the weight and capacity of fans by several well-known makers, who construct fans for giving blast up to 10in. and even 30in. of water pressure through a restricted area of pipe, say 2ft. in diameter or less. Will "G. T. H." inform me in your next what pressure his Blackman air propeller will give, restricting the volume to 2ft. diameter? Also the pressure he can give through a 1ft. diameter pipe; if he cannot do so it is unfair for such fans to enter the arena of discussion in your paper. None of the makers referred to by "G. T. H." would even think of making such fans to discharge through 4ft. pipes; they would have recourse to the windmill fans, such as the Blackman air propeller. The Patent-office holds a great diversity of patents for this class of windmill fans, long before any American brought them into this country. I myself have taken such fans down as unfitted for the purpose for which they were intended eleven years ago. If such fans are to be classed with the Root blowers, all our ventilating engineers in London may discuss theirs as Verity, Boyles, &c., and your readers will not learn much from such an unreasonable and ridiculous comparison. I question if the Blackman air propeller will give 1in. of water pressure at 600 unless it blows upwards hot air. The proper way to try it then would be to see by the anemometer what amount of air would ascend with the fan at rest, and take off from the 38,000 what ascends without being forced by the fan. At 600 revolutions the periphery travels at about 7500ft. per minute, while at 2ft., 3750, consequently a far higher blast than 1in. of water must be attained on the delivery orifice in some parts of it to obtain an average all over 12½ square feet area. I have seen this week a 4ft. fan discharging air at the works of Haland and Son, at 46, Commercial-road, Lambeth, as follows:—Revolutions 285, cubic feet of air per minute, 35,000. I have been informed that experiments have been carried on with this patent fan for many months with both a 3ft. and 4ft. fan, solely for the purpose of ventilation. It is a fan constructed in obedience to the laws which govern the limits of the powers of rotary fans, and can no doubt be inspected by appointment at the above works. C. P. HENDY, Engineer.

Cook's-yard, Nelson-street, Commercial-road, E.
January 10th.

SPRING-CARRIED TRACTION ENGINES.

SIR,—I observe in your article in THE ENGINEER of the 4th. instant, on the prospects of the New Year, that referring to traction engines, you state that a great number of spring wheels and systems of springs have been brought out, "and the inventors or manufacturers have invariably stated that the problem was solved, and as invariably they have given up building engines so fitted within a very few months." You also state that "the spring-carried traction engine has yet to be produced, unless Messrs. McLaren of Leeds have solved the problem." Allow me to state that this company exhibited a spring-carried traction engine at the Royal Agricultural Society's Show at Derby, of which you have in your issue of July 15th, 1881, a note and a sketch, taken by your artist on the ground, of the side plates for carrying the shafts and axle. What this company then said has been fully borne out by the constant working of the engine ever since without any repairs whatever having been required, and the springs and mountings are acting as well to-day as they did when first sent out. The party who bought it is highly pleased with it, and told me only lately that there was not another equal to it in his neighbourhood, except ———, alluding to a similar one of our make sold into the district last season. This must, therefore be an exception to the rule you mention of inventors and manufacturers giving up making such engines "within a very few months." On the contrary, this company has now engines on this principle in progress in its works here. As regards the other remark in your paper to which I make objection, and relying on your general statement as being correct, if you consider the evidence now given conclusive, I think I may claim that this company was the first manufacturer of successful spring-mounted traction engines; the joint inventors of the separate side frames and spring mountings being Mr. R. Nicholson and myself. I may also mention that this company obtained a medal, the only prize awarded for this class of engine at the Northumberland Agricultural Society's Show at Berwick in August last. WM. HEWISON, Secretary.

Durham and North Yorkshire Steam Cultivation
Company, Limited, January 9th.

DOUBLE RUDDERS.

SIR,—Your number dated Jan. 4th, 1884—the last edition—gives an account of a "torpedo boat rudder," a suggestion of a Mr. Charles Folkert, Nicolaieff, South Russia; his letter is dated 18th August, 1883. A drawing accompanies the description. To all intents and purposes it is identical with my own invention, which I call "double rudders for steering and checking, or water brake," which, from its having been very frequently exhibited, is not unknown; and its familiarity to the public has also been brought about by descriptions of it in many papers. It was exhibited at the Naval Engineering Exhibition, Agricultural Hall, at the Tynemouth Exhibition, the Falmouth Exhibition, the Fisheries Exhibition, South Kensington; it has been shown at Lloyd's, the Institution of Civil Engineers, the Society of Arts. Anybody caring to see it now can do so any day at the United Service Museum, Whitehall, where a model is placed.

I enclose you a copy of my specifications. I hold the American, French, and Belgian patents, as well as the English patents, and I shall be very much obliged to you if you will kindly permit this letter to have a place in your well-known journal.

T. B. HEATHORN.

10, Wilton-place, S.W., January 14th.

BRIGHTON BEACH.

SIR,—In your issue of the 4th. inst. you remark regarding Brighton: "During the year we have several times commented upon the Brighton beach and the groynes erected to prevent the loss of foreshore. The result of the work there carried out indicates the necessity for a different form of groyne; and here, as in a good many places, there is no doubt that a form of open-work groyne would be much more successful. In many places it is useless to try to stop the sea. To break it up and take the velocity out of the water, and so dissipate its energy, is what is wanted, so that the back-wash may have but small velocity." And you have previously entered into the controversy as to the question of whether the destruction wrought by the sea there was due to current power or wave power. I have pointed out that it was the latter.

Permit me to add a few words of protest against the continuance, at great cost to ratepayers, of the stereotyped plan which has so incessantly proved useless. That it is wave, and not current power, that we have to fear is surely manifest when we remember that a ten mile current is an exceptionally rapid one, whereas waves frequently overtake and flood a vessel going more than that rate before a storm, and "storm waves," *i.e.*, waves indicating the approach of a storm, often reach places where all is calm many hours before the storm itself, and must have travelled at a rate more approaching fifty miles an hour. Iquique, Masulipatam, and a large tract of country between Calcutta and the mouth of the Hooghly were each of them nearly depopulated by a single wave. Besides this powerful forward momentum, there is also the back-wash, which sometimes does the most injury, as at Brighton and elsewhere. The simplest, most economical, and most scientific way to deal with this force is not to oppose, but utilise it. Divide the wave into portions, and turn those portions against each other.

376, Strand, January 14th. E. C. GREENWAY THOMAS.

THE LOAD LINE IN MERCHANT STEAMERS.

SIR,—Whereas in all ships the metacentre is a point above which the centre of gravity of all the weights must not be carried, to ensure stability—in the initial state—and under the condition of their being inclined or forced over, by any force or power acting upon them; and whereas the centre of internal volume of holds is the centre of lading, and with homogeneous cargoes filling the holds, the centre of gravity of the cargo. In some ships this centre of lading or volume of internal capacity is above the position or height of the metacentre, and consequently with homogeneous cargoes filling the holds, the centre of gravity of the cargo is above the position or height of the metacentre. These vessels when so laden are unstable, and liable to capsize upon any force or power acting upon them.

Now to obviate this tendency and liability of vessels to capsize by the centre of lading or volume of internal capacity being above the position or height of the metacentre, and consequently the centre of gravity of homogeneous cargoes being above the position or height of the metacentre, it is possible to so construct and proportion vessels that the centre of internal capacity or volume of holds shall be always below the position or height of the metacentre at any different or variable draught of water, so that with homogeneous cargoes, or cargoes of variable nature, the centre of gravity of the cargo and centre of lading shall be always below the position or height of the metacentre at any draught of water, thus rendering it impossible to endanger the stability of the vessel by overloading.

Centre of lading or internal capacity of holds to be below the position or height of the metacentre at any draught of water.

Old Charlton, January, 1884. JOHN J. F. ANDREWS, N.A.

LEAD PIPES.

SIR,—As you have been good enough to mention my name in your article on the above subject in THE ENGINEER of Jan. 18th, relative to my letter appearing on Dec. 7th, I trust you will allow me to add a few further remarks on the subject.

You say that I "seem to be under the impression that air cannot act as a cushion, and yet act as pressure conveying medium;" for this I am most sorry, and in reply would ask, "What is it that compresses the air which possesses this immense faculty for bursting pipes?" Is it not the expansion of part of the water in the pipe during the act of freezing? If this is so—and what reasonable creature will deny it?—then obviously the water in the pipe which compresses the air must of necessity be under the same pressure as the air collected in the pipe. This being so, why, I ask, must the pipe yield to the air pressure more than to the water, and are not you, Sir, forgetful, for the moment, of the fundamental law of action and re-action?

Further, is it not contrary to, at once, all theory and experience to suppose, in support of an argument, that the last part of the water in a pipe to freeze would be the top? Will it not be the warmest place? and there will the burst occur.

Again, may I ask what is the proportion of air in a pipe which will cause the greatest likelihood of its bursting? One might infer from your remarks that the more air present the more absolute certainty would there be of that calamity; but this you will at once allow to be a *reductio ad absurdum*.

It would be wasting both time and your valuable space to prove by figures that a pipe absolutely filled with water is far more likely to burst from frost than one which is provided with an air space into which the increased bulk can force its way. To any one with a rudimentary knowledge of the subject the case must be too clear to make any such proof necessary.

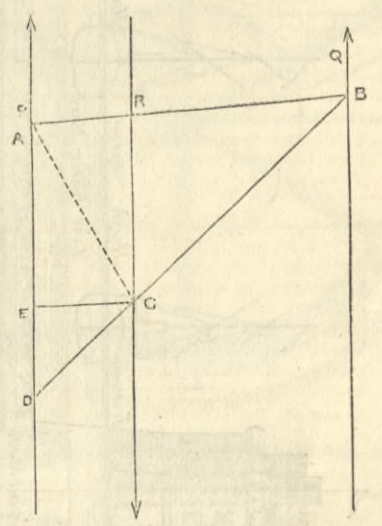
In conclusion, I can only express my gladness that your original theory is capable of such material modification; and I venture to hope that on further consideration you will be able to abandon the air theory of burst pipes altogether. F. W. STOKES.

13, Holland-street, Kensington, January 22nd.

[We publish this letter for the reason assigned for writing it. If Mr. Stokes reads the article which he essays to criticise he will find that his second paragraph asks questions already therein answered. His third paragraph states as a question what is not true, and ends by repeating part of the article referred to. His fourth paragraph shows want of understanding, as it admits an inference which probably none but himself has made, none could gather that the air mentioned in the article was other than the small quantity liberated from the water. His fifth paragraph suggests a proof which no one but himself imagines to be necessary as the converse has never been stated, and his last is in keeping with the whole and does not offend with too much modesty.—ED. E.]

IMPROVEMENTS IN GRAPHIC STATICS.

SIR,—Graphic statics has no doubt interested many of your readers, if only as a recreation; but to the "practical man" it is certainly a subject of importance, as by its means a solution of many complicated problems can be so easily and elegantly obtained. It is to such that graphic statics is so useful, and to those requiring a check on formulated results. Any mode, then, by which the working of even the more minute problems may be facilitated, provided that such mode is correct and not liable to confusion, will, I hope, be acceptable. It is to this end that I venture to introduce the following simple improvement in one of the problems so often recurring, *i.e.*, the finding the resultant in a general case of two given parallel forces; or to compound one force into two others, the position of which are given parallel to the original. Taking the first case, let P and Q in the figure be the given forces, the resultant of which is required. Without reminding the reader of the ordinary way of proceeding, I will simply describe the treatment I would suggest. Along the direction of P lay off to a convenient scale, A E = P, and from E, E D = Q; then from A draw A B in any direction crossing the line of action of Q at B; join B and D; and from E draw C E parallel to A B, cutting B D in C. Then through C draw the line R parallel to the directions of P and Q. The line R gives the position of the resultant, the magnitude of which is P + Q. Again, in the second case, when the force R is given and the values of the two forces P and Q are to be found, proceed as follows: Along the direction of P scale off A D = R, and from the ends A and D, join to any point B on the line of action of Q, and where B D cuts the



line of R draw a line parallel to A B; this will divide the length A D, representing R, into two segments A E and E D. These segments will represent to scale the amount of the required forces, P in this case being equal to A E, and Q equal to E D. If there is any doubt as to which segment of R should be taken to give either P or Q, it will be noticed that the two lines meeting on the line of the central force always include the segment applying to the force, on the line of which the parallel of one and the production of the other intersect. The proof of this solution is obviously only a matter of proportion; or by drawing the line A C its connection with the old solution is made evident, and will, therefore, at once be admitted.

The advantage of the above method will be understood when the number of lines required, and how many of them have to be drawn parallel to others, is known. Usually the problem requires seven lines in its solution, not counting the lines of action, out of which number four have to be drawn parallel, or at some constant angle, to four other lines. In the mode here suggested three lines have to be drawn—supposing, as before, that the lines of action are not included—of which only one has to be drawn parallel to another. This is a great advantage, for not only are more than half the lines saved, but three-quarters of the time of adjusting the set squares is also gained. I will not occupy your valuable space by showing its application to beams or cantilevers, which will be sufficiently clear, but leave the above for the consideration of your readers, as being a small step in the direction of making the employment of graphic statics not only more useful but also more advantageous.

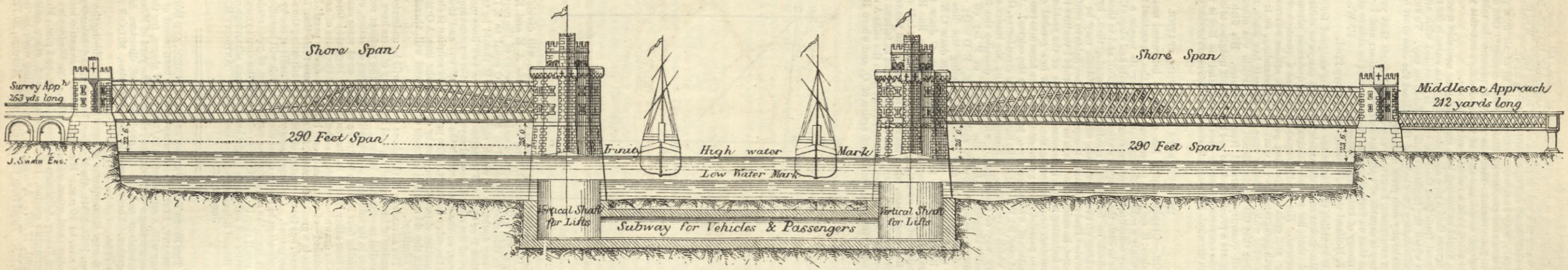
Bristol School of Science and Art, ANTHONY R. F. TREW.
January 22nd.

THE RIVER TYNE DRY DOCKS, ENGINEERING, AND BOILER-MAKING COMPANY, LIMITED.—A prospectus has been issued of a new company with a capital of £125,000, in £10 shares, for the purpose of constructing a dry dock, &c., close to the yard of Messrs. Wigham Richardson and Co. A good board of directors has been got together. The engineer is Mr. Sandeman, M.I.C.E., Newcastle-on-Tyne.

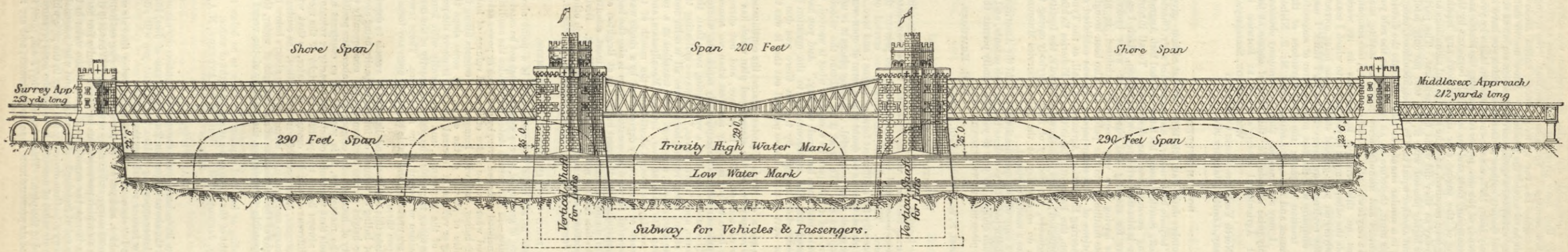
SOUTH KENSINGTON MUSEUM.—Visitors during the week ending Jan. 19th, 1884:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 12,416; mercantile marine, Indian section, and other collections, 3359. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. to 4 p.m., Museum, 1567; mercantile marine, Indian section, and other collections, 655. Total, 17,997. Average of corresponding week in former years, 16,125. Total from the opening of the Museum, 20,722,771.

PROPOSED BRIDGES EAST OF LONDON.

MESSRS. KINIPPLE AND MORRIS, MM.I.C.E., WESTMINSTER, ENGINEERS.



SECTIONAL VIEW, SHOWING CANTILEVER SPAN WITHDRAWN.



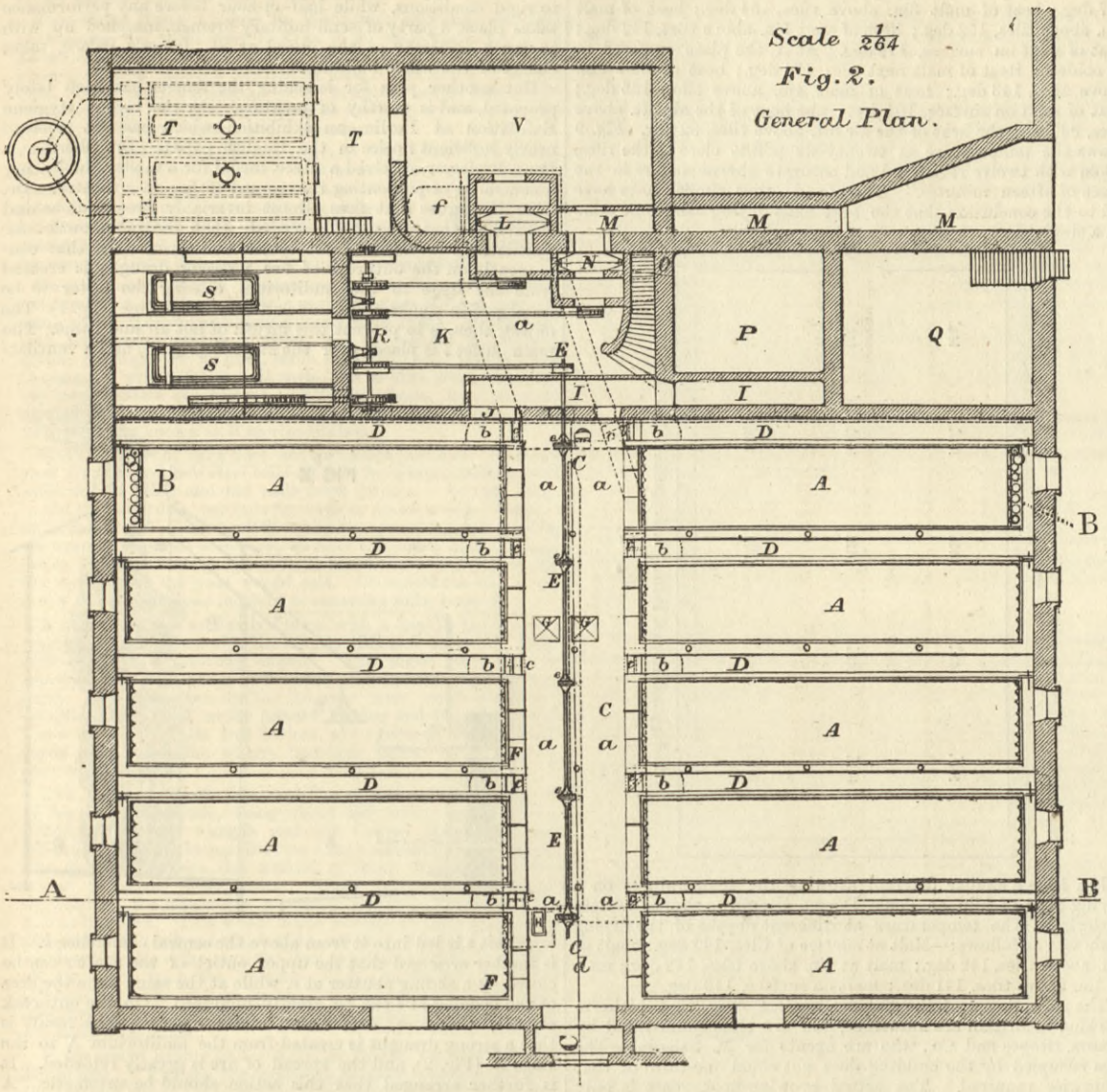
BRIDGE CLOSED—CANTILEVERS RUN OUT

THE design of a bridge which shall best suit the requirements of the cross-river traffic below London has probably been discussed more than that of any other bridge, except London Bridge, and no satisfactory conclusion has yet been reached. We have already drawn attention to some designs, and now publish a proposed design by Messrs. Kinipple and Morris, which has some features worthy of special notice. There is said to be little doubt that a high level bridge is, for various reasons, out of the question. A fixed low level bridge would involve great expenditure for compensation to wharf-holders. An opening bridge is said to be a necessity, as it will avoid the waste for compensation, and yet, in a few years, will probably be seldom or never opened. In their description of the design we now illustrate, Messrs. Kinipple and Morris say, that it being generally admitted that three communications are required to give adequate and proper accommodation between the two sides of the river, with this object a scheme has been prepared and will be laid before Parliament in the ensuing session, having for its object the construction of three low level opening bridges, with subways, at the Tower, Stepney, and Greenwich. The principal features of the three bridges are similar, and the following description of that proposed for the Tower may be held as applying to the bridges at Stepney and Greenwich, except as regards the spans of the two latter, which are somewhat wider, and the headways above Trinity high-water, which are somewhat higher. The Tower Bridge will be in three spans—that is, have two piers in the river—the side or shore spans being each 290ft., with a clear headway above Trinity high water mark varying from 22½ft. to 25ft., and the central opening span being 200ft., with a clear headway when closed of 29ft. above Trinity high water. The arches of London Bridge vary in span from 130ft. to 152ft., and from 22ft. 6in. to 29ft. 6in. clear headway above high water in the centre of the spans, but the available headways owing to the curvature of the arches are much reduced, so that as regards the spans and headways proposed by this scheme, better accommodation will be given to lighters and other vessels passing underneath, as they will have the full headway for the whole length of each span. The central span of the proposed bridge will be an opening span, having a drawbridge run out from each of the shore spans on either side and meeting in the centre of the opening. It is intended that these drawbridges shall be capable of being run back their full length in two minutes. Under the central opening span there will be a subway of 200ft. in length for the passage of passengers and vehicles during the time that the drawbridges remain open for the passage of large vessels. Passengers and vehicles will be lowered into the subway and raised again at the other end by large hydraulic lifts working in shafts in the two piers placed in the river. These piers are intended to be about 60ft. in width by about 100ft. in the direction of the stream, and in each there will be two hydraulic lifts with platforms of about 40ft. by 25ft. One of these lifts will be used for traffic going in one direction, and the other for traffic going in the opposite direction, so that no interruption or blocking of the traffic can take place. Each lift will accommodate four vehicles and a large number of foot passengers, and would be lowered or raised in one minute. The approaches to the bridges will be short and have moderate gradients; that on the Tower side of the river being 212 yards in length, having an inclination of 1 in 50 for 195 yards, and on the Surrey side 253 yards in length with an inclination of 1 in 30 for 217 yards. This latter gradient is fixed by Act of Parliament for turnpike roads, and as it is only a short length, it cannot be regarded as a heavy pull for horses. The designers urge that this proposal of low level opening bridges combined with short subways will fully meet all the reasonable requirements of the river traffic, and completely overcome the objections urged against the construction of a low level opening bridge. It further provides means for maintaining a continual flow of vehicular and passenger traffic, while the drawbridges are open for the river traffic of large masted ships, which will principally occur at high water. It is believed that all the reasonable requirements of this traffic will be met if the central span remains open for one hour at high water of each tide, or one hour out of twelve, and during this hour the vehicular and passenger traffic will pass through the subway as already described, and for the remaining eleven hours the bridge will be used for all street traffic in the same way as the other bridges over the Thames. The bridge could be opened specially for vessels to pass at any other time than the one hour at high water as previously mentioned. The fact that at Seacombe Ferry a hydraulic lift is in daily operation, lifting and lowering passengers, vehicles and railway wagons, is referred to. Of the several advantages claimed for this form of bridge, the following is placed fifth.—Small cost of the bridges, the three being estimated to cost £1,274,865 sterling, including approaches and compensation. This latter item—that of cost—is very important, as it affects not merely the east end of London, but the whole metropolis. The dotted lines in the above engraving represent London Bridge spans.

DOES NOT WANT TO BE GRAMMARED OUT OF HIS PATENT.—A correspondent who is a practical worker and an ingenious inventor, but not a man of letters, is at present going through the ordeal of a suit which he has brought against a rich railway corporation for an infringement of one of his patents. He complains of the twists and strains in which the lawyers and judges seem to indulge over the wording of the patents, by which means they try to jew the patentee out of his rights, and among other things says:—"I think whatever is new about a patent belongs to the one who has the patent, whether there is a special claim on it, or its parts, or not; and they can't grammar me out of it; for I think I have not got to put my name on every spear of grass in order to own a meadow, whether I mention the word lot or not in my deed or patent." Our correspondent's idea is a good one. An inventor ought to be protected in the enjoyment of whatever is new and useful in his patented invention, and ought not to be deprived of the fruits of his labours because a sentence in his speeification contains a word too much or too little. Our correspondent's idea is in accordance with the spirit of the Constitution, which provides for the issue of patents for the special purpose of encouraging the progress of the arts and sciences. Liberality, encouragement, and the broadest possible protection of the inventor should therefore be the aim of the courts and of the Patent-office. This the Constitution calls for. But some of the courts and some of the Patent-office officials occasionally seem to take exactly the opposite view, and appear to labour under the notion that it is their duty to discourage, limit, reduce and nullify as much as possible the constitutional rights of authors and inventors.—*Scientific American.*

NAVIGATION OF THE CONGO.—As the operations of the Association Internationale du Haut Congo of Brussels, with Mr. Stanley at its head, in Africa is occupying considerable public attention, it may be interesting to our readers to know that in addition to the stern-wheel paddle steamer described by us on the 11th inst., there are at the present time two other boats on their way to the Congo. One of these is what may be termed a despatch boat, 75ft. long, 13ft. beam, 7ft. deep, constructed of Siemens-Martin steel from the designs of Mr. M. G. Delcourt, engineer-in-chief to the Belgian Government, by Messrs. Edwards and Symes, Cubitt Town, London, and under the inspection of Mr. J. G. Luning, of the Bureau Veritas. This vessel is intended for the service of the expedition on the coast and up the river as far as the first cataract, and is very strongly built, all her plating and scantling being considerably in excess of the requirements for the highest class of Lloyd's register. She is fitted with compound surface-condensing screw engines capable of developing 150-horse power, with a piston-speed of over 500ft. per minute. The boiler is also of steel except the tubes, and is constructed to meet Lloyd's rules for a working pressure of 105 lb. per square inch, and tested to 210 lb. per square inch. It is circular in form, 7ft. 6in. diameter by 8ft. 6in. long, with one furnace 3ft. diameter. The other boat supplied by Messrs. Edwards and Symes for the use of Mr. Stanley, and now on its way to the Congo, is a galvanised steel shore boat 42ft. long, 7ft. 6in. beam, 3ft. 3in. deep, constructed in six water-tight compartments, each having two bulkheads. All the compartments were bolted together in the builder's yard and the boat launched into the Thames, instead of testing the work by means of a jet of water from a hose, as is usually done. Messrs. Edwards and Symes constructed a light draft twin-screw steel steam launch, which was conveyed overland upwards of 500 miles into the interior of Africa, and though only drawing 20in. of water, was capable of being propelled 11 miles per hour.

PNEUMATIC MALTING AT TROYES.



THE lethargy in the malting trade, and in all matters relating to malting processes, induced by two centuries of restrictive legislation, is being gradually shaken off by the malting industry under the new law. For many years nearly all improvements in malting processes originated abroad, as numberless Acts of Parliament fettered every process and the use of every implement requisite in a malt-house in this country. The entire removal of these legislative restrictions gives an opportunity for improved processes, which promises to open up a considerable field for engineering work, and to develope a very backward art by the application of scientific principles. The present time is, therefore, one of more material change than malting has ever experienced.

Of the numerous improvements effected in the past few years, those made by M. Galland in France, and more recently by M. Saladin, are by far the most prominent, M. Galland originated what is known as the pneumatic system eight or nine years ago. This system, as carried out at the Maxéville brewery, near Nancy, was described in the *Bulletin de la Société d'Encouragement*, in August, 1876, and subsequently in Vol. xlvi. of the Proceedings of the Institution of Civil Engineers.

Since that time further improvements have been made by M. Galland; but more recently great advances have been made in the system by M. Saladin. He has developed the practice of the leading principle, and in conjunction with Mr. H. Stopes, of London, has added improved kilns and various mechanical apparatus for performing work previously done by hand. He has also devised a very ingenious machine for cooling the moist air by which the process is carried on.

At the recent Brewery Exhibition, some of the machinery used in these new maltings was shown in action by Messrs. H. Stopes and Co., together with drawings of a malting constructed at Troyes for M. Bonnette under M. Saladin's instructions. This malting is the third constructed for the same firm, the others being at Nancy. That at Troyes we now illustrate. We will not occupy space by a general description of the pneumatic system, one great feature in which is the continuous manufacture of malt throughout the year instead of only from five to eight months of the year, as it will be gathered from the following description of the Troyes malting:—In our engravings, Figs. 1, 2, and 3, pages 76 and 69, the letter A indicates the germinating cases; B, Saladin's patent turning screws; C A, air channels; D, passages; E R, main driving shafts; *e*, pulleys; F, metal recesses to fit turning screws; G, elevators; H, trap-doors; I, air channels; J, openings to growing floor for air; K S, engines and fan room; L N, fans, supply and exhaust; T, boiler; U, chimney; *f*, well. The capacity of the malting is 130 qr. malt every day. This is equivalent to an English house of 520 qr. steep. The whole space occupied is the area necessary for kilns, malt and barley stores, engine and boiler house, and fans. No additional area is required for germinating floors, as ten germinating cases—A—are placed in the basement below kilns and stores. The building is of brick, with the internal walls below the ground line resting upon cast iron columns and rolled joists. The germinating cases A A are of iron; the bottoms are double. One of perforated plate is placed 6in. above the bottom. These plates admit of draining the corn if the germinating case is used as a steeping cistern also. Their chief object is, however, to admit of ready circulation of the air by the means presently to be described. Large channels A *a* serve as drains for moisture and to convey the air to or from the growing corn. Between each case is a passage D, enabling the maltster to have free access to the corn at all points.

With the exception of the driving shaft E, all the machinery is in duplicate, so that the possibility is remote of any breakdown that would seriously affect the working of the house.

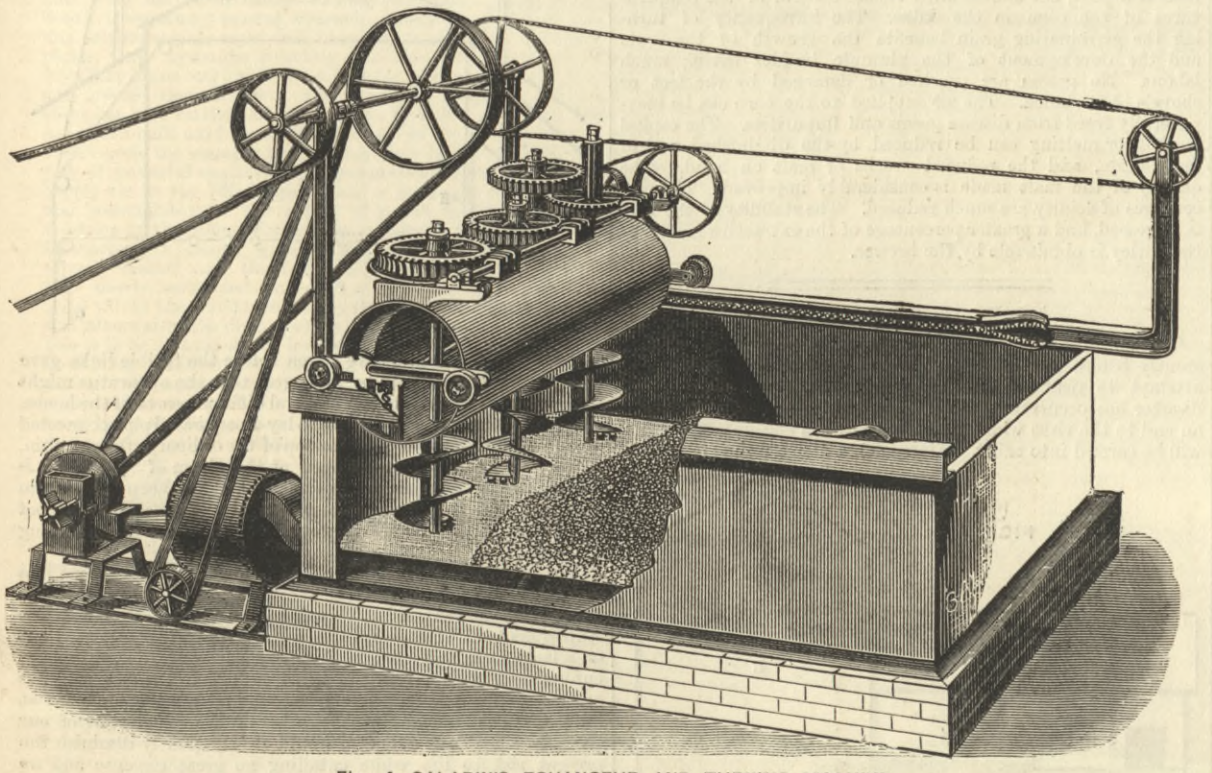


Fig. 4—SALADIN'S ECHANGEUR AND TURNING MACHINE.

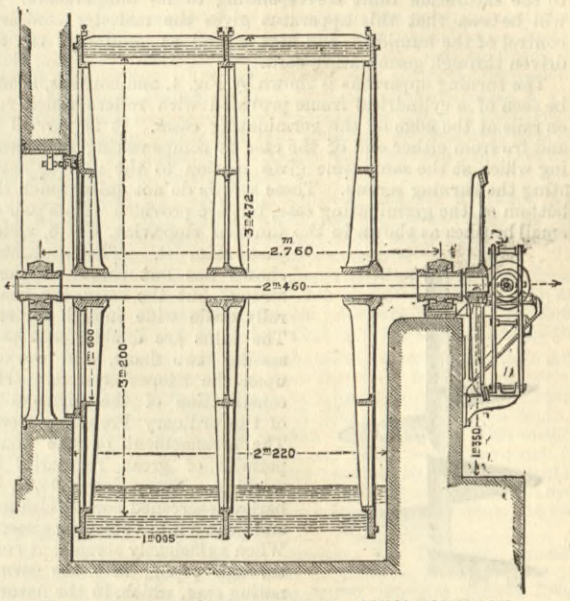


Fig. 5—SALADIN'S ECHANGEUR, AXIAL SECTION.

This is necessary, as should the fans L N be stopped for twenty-four hours the corn germinating at a depth exceeding 30in. would heat and impair its vitality. The boilers T and engines S are of the common type of 20-horse power nominal. The fans L N are the Farcot patent, illustrated a short time since in our pages. The lower floors of the kilns are provided with the Schlemmer patent mechanical turners. The turners—Fig. 4—in the germinating cases are Saladin's patent.

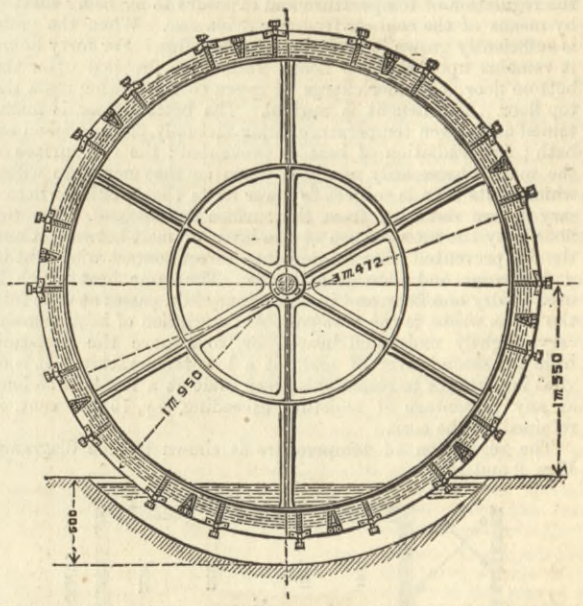


Fig. 6—SALADIN'S ECHANGEUR, TRANSVERSE SECTION.

The germination of the grain is effected by means of cool moist air provided by the fan described and the cooler and moistener—Figs. 5, 6 7, herewith—known as an *echangeur*. As the germinating grain has a depth of from 30in. to 40in. some pressure is required, and mechanical means are necessary for efficient and economical turing. The *echangeur* is a very ingenious application of the well understood rapidity of evaporation of any liquid when spread out in very thin layers over large surfaces and exposed to a current of air. It consists of a cylinder, or series of cylinders, of increasing diameter, placed one within another. Each consists of finely perforated sheet iron. They are placed in a trough of water, just sufficiently immersed to ensure complete wetting, When rotated at a slow speed the surfaces of all the cylinders are kept just wetted. A volume of air is either driven or drawn through as may be required for any particular purpose. In the model malting, as shown at Fig. 4, next columns, taken from that shown at the Brewery Exhibition, the air was driven through the *echangeur* and thence through the germinating barley. Here or as

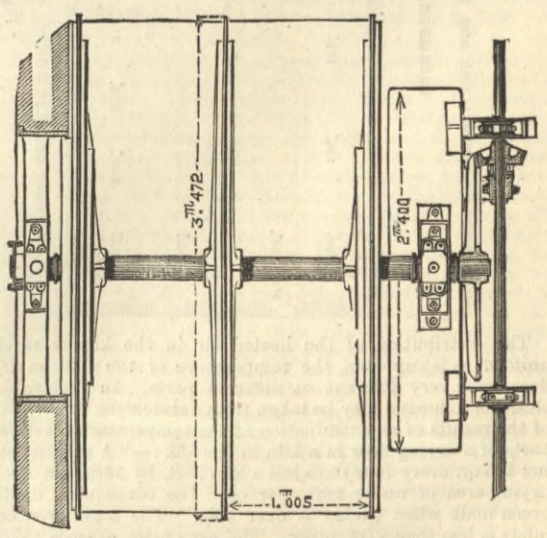


Fig. 7—SALADIN'S ECHANGEUR, SECTIONAL PLAN.

employed in the malting illustrated, the air in its passage comes first into contact with the moistened cylinders, and if hot and dry it becomes moist and cool, for the constant evaporation upon the cylinders has a very considerable refrigerating effect. This was well known to the Egyptians over four thousand years ago, and the porous bottle—*gergeleh*—of Esneh has been made until the present day, to keep the drinking water cool and fresh. The *echangeur* is like a gigantic gergeleh, and by increasing the size and number of the cylinders, and causing the water in the moistening trough to circulate, any volume of air can be wetted to the saturation limit corresponding to its temperature. It will be seen that this apparatus gives the maltster complete control of the humidity and heat as well as volume of the air driven through germinating corn.

The turning apparatus is shown by Fig. 4, and consists, as will be seen of a cylindrical frame provided with rollers which run on rails at the edge of the germinating cases. It is carried to and fro from either end of the case by compensating rope gearing which at the same time gives motion to the gearing actuating the turning screws. These screws do not quite touch the bottom of the germinating case, but are provided with a pair of small brushes as shown in the annexed engraving, Fig. 8, which just skim it. The apparatus shown has but three of these screws, but the cases are generally made wide enough for six. The kilns are double, each possessing two floors, and worked upon the Stopes' system. The construction of the furnaces is of the ordinary French pattern. The arrangement of the house permits of great regularity in working. Every day 130 qrs. of barley is screened, sorted, cleaned, and passed into a steeping cistern. When sufficiently steeped it runs through piping into the germinating case, which, in the natural order of working, is empty. Here it forms the couch. When it is desirable to open couch a small amount of air is forced through the grain by opening the trap door connected with the main air channel. This furnishes the growing corn with oxygen, removes the carbonic acid gas, and regulates temperatures of the mass of grain. Later the Saladin turner is put in motion about every eight to twelve hours. The screws in rotating upon their axes are slowly propelled horizontally. They thus effectually turn the grain and leave it perfectly smooth. This turning prevents matting of the roots, the regulation of temperature and exposure to air being effected by means of the cold air from the *echangeur*. When the grain is sufficiently grown it is elevated to the kilns. For forty hours it remains upon the top floor. It is then dropped upon the bottom floor, a further charge of green corn following upon the top floor. The benefit is mutual. The bottom floor is maintained at an even temperature, being virtually plunged in an air bath; free radiation of heat is prevented; the top surface of the malt is necessarily nearly as warm as that next the wires, which in its turn is subject to lower heats than would be necessary if free radiation from the surface was allowed. The top floor is by the intervention of the layer of malt between it and the fire prevented from coming into direct contact with heat of a dangerous and damaging degree. The same heat which is used to dry one floor, and in an ordinary kiln passes at once into the air as waste, is the best possible description of heat, namely, very slightly moistened heated air, to remove the moisture from the second layer of malt at a low temperature. It is of vital importance to retain this green malt at a low heat so long as any percentage of moisture exceeding, say, 15 per cent. is retained by the corn.

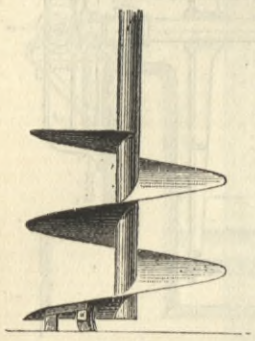


Fig. 8.

The regulation of temperature is shown by the diagrams Figs. 9 and 10:—

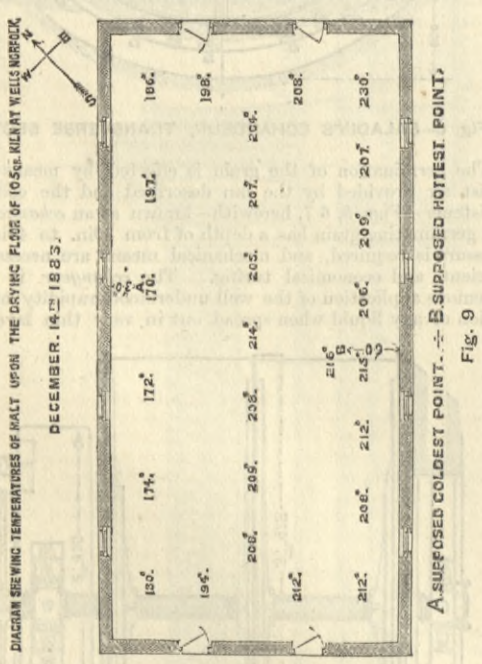


Fig. 9

The distribution of the heated air in the kiln is rarely as uniform as is supposed, the temperature of the malt on drying floor being very different at different parts. In illustration of this, the following may be taken from a statement by Mr. Stopes of the results of an examination of the temperatures at different parts of a drying floor in a kiln in Norfolk:—"A malting steeping 105 qr. every four days has a kiln 75ft. by 36ft.; an average drying area of under 26ft. per qr. The consequent depth of green malt when loaded is over 10in. The total area of air inlets is less than 27ft. super. The air outlet exceeds 117ft., a ratio of 13 to 3. The capacity of head room equals 44,550ft. cube. The area of each tile is 144in., with 546 holes, giving an effective air area of some 32in. The ratio of non-effective metallic surface to air space is thus 9 to 2." The Casella anemometer gave no indications at several points, and fluctuating up and down draughts were observable at many others, especially at two corners and along the centre. "The strongest upward draught pulsated with the gusts of wind, and ranged from 30ft. to 54ft. per minute, a down draught of equal intensity occurring at intervals at the same spot, notwithstanding the fact that the air was rushing in at the inlets below the floor at the high velocity of 785ft. per minute." The temperatures of the drying malt and superimposed air consequent upon the conditions thus indicated, were naturally as follows:—At B, the place supposed to be hottest: Heat of malt touching tiles, 216 deg.; heat of malt 1in. above tiles, 167 deg.; heat of malt 3in. above tiles, 154 deg.; heat of malt 4in. above tiles, 152 deg.; heat of malt 5in. above tiles, 142 deg.; heat of malt on surface, 112 deg. At A, the place supposed to be coldest: Heat of malt next tiles, 174 deg.; heat of malt 2in. above tiles, 143 deg.; heat of malt 4in. above tiles, 135 deg.; heat of malt on surface, 104 deg.; the heat of the air 3ft. above tiles, 84 deg.; the heat of the air 5ft. above tiles, 82 deg. Fig. 9 shows the temperature at twenty-six points close to the tiles, taken with twelve registered and accurate thermometers in the space of fifteen minutes." These and other similar tests have led to the conclusion that the best malt drying cannot be done on a single floor.

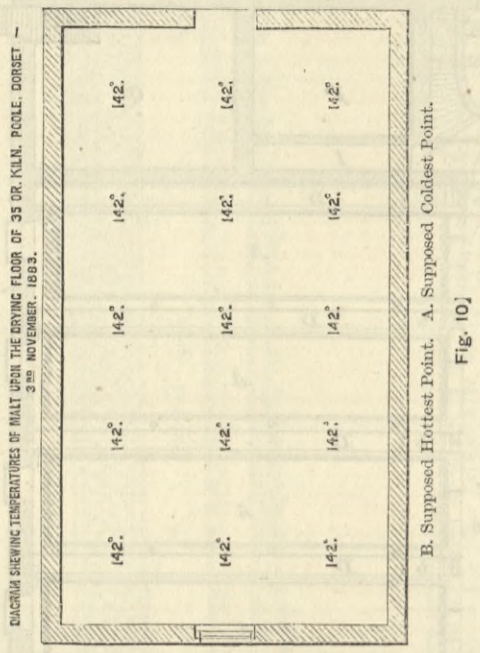


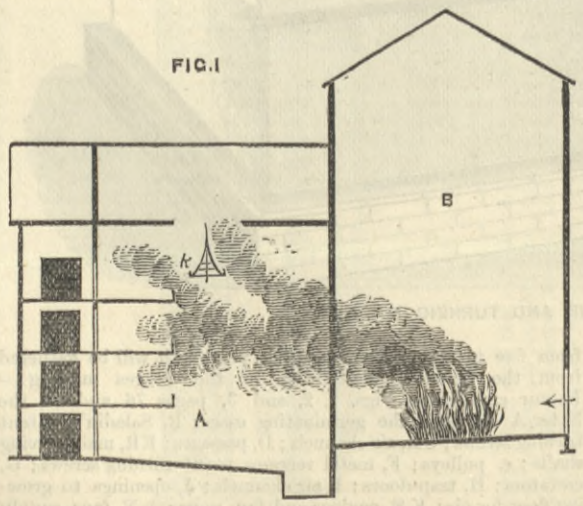
Fig. 10.

Fig. 10 is a similar diagram showing the temperatures on a drying floor of kiln at Poole, Dorset, altered to Stopes' system of drying. The temperature at different depths of the drying grain was as follows:—Malt at surface of tiles, 142 deg.; malt at 1in. above tiles, 142 deg.; malt at 2in. above tiles, 142 deg.; malt at 4in. above tiles, 141 deg.; malt on surface, 140 deg.

The advantages of the Saladin system over that hitherto working in Britain are numerous, and are thus enumerated by Messrs. Stopes and Co., who are agents for M. Saladin:—The area occupied by the building does not equal one-third of that otherwise required. The actual growing-floor space is only about one-seventh, and the number of workmen is ruled necessarily by the size of the house, but on an average is reduced two-thirds; but the employment of much more power is necessary, and the power is used at more frequent intervals. The use of plant and premises is continuous, the processes of malting being equally well performed during the summer months. The further advantage of this is that brewers secure entire uniformity in age of malt. By the English system the stocks of finished malt necessarily fluctuate largely. All grain is subjected to the same conditions of surrounding air, exposure, and temperature. The volume of air supplied to the germinating corn is entirely under control, as are also its temperature and humidity. When germination is arrested and the green malt is drying, the double kilns ensure control of the temperatures of the corn in the kilns. The infrequency of turning the germinating grain benefits the growth of the roots and the development of the plumule, besides saving much labour. No grains are crushed or damaged by the feet or shovels of workmen. The air supplied to the corn can be inexpensively freed from disease germs and impurities. The capital needed for malting can be reduced by the diminished cost of installation, and the reduced stocks of malt on hand. The quality of the malt made is considerably improved. The percentages of acidity are much reduced. The stability of the beer is increased, and a greater percentage of the extractive matter of the barley is obtainable by the brewer.

FIRES IN THEATRES.

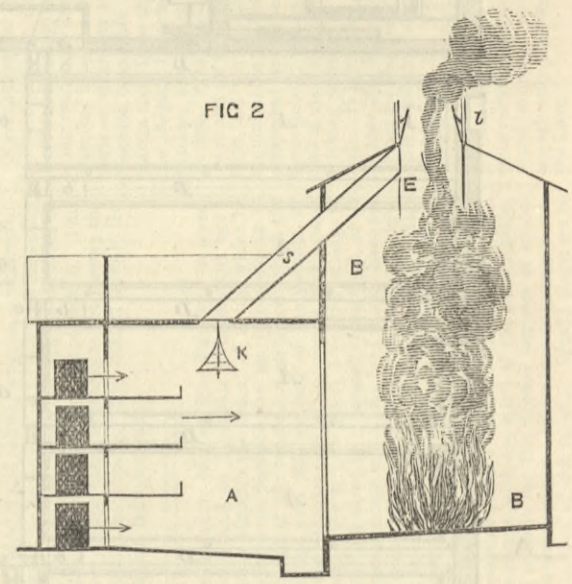
THE question of the dangers incurred by theatre-goers is constantly before the public, but as yet there has been no serious attempt to deal with it. Nor is it probable, until a great disaster has occurred, that sufficiently strong measures, putting an end to the risks which Captain Shaw has clearly pointed out, will be carried into effect. After such a disaster the strong tide



of public opinion will render almost any legislation possible—too late, however, for the victims. Meanwhile, it has not perhaps been sufficiently considered whether there are no possible preventive measures which would give increased security without involving serious structural alterations.

The Berlin theatres, most of which are admirably provided with supplementary exits, all have a fireproof screen isolating the stage from the auditorium. This screen comes rattling down immediately after the fall of the curtain on the last act, and is occasionally lowered during the play, so that the audiences become accustomed to it, and would not be liable to panic at its sudden appearance. Fire tell-tales are also in common use. Moreover, all the water service of every theatre has to conform to rigid conditions, while half-an-hour before any performance takes place, a party of semi-military firemen, marched up with as much certainty as the guard at St. James's Palace, takes charge of the whole building.

But another plan for lessening the danger has been lately proposed, and is worthy of mention. At the recent Hygiene Exhibition at Berlin—an exhibition which has not received nearly sufficient notice in the English papers—Dr. Obernier, a Bonn Professor, received a silver medal for a model illustrating a new mode of preventing the spread of fire in a theatre. Dr. Obernier argues that fires almost invariably break out behind the stage; that time only is needed; that the main outlet for ventilation is over the centre of the auditorium, and that consequently on the outbreak of fire a strong draught is created from the stage to the auditorium, causing the latter to be enveloped in smoke and flame in a very short time (Fig. 1). The object, then, is to prevent this inrush of hot air and flame. The main outlet *l* is placed over the stage B (Fig. 2), and a ventilating shaft *s* is led into it from above the central chandelier *k*. It is further arranged that the upper outlet of the shaft *s* can be closed by a sliding shutter at *e*, while at the same time the area of the opening at *l* can be greatly increased. On the outbreak of fire, therefore, *e* is closed and *l* opened. The result is that a strong draught is created from the auditorium A to the stage B (Fig. 2), and the spread of fire is greatly retarded. It is further arranged that this action should be automatic. A chain D (Fig. 3), passing close under the stage is provided with links of fusible alloy. On the softening of the latter by heat, the weight U falls, and adding itself to the weight G, acts on a system of ropes and pulleys drawing up the sliding shutter *e* and opening wide the flaps L L. By pulling on the weight G it can be ascertained at any time whether the arrangement is in working order. The automatic part of the scheme does not appear to be of much value, since it is evidently possible that a



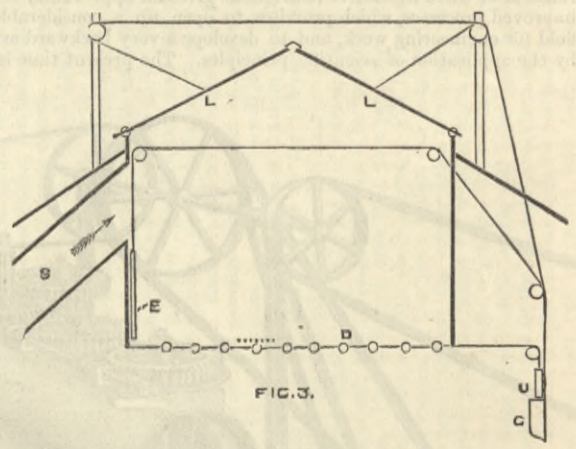


FIG.3.

considerable fire might have arisen before the fusible links gave way; but it could easily be arranged that the apparatus might be set in action by hand from several different parts of the house.

Dr. Obernier further proposes to lay a perforated pipe connected with the water service over the top of the ordinary stage curtain. The latter having been dropped at the alarm of fire, water is turned on, and the continuous stream serves to keep the curtain drenched and to interpose a wet screen—practically fireproof for a considerable time—between the stage and the escaping audience.

The practical action of the above arrangement was shown in a model before the jurors of the exhibition, and pronounced quite successful, the wet curtain showing great fire-resisting qualities. Experiments of this class cannot, unfortunately, be carried out on a large scale, and when made with models only, do not perhaps enforce conviction. But the principles which Dr. Obernier has advanced appear to be perfectly sound, and his proposals are at least worth the serious consideration of the proprietors of our theatres, since their adoption would clearly greatly diminish the present risk to life, while entailing no great expense and no radical alteration of structure.

TENDERS.

TENDERS for the completion of the Lenton Boulevard, Nottingham. Mr. Arthur Brown, borough engineer.

	£	s.	d.
Samuel Thambs, Nottingham—accepted	10,986	13	3
James Knight, Loughborough	11,275	0	0
W. E. Hopkin, Nottingham	11,300	0	0
Foster and Barry, Nottingham	11,400	0	0
Meats Bros., Nottingham	11,900	0	0
T. Smart, Nottingham	12,725	0	0
D. C. Woodhouse, Nottingham	13,436	0	0
George Smith, Newcastle-on-Tyne	17,323	12	6
Borough Engineer's estimate	11,350	0	0

AT the Royal Observatory, Greenwich, last week the mean temperature registered was 42·7 deg., being after all only 4·1 above the average.

RAILWAY MATTERS.

AT Hallstadt, in Upper Austria, an avalanche took place, which, after devastating the forest, blocked the railway line for a distance of 300 metres; the snow was 15 metres deep.

THE Dover Town Council on Wednesday adopted a resolution authorising the town clerk to write to the joint committee of the Dover and Deal Railway, stating that unless the existing railway accommodation between Shorncliffe and Folkestone by Dover to deal, Sandwich, Ramsgate, and Margate were immediately improved, the council would apply to the Railway Commissioners for proper through railway communication.

THE directors of the Grahamstown and Port Alfred Railway have received information from their contractor that the railway from Port Alfred to Blaau Krantz, a distance of thirty-two miles, was passed by the Cape Government Inspector, and opened for traffic on Christmas Day. The remaining twelve miles of the line are nearly completed, and temporary arrangements have been made for carrying traffic over the whole line to Grahamstown.

THE directors of the London and South-Western Company recommend a dividend for the past half-year of 7 per cent., the same as for the corresponding six months of 1882. At this rate it may be hoped that the company will be induced to put some decent carriages on its lines, some rails and chairs that can carry the engines with safety at all parts, and to burn down the Waterloo complication of stations, platforms, roads, level crossings, myriad booking offices, and all that hopelessly unlearnable collection generally known as Waterloo Station.

MAINTENANCE of rails does not cost much just now. The *Railroad Gazette* says new steel rails are sold for winter delivery at the mills for 34 dols., and old rails fetch 22 dols. At that rate it would cost 1130 dols. per mile for rails to renew a mile of track of 69 lb. rails: and as one-twelfth would be a very large allowance for the average renewals necessary, we have the yearly cost, at present prices, less than 100 dols. per mile, which is much less than the new ties required for the year would cost. Of course the cost of rails is not the only expense incident to renewing rails, however.

A FEW days ago at Leeds a horse with a heavily-laden railway wherry dashed down the Headingley Hill and came into violent collision with a tramway engine. The sheet iron case was smashed, the side windows broken, and the feed pipes bent and burst. The passengers in the tramcar were much alarmed at escaping steam, and on the ground, kicking and plunging, lay the horse with one of its legs broken, and scattered about were the goods with which the wherry had been laden. The horse was ordered to be killed.

THE Northern Pacific Railroad lies mainly between 46 deg. and 47 deg. north latitude, being about 200 miles south from the boundary between Canada and the United States, and about 300 miles south of the parallel line—the Canadian Pacific Railway. The distance between the termini at Lake Superior and Puget Sound is about 2000 miles. There is besides a branch to St. Paul on the Mississippi of about 140 miles, leaving the main line at Brainerd. This would more strictly be the main line than the part of the railroad which communicated with Lake Superior, inasmuch as the railroad to St. Paul would be the line from which all the traffic from the Northern Pacific towns would travel to Chicago and the eastern ports. There are also a number of branches under construction, which will bring up the total length to nearly 2500 miles.

IN his recent lecture on the Northern Pacific Railway, Mr. G. B. Bruce said: "Perhaps the grandest or most imposing feature of the line was where the Columbia river passed through the Cascade range of mountains. Here the basaltic mountain side rose sheer out of the river almost perpendicularly to a height of 450ft., and the river itself at that place was about 120ft. deep. In constructing the line blasts of enormous proportions were put in, and the face of the hill was blown down into the river below, filling it up to a certain height, and at the same time forming a ledge in the rock for the railroad. In one instance 10 tons of powder were fired at once, which brought down 140,000 cubic yards of rock. The line now ran for a considerable distance along a magnificent hill-side almost perpendicular, which, whether when travelling on the railroad, or sailing up the river near it, presented one of the finest scenes which could well be imagined."

MAJOR-GENERAL HUTCHINSON and Major Marindin have sent in a report on the progress of the Forth Bridge Railway, in accordance with the Forth Bridge Railway Act, 1882. In the shops at South Queensferry several hydraulic cranes for handling plates and angles, a large eight-drill travelling machine, for drilling bedplates, three hydraulic rivetting machines, and the second large travelling crane and ten-drill machine for tubes have been delivered and erected since August. The temporary stage on the south shore has been carried out to a distance of 1800ft., and spur jetties have been built out from it alongside each of the viaduct piers. At Inch Garvie the wrought iron landing stage has been completed; a pair of powerful engines and air compressors have been erected to supply air to the 70ft. caissons, and a hydraulic pumping engine and accumulator for the supply of power to the machines for rivetting up the caissons in position are almost finished. At North Queensferry a second wrought iron stage, similar to the one already erected over the foundation of the south-west pier, has been nearly completed over that of the south-east pier. This stage will in the first instance carry the diamond drilling machinery, and afterwards the diving bell by means of which the rock at this pier is to be excavated and levelled. The diamond drill frame is now being transferred to the south-east pier, and parts of the diving bell and accompanying machinery have already been delivered on the ground. A complete set of air compressing machinery similar to that on Inch Garvie has been erected here, and is being used at present for supplying air to the rock drills at work levelling the ground round the piers. For the erection of the girders of the viaduct at the north end of the bridge a timber stage, varying from 10ft. to 40ft. in height, has been set up between the Fife cantilever pier and the north abutment.

DURING the past half-year the Manchester, Sheffield, and Lincolnshire Railway has made fair progress with some of the works we recently noticed in THE ENGINEER as being then commenced or in contemplation. In that half-year the expenditure on capital account was £201,207. Of this amount £87,336 was the sum spent on land purchases, construction of way, and stations on lines open for traffic; 42,452 was spent on new working stock, including £19,490 for new locomotives and tenders; £42,500 on subscriptions to other railways, the Wigan Junction Railways being the most costly; and the balance was spent in dock, steamboat, and other special items—at Grimsby mainly. In the half-year now entered upon, the estimate of the expenditure is slightly less—£185,000. Of this £105,000 is to be spent on the lines that are open for traffic, £30,000 on working stock, and £50,000 on subscriptions to other railways. The line seems to have before it an expenditure of £786,000, in addition to that we have named; but of this sum half a million is for works "not yet commenced and in abeyance," so that the expenditure on capital account of the railway is small, except so far as it may be enlarged by the proposals to Parliament in the present year. And, indeed, this is one of the railways that may be said to have need of rest in this respect. It has spent largely of late years, and it ought now to be developing the traffic on the lines that it has made, and on the costly joint lines—such as the Cheshire—in which it has a share. It is in these Cheshire and other joint lines that much of the want of large dividends on the part of the Manchester and Sheffield Railway is concerned. It has expended £6,267,093 on "subscriptions to other railways," and in the past half-year it only received £60,000 for its share of the net receipts of these lines. A time of rest would allow the traffic to grow, and would allow the working expenses to be kept in check—though these are not very extravagant—and thus the future of the line would be better.

NOTES AND MEMORANDA.

MR. FRANCIS GALTON gives the mean weight of professional men as 161 lb. at 27 years, 167 lb. at 30 years, 173 lb. at 40 years, 174 lb. at 50 years and the same at 60 years.

HERR S. KALISCHER, in the Physical Laboratory at Berlin, has been making a number of experiments on the alleged development of electricity during the condensation of steam. He could not find any electricity.

A PLATE-GLASS insurance company having to pay 1456 losses in eight months to September, reports 343 breakages from stone throwing &c.; imperfect glazing caused 144; 86 door plates were broken by wind and 59 by wind and hail; burglars, 76; malicious persons, 43; runaway horses, 24; persons falling on sidewalk, 39; window cleaners, 103; moving shutters 54; with other breakages from 59 down to 1, the last caused by a flying owl.

DURING the week ending December 29th, in thirty cities of the United States, having an aggregate population of 6,998,800, there died 2810 persons, which is equivalent to an annual death rate of 20·9 per 1000. For the North Atlantic cities the rate was 23·8; for the Eastern cities, 21·9; for the Lake cities, 16·4; for the river cities, 17·1; and in the Southern cities, for the whites, 24·6, and for the coloured, 37·4 per 1000. Of all the deaths, 34·3 per cent. were under five years of age, the proportion of this class being, as usual, the American *Sanitary Engineer* says, highest in the Lake cities, where it was 42 per cent.

AMONGST the many recent suggestions for primary batteries is one due to MM. Lalande and Chaperon, in which oxide of copper is used as a depolarising agent. The oxide, in powder, is placed in or on a sheet of copper or iron. The positive element is zinc, and the exciting liquid caustic potash. A zincate of potash is formed by the solution of the zinc. The cell is absolutely inactive when the circuit is open; when closed the current is remarkably constant. According to M. Hospitalier, the electro-motive force is 0·98 volt. It must of course be closed from the air, to prevent absorption of carbonic acid by the potash. The reduced copper is reoxidised by simple exposure to the air.

IN a recent lecture on house drainage Captain Galton said:—"The Delhi ulcer was traced to the pollution of the wells from the contaminated sub-soil; and the soil in many cities and villages is loaded with nitre and salt, the chemical results of animal and vegetable refuse left to decay for many generations, from the presence of which the well water is impure. There are many factories of saltpetre in India whose supplies are derived from this source; and during the great French wars, when England blockaded all the seaports of Europe, the first Napoleon obtained saltpetre for gunpowder from the cesspits in Paris." These illustrations of conversion of ancestors into explosive materials serve to show "to what base uses," &c., and that Shakespeare's ultimate fate of Cæsar was not perhaps the most objectionable.

DR. H. HAMMERL, who has been writing on the copper voltameter, arrives at the following conclusions:—(1) The material condition of the surface of the electrode, that is to say, whether it is covered with a bright copper film or not, has no influence on the amount of the deposit. (2) The changes of concentration of the copper solution, brought about in the voltameter by the current itself, cannot be sufficiently prevented by stirring. (3) Heating the fluid to boiling causes the deposit to come down almost completely in the state of cuprous oxide; it is partially oxidised even at temperatures between 40 deg. and 60 deg. Cent. (4) The greatest permissible strength of current, for which the deposit may be safely assumed to be a measure of the current, is about 7 ampères per square decimetre of the cathode surface.

ACCORDING to the *Report on the Census of* 1881, the territory occupied by the 254,187,630 inhabitants of the British Empire is estimated as consisting of slightly over eight millions of English square miles—an area more than twice as large as Europe, larger than North America, almost half as large as Asia, and not very far short of one-sixth of the land surface of the earth. Of these eight millions of square miles, somewhat more than three and a-half millions are in America, and form nearly a quarter of that continent; three millions more square miles are in Australasia; somewhat less than a million are in Asia; a quarter of a million are in Africa; while the portion that lies in Europe constitutes a very inconsiderable fraction of the whole, amounting to no more than 120,960 square miles, of which 120,537 form the United Kingdom.

THREE sheets containing the results of the past year's meteorological observations conducted at Nottingham, at a station 182ft. above half-tide level at Hull, under the direction of Mr. M. O. Tarbotton, M.I.C.E., have been published, and these contain a good many figures of interest. The total range of atmospheric pressure was 1·965in., the highest reading being 30·739in., and the lowest 28·774in. The highest temperature in the shade was 87·7 deg. F.; lowest, 15·0. Highest reading in sun, with blackened bulb in vacuo, 135 deg. on July 2nd and August 14th. Total rainfall in year, 30·046in. measured on the ground, and 27·760 measured 39ft. above ground. The mean monthly weight of a cubic foot of air varied through the year from 528·5 grains to 557·3 grains, the mean of all the means being 546·4 grains, or 0·07806 lb.

AN investigation has been made by M. E. Reynier on the electromotive force of certain batteries in which polarisation takes place. These, following the late M. Mandet, he calls "single-electrolyte," instead of "single-fluid" batteries. For a zinc-copper cell containing a single electrolytic fluid, he made the maximum cell with a cathode of sheet copper folded and curved, presenting 300 times as much surface as the thin copper rod which serves as anode, whilst in the minimum cell the proportion is reversed, so that the polarisation at the surface of the copper attains at once its maximum value. The electro-motive force of the cells when filled with dilute sulphuric acid, and having the zinc amalgamated, was 1·072 volts maximum, and 0·272 volts minimum. Many other electrolytes were examined. The electro-motive force was measured upon a galvanometer of high resistance.

NEARLY three years have passed since the census was taken, so that the population of the large towns now greatly exceeds that which was given in 1881, assuming the same rate of increase to continue. These decennial rates varied, of course, very great—namely, from 41·2 in Salford to 7·3, taking twenty of the chief towns. They were as follows:—Salford, 41·2; Oldham, 34·8; Nottingham, 34·2; Leicester, 28·5; Hull, 26·5; Bradford, 24·4; Leeds, 19.3; Sheffield, 18·6; Sunderland, 18·6; London, 17·3; Birmingham, 16·6; Brighton, 16·3; Bristol, 13·3; Newcastle, 13·2; Portsmouth, 12·7; Liverpool, 12·0; Wolverhampton, 10·9; Norwich, 9·3; and Plymouth, 7·3 per cent. In the case of Manchester the rate is a small declining one, namely, 2·8, but, taking Manchester and Salford together, the rate of increase was 8·8. Correcting the census tables by these rates, the following will be the populations of the large towns, dated to the middle of 1884:—Salford, 197,153; Oldham, 122,676; Nottingham, 235,298; Leicester, 132,773; Hull, 181,225; Bradford, 207,564; Leeds, 327,324; Sheffield, 300,563; Sunderland, 123,204; London, 4,019,361; Birmingham, 421,258; Brighton, 112,954; Bristol, 215,457; Newcastle, 151,325; Portsmouth, 133,059; Liverpool, 573,202; Wolverhampton, 78,367; Norwich, 90,410; Plymouth, 75,509; and Manchester, 338,296. In addition to these, the population of Cardiff is now taken at 93,468; Huddersfield, 86,004; Halifax, 76,479; Blackburn, 110,498; Preston, 99,481; Bolton, 108,968; Derby, 87,608; and Birkenhead, 90,870. Respecting the growth of London, the Census Commissioners point out that "the population has almost exactly doubled itself in the course of forty-one years, whereas the population of the rest of England has taken fifty-seven years to multiply in an equal degree. The metropolis has thus been gaining in its proportions as compared with the country at large, and whereas at the beginning of the century out of nine inhabitants of England and Wales one lived in London, the proportion has now risen to one out of seven."

MISCELLANEA.

THE six new gunboats which were recently ordered for Tonquin will be ready for despatch from Saint Nazaire by March, and the last of them will leave on the 10th of that month.

A MEMORIAL to the Board of Trade in favour of the legislation of the 112 lb. weight is to receive the support of the Sheffield and Dewsbury Chambers of Commerce and the Shropshire Ironmasters' Association.

MR. W. MATTHEWS, C.E., the borough engineer of Peterborough, has been selected from sixty-one candidates to fill the post of waterworks' engineer to the Southampton Corporation, in the room of Mr. G. Manwaring resigned.

THE "list of sections" of angle, bulb, tee, joist, channel, deck beam, and other sections of iron and steel which Messrs. Bailey, Sons and Co. have hitherto issued yearly, will in future be published quarterly. The list just published contains 1850 sections.

IN Nasmyth's account of his inventions and contrivances, p. 417, is a description of a method of reversing the action of slide lathes. A correspondent points out that although Mr. Nasmyth says the contrivance was adopted, it certainly would not work as illustrated in Mr. Nasmyth's autobiography.

ON the 16th inst. there was launched from Mr. Skelton's yard, at Millwall, a mail lighter which has been constructed for the Orient Steam Navigation Company, and is intended to be used at Suez for the conveyance of the mails to or from the steamer. The lighter is 45ft × 8ft. × 5ft. 6in., constructed of Siemens steel, and will carry 30 tons of mails. At each end of the lighter is an air-tight chamber similar to a lifeboat. On deck is a small hatch for handing the mail bags in or out, which is made to close watertight.

AS water may be said to be the chief source of wealth in Australia, the following telegram from the officer in charge of borings at Bourke, in New South Wales, is important:—"We have struck a further supply of fresh water in Bore B, No. 3, at a depth of 192ft., in a layer of granite pebbles and boulders. This water is quite distinct from that struck at 122ft. We have not yet gauged the quantity, but the water has risen 10ft. over the surface in pipes. We are of opinion that we are only coming on the main water-bearing strata, and will have a greater supply when the bore gets deeper into the gravel bed."

A NEW twin-screw hopper dredger, the Platypus, recently launched by Messrs. Simons and Co., Redfern, steamed down the river on Saturday last, and anchored opposite Garvel Dock, Greenock, where, after filling her hopper with nearly 1000 tons of dredgings, at the rate of 500 tons per hour, the vessel lifted its bucket girder and steamed to Loch Long, where her load was instantly deposited. A speed of ten miles per hour was obtained. The Platypus has an awning deck, and was constructed for the Queensland Government, and is for the purpose of deepening the rivers and bars at the northern ports of Queensland, and is intended to steam considerable distances along that coast. The machinery for propelling the vessel consists of two independent sets of compound surface condensing engines, of 500-horse power. The boilers are made entirely of steel, and the working pressure is 80 lb.

A MEMORIAL has been forwarded to the Secretary of State for India by the Council of the East India Association, which shows how important engineering work in that country is considered. It directs attention to the great importance of the construction of public works, and more particularly of railways in India, and expressing regret that, during 1883, the increased number of miles completed was only 373, compared with 726 in the previous year, and 838 in 1880-81. The Council point out that the proposed suspension of all further operations pending the appointment of a Committee of the House of Commons to consider the whole question, would be tantamount to more than a whole year's arrest of the material progress of India. They also urge the obvious claims for railway extension, and for the construction of reservoirs and irrigation canals for the preservation of the people in times of drought.

MESSRS. A. JOHNSTON AND CO. have published a standard chart of the British Empire, designed more especially for use of schools under the Education Department. It is printed in colours, and has well and clearly executed maps of the Maltese Islands, Gibraltar, Heligoland, the Isle of Man, the Channel Islands, Cyprus, Aden, Perim and Socrotra, India, Australia, Tasmania, New Zealand, the Fiji Islands, the Straits Settlements, Hong Kong, North Borneo, Mauritius, South Africa, West Africa, St. Helena, Ascension, British Honduras, British Guiana, the West India Islands, the Bermuda Islands, the Falkland Islands, and British North America. The population of each country is given from the last census, the railways from information specially acquired, the coast lines have been drawn from the latest Admiralty charts, and the connection by submarine cables is shown.

WE learn from Messrs. J. Gavin, Birt, and Co., Leadenhall-street, London, the official agents for the naval section of the International and Universal Exhibition to be held this year at the Crystal Palace, that they are making arrangements for a full and representative collection of models of steamships and iron sailing vessels, so that the great improvements made in shipbuilding, in accommodation for passengers, in cargo carrying powers—including the preservation of fresh provisions—in appliances for economising the consumption of fuel, and in marine engines, during the last thirty years, may be brought thoroughly under the notice of the civilised world, and if possible contrasted with examples of naval design prevalent at the time of the first great Exhibition of 1851. This section includes everything relating to the outfit and maintenance of steamers and sailing vessels, lifeboats, pleasure boats, yachts, &c., and every appliance incidental to navigation. It would thus appear that the Crystal Palace Exhibition is to take place, though nothing is ever heard of it.

ELECTRIC lighting of trains by an arrangement devised by an engineer, Mr. Massey, seems to give every promise of practical and continued success. After nearly three weeks working without hitch, the experiment of the direct electric lighting of one of the District Railway trains between Kensington and Putney is looked upon as a success. The Putney train is provided with a collection of plant procurable without special manufacture, the whole consisting of a launch boiler, a Willan's three-cylinder single-acting compound engine, running at 500 revolutions, and driving direct a Siemens shunt-wound dynamo supplying current for fifty Swan twenty-candle power incandescent lights, and thus giving about seven indicated horse-power. In addition, there are two water tanks and a coal box, the whole being placed in a separate van, and this tentative arrangement has this advantage, that by the removal of the van on other lines, more extended trials can be made on longer trains, as in the present case only thirty of the lamps are employed for the actual service of the train, the remaining twenty being kept lighted in the van itself.

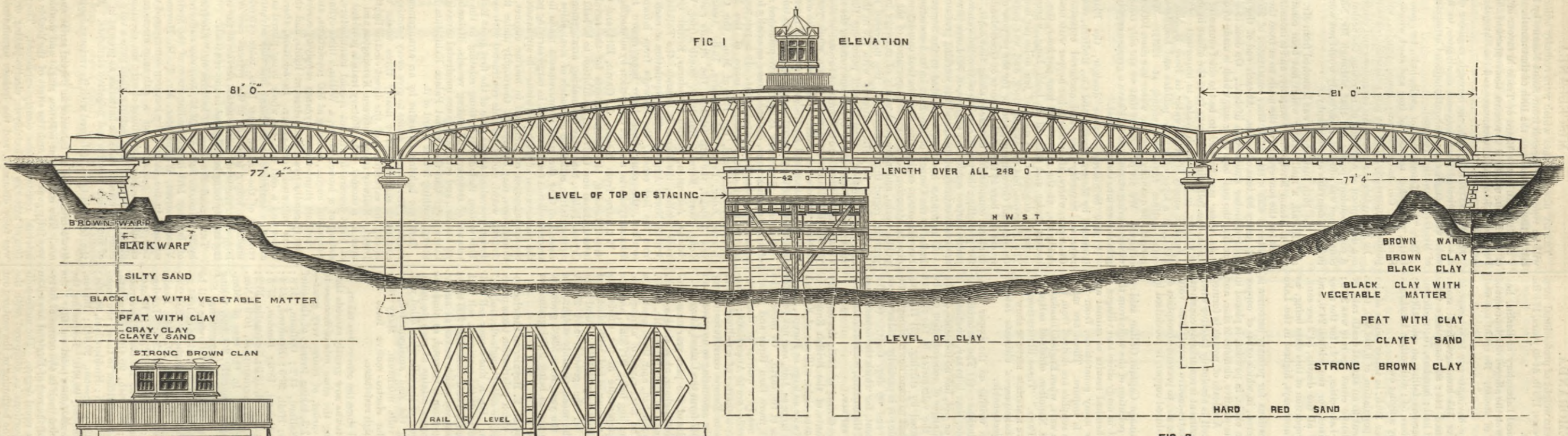
THE second of a course of lectures on "Electrical Engineering," by Mr. Jno. C. Fell, M.I.M.E., &c., was delivered on the evening of January 14th in the reading room of the Society of Engineers, Victoria-street, Westminster, Mr. T. H. Hovenden, member of council, in the chair. The lecturer commenced with an explanation of the generation of a galvanic electrical current from chemical reaction, explaining clearly the chemical changes taking place in the cell. The lecturer then gave a very useful list of the chief commercial galvanic batteries at present in use, with details of the various positive and negative elements. An explanation of the formula $Q = \frac{E}{R}$ followed with its various adaptations to alternative combinations of batteries in partial series and partial parallel arc. The comparison between single and double-celled batteries was fully gone into, and the effect of the double cell on increased internal resistance was clearly explained. The practical adaptation of batteries to electrolysis, electro-plating, or lighting purposes was fully discussed, and the lecture terminated with some new theoretical views expounded by the lecturer upon the value of dispensing as far as possible with internal fluid resistance.

THE HULL AND BARNSLEY RAILWAY.—SWING BRIDGE OVER THE OUSE.

MR. W. SHELFORD, M.I.C.E., LONDON, AND MR. G. BOHN, M.I.C.E., HULL, ENGINEERS.

(*For description see page 75.*)

FIG 1 ELEVATION



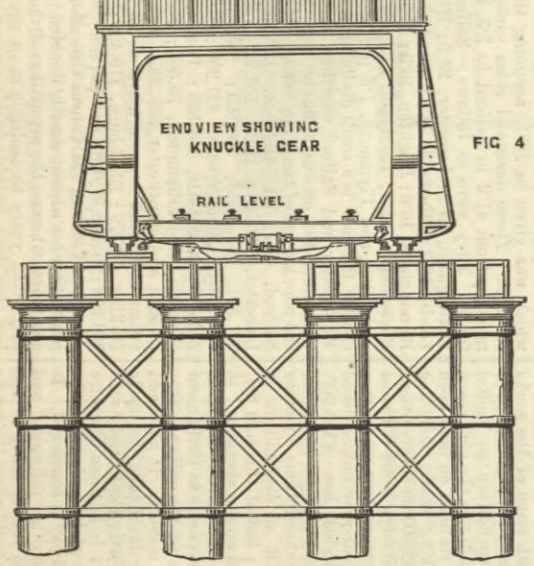


FIG 4

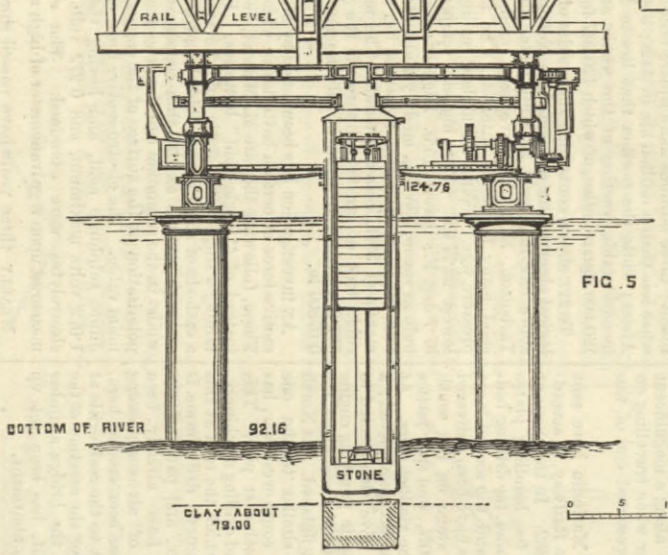
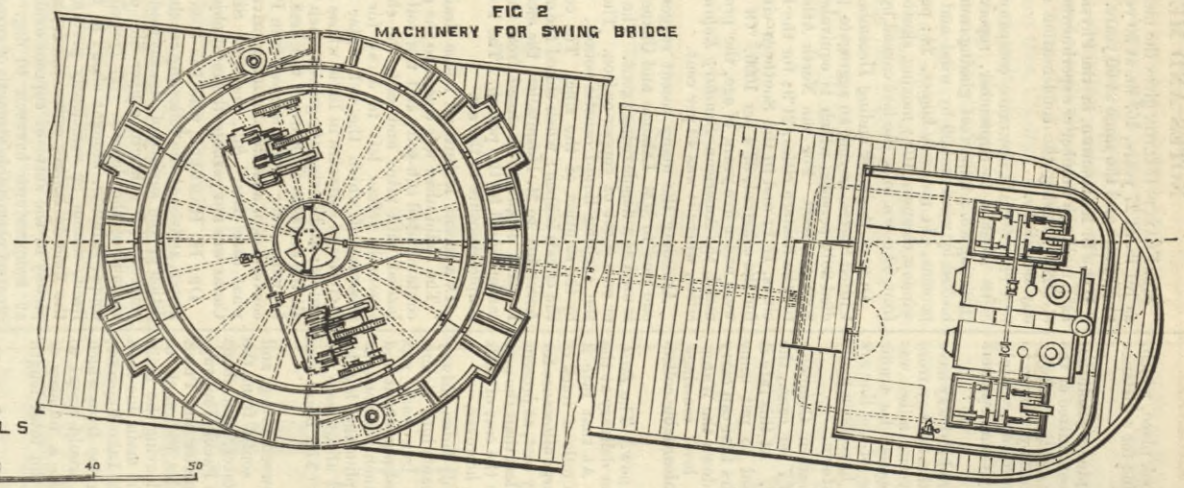


FIG 5

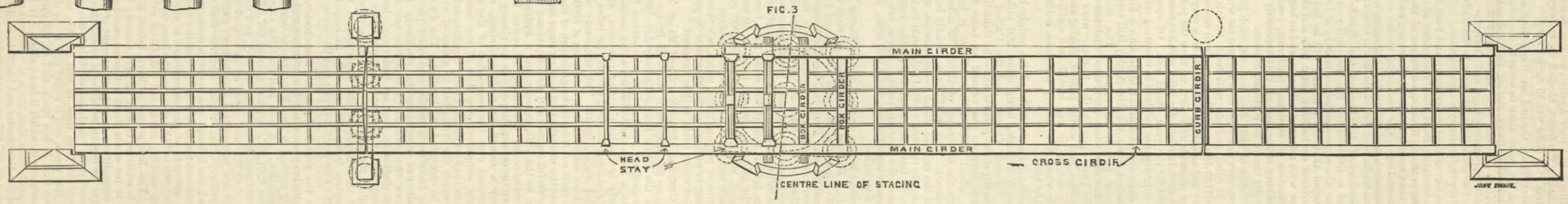
FIG 2
MACHINERY FOR SWING BRIDGE



SCALE FOR DETAILS

0 5 10 20 30 40 50

FIG 3



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PUBLISHER'S NOTICE.

*** *Next week a Double Number of* THE ENGINEER *will be published containing the Index to the Fifty-sixth Volume. The Index will include a Complete Classified List of Applications for Letters Patent during the past six months, together with a list of Abstracts of Specifications published during the same period. Price of the Double Number,* 1s.

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.*

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

A. J. R.—*We are not acquainted with the machine.*

L. (Sheffield).—*A letter awaits the application of this correspondent.*

J. R. (Barcelona).—*A letter awaits the application of this correspondent.*

R. E. C.—*Repeat your question and send a sketch. We fail to catch your meaning.*

AN ARTIZAN.—*You will find as much of the Patent Act as you will require in* THE ENGINEER *for September 7th and 14th,* 1883.

READER.—*The question you ask would require the reproduction of a chapter from a book, such as Unwin's "Elements of Machine Design," Clark's "Book of Rules, Tables, and Data," B. B. Stoney's book "On Strains," and others, to which we must refer you, as we have not the space required.*

W. J. H.—*In fitting up a lightning conductor care should be taken to put every bit of metal in the cap or other part of the chimney in good electrical contact with the conductor. If the cap of your chimney is of cast iron, the conductor may pass through a hole in it and be wedged in tight with copper wedges.*

W.—*It is impossible to say whether your scheme would answer or not without direct experiment. In some ships it would do no good, in others it would prove serviceable. There are practical objections to the scheme, and also points in its favour. If you like to send a sketch and description, we will submit it to our readers for their opinion.*

DRAWN STEEL TUBES.

(*To the Editor of the Engineer.*)

SIR,—Can any one inform me if there is a maker of steel drawn tubes up to 18in. diameter and 16ft. long? SIGMA.

CLIFF'S SMOKE CONSUMER.

(*To the Editor of The Engineer.*)

SIR,—Can any reader inform me where I may obtain the particulars of Cliff's patent smoke consumer adapted to locomotives? T. B.
West Bromwich, January 22nd.

CORRUGATING STAMPING PRESSES.

(*To the Editor of The Engineer.*)

SIR,—I shall be obliged to any reader who will give me the names of makers of machinery for stamping corrugated sheets. C. H. S. F.
Sheffield, January 19th.

INDIA-RUBBER STAMPS.

(*To the Editor of The Engineer.*)

SIR,—Can any reader inform me where I can purchase a machine for the manufacture of india-rubber stamps, and the probable cost of same?
Bristol, January 17th. J. R. R.

PLAIN WATERPROOF CANVAS.

(*To the Editor of The Engineer.*)

SIR,—Can any of your readers inform me whether such a thing as plain waterproofed canvas for vans, trucks, &c., is made in England—flax for choice; its qualities and price? LODZ.
London, N.W.

COKE WASHING MACHINERY.

(*To the Editor of The Engineer.*)

SIR,—Can any reader refer me to the best known machinery for washing coke from puddling and mill furnaces, as I am about putting down machinery for the purpose? R. T. C.
Stockton-on-Tees, January 23rd.

TRAM-CARS.

(*To the Editor of The Engineer.*)

SIR,—(1) Will any reader tell me where I can obtain working drawings of tram-cars? (2) Details showing and describing improved couplings for steam or horse-power? (3) Will there be any objection to the lowering of the tram-car platform one step—the step coming in at the door, going inside the car? W. A. J.
Liverpool, January 21st.

ENAMELLING STEEL.

(*To the Editor of The Engineer.*)

SIR,—Will any of your readers kindly inform me by what process I may produce a black enamel upon steel which will not scratch easily or peel off? The steel upon which I wish to operate is in lengths of 10ft. by 3in., and very thin. I have used the following chemicals, but they produce a rough and dead black surface:—4 oz. water, 2 oz. crystallised iron chloride, 2 oz. antimony chloride. A READER.
Egremont, January 19th.

WATER POWER.

(*To the Editor of The Engineer.*)

SIR,—I shall feel much obliged by any reader giving from reliable data the most economical method of utilising a water-pressure supplied from continuous iron piping of 3in. internal diameter for a distance of a mile over undulating ground. This main taps a lake of about 10 acres area, and is of the same diameter throughout. The last of two of the undulations referred to approximate in altitude almost to that of the lake itself, which is 200ft. above the lowest point of the main, to which lowest point an oscillating water engine has been attached; but the friction in this great length of piping almost entirely negatives the power expected from a registered pressure of 90 lb. to the square inch. Providing that the volume of water passing through the above piping admits of it, would a turbine or overshot water-wheel prove the best to develope a power of, say, eight horses for sawing machinery, and what should the measurement of each be in diameter, breast, &c.? TU QUOQUE.
Salop, Jan. 21st.

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Advertisements cannot be inserted unless Delivered before Six o'clock on Thursday Evening in each Week.

Letters relating to Advertisements and the Publishing Department of the paper are to be addressed to the Publisher, Mr. George Leopold Riche; all other letters to be addressed to the Editor of THE ENGINEER, 163, *Strand.*

MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, Jan. 29th, at 8 p.m.: Ordinary meeting. Renewed discussion upon the paper by Mr. Hackney, "On the Adoption of Standard Forms of Test-Pieces for Bars and Plates;" and paper to be read, time permitting, "Speed on Canals," by Mr. F. R. Conder, M. Inst. C.E. Friday, Feb. 1st, at 7 p.m.: Students' meeting. Paper to be read and discussed, "Some Elementary Electrical Notes," by Mr. Edgar Smart, Stud. Inst. C.E.

THE SOCIETY OF TELEGRAPH ENGINEERS AND ELECTRICIANS.—Thursday, Jan. 31st, at 8 p.m.: Paper to be read, "On a System of Electric Fire-alarms," illustrated by diagrams and apparatus, by Mr. Edward Bright, Member.

SOCIETY OF ARTS.—Monday, Jan. 28th, at 8 p.m.: Cantor Lectures. "Recent Improvements in Photo-Mechanical Printing Methods," by Mr. Thomas Bolas, F.C.S. Lecture I.: New development of the Woodbury-type process. Tuesday, Jan. 29th, at 8 p.m.: Foreign and Colonial Section. "Canada as it will appear to the British Association in 1884," by Mr. Joseph G. Colmer, Secretary to the High Commissioner for Canada. The Most Hon. the Marquis of Lorne, K.T., will preside. Wednesday, Jan. 30th, at 8 p.m.: Eighth ordinary meeting. "Coal Gas as a Labour-saving Agent in Mechanical Trades," by Mr. Thomas Fletcher, F.C.S. Sir Frederick Abel, C.B., D.C.L., F.R.S., Chairman of the Council, will preside.

DEATHS.

On the 16th inst., at Dartmouth Park-hill, N., WILLIAM BROWN, C.E.

On the 11th inst., at Chichester-road, after a long, painful illness, borne with the greatest patience and resignation, EDWARD E. TALBOT, C.E., aged 63, deeply and sincerely mourned.

THE ENGINEER.

JANUARY 25, 1884.

CANALS AND RAILWAYS.

IN our last impression we directed attention to the influence which good and bad railway management, especially in the matter of passenger traffic, exerts on the cost of transport. We stated at the outset that the part played by railway companies has a great effect on the position of various trades and enterprises. It is, we fear, not to be disputed that railway companies are at this moment, and have been for some time past, doing a great deal of mischief by charging excessive, incongruous, and irregular rates. There are breathings in the air which denote that long suffering as the Englishman is, there are some things which he cannot stand; and it is our purpose now, following up the line of action which we took last week, to direct attention to canals as competitors operating against railways; and powerful means, if properly used, for reducing the rates charged by railroad companies. Curiously enough, in one sense, very little seems to be known about the important part that canals not only may play, but probably will play at no distant date. To the outside public, canals are simply survivors of a past age. They are looked upon much as a mail coach would be regarded; and the railway companies have done all in their power to foster this theory. But the truth is that the waterways of a country may be made to take a very influential part indeed in the trade operations of a nation. The truth is recognised in all civilised countries save England. Even here, however, men are beginning to understand the real value of canals; and action of a somewhat energetic character is, we are happy to say, being taken, which may result in conferring considerable benefits on the trading community.

It may not be known that railway companies from comparatively early periods moved heaven and earth to get the canals into their own hands, and in this to a great extent they succeeded. The system adopted was very simple. They pointed out to the shareholders in canals that the railways would probably ruin them, but they offered to guarantee a dividend of 4 or 5 per cent., provided the owners of the canals would hand over the control of the canals to them. This seemed a very munificent offer, and was largely accepted. The companies also bought up canals bodily. We need hardly add that the railway companies did nothing to develope canal traffic. In February, 1883, however, a Select Committee was appointed, without much opposition, because it was generally believed that its functions would consist in inquiry into the provisions of the Canal Boats Act (1877) Amendment Bill; but, as a matter of fact, the consideration of this Bill was but a small part of the duty entrusted to the Committee, and the Bill was reported without any amendment whatever. The Committee was really appointed "to inquire into the condition and the position of the canals and internal navigation of the country, to report thereon, and to make such recommendations as may appear necessary. The committee consisted of Mr. Peel, Mr. John Corbett, Mr. Barnes, Mr. Bolton, Mr. Carrington, Mr. Rowley Hill, Mr. John Holms, Mr. Isaac Wilson, Mr. Stavely Hill, Sir Edmund Lechmere, Sir Henry Holland, Mr. Jackson, Mr. Shiel, Mr. Hicks, Mr. Salt, Mr. Phipps, and Mr. Slagg. The committee commenced operations, and reported last July as follows:—"Your committee have examined several witnesses upon the subject, and upon the Bill referred to them; but as it will not be in their power to conclude the investigation in the present session, they have agreed to report the evidence already taken before them, and to recommend that the committee should be reappointed in the next session of Parliament." The Blue-book containing the evidence can now be obtained, and a more formidable indictment has never been framed against the railway companies. We have no intention of—nor, indeed, would it be possible to give even an outline of the contents of the bulky volume. It must suffice for the present if we point out some of the deductions which may be drawn from its pages.

The first truth which is made prominent is that canals can be made to do an immense amount of necessary work at much less cost than railways. We find, for example, so eminent an authority as Mr. James Abernethy asserting that the canals of this country could be enlarged and improved with the greatest ease, and that all raw materials could be transferred on canals at less cost than on railways. He considered that any scheme which would promote the carriage of raw materials from the centre of England to the ports would be a matter of great importance to the manufacturing interest, chiefly in order to enable our manufacturers to compete with continental manufacturers, and particularly with Belgium. It is essential, in order to do this, that the rates for the conveyance of raw material should be as low as possible. Mr. Abernethy is by no means opposed to the railway companies; on the contrary, he would let the canals remain under their control, and he points out that much would have to be done in the making of new canals to establish through routes or lines of communication. We find witness after witness all bearing testimony to the desirability of improving canals, either to supplement the services rendered by the railways, or to take out of the hands of these last traffic which they cannot or will not carry at sufficiently low rates. We have, on the other hand, evidence from the railway companies, and we are not surprised to find that these witnesses do not believe in canals. Thus Mr. Allport says: "My opinion and my advice would be, if you can get the canal companies to unite, and to return the capital that we have expended in purchasing those canals, my advice would be to sell them."

Two questions have to be considered in dealing with this subject. The first is the cost of augmenting the dimensions and improving generally the existing canals, making new water-ways, and opening up the country generally. The second question is the relative cost of transport by water and by rail. The former question is too large to be dealt with here. As to the latter, there are but few data available concerning this country, but these are, of course, all in favour of the canal. On the Continent, however, very exhaustive inquiries have been made, which appear to result in demonstrating that goods can be carried, on French canals at all events, in quantities of not less than 100 tons, at one third of the lowest railway rate. One witness, Mr. Watson, an iron steam barge builder, holds that if a proper canal existed between London and Liverpool, goods could be transported from one city to the other for about 3s. 8d. a ton. Grain is now carried on independent canals at less than 1d. per ton per mile, inclusive of all charges: but the railway companies who hold canals charge in toll alone 1d. per ton per mile.

One of the favourite arguments against canals is that time is lost on them, and that time is money; but those who have had most to do with railway companies are least likely to believe in their expedition. Thus, for example, it was stated before the Committee that a load of grain or of deals sent from Worcester to Birmingham on Monday evening would be delivered by the canal on Wednesday morning. The distance is about thirty miles. The railway company is not more expeditious, as much as thirty-six hours being spent in getting over the thirty miles. But even if we admit that the canals are very slow, it does not follow that loss must accrue to the owners of the goods transmitted. In nearly all, if not all cases, the merchant, or the farmer, or the mine-owner, must have some stock on hand, and it matters little where the stock is lying. Thus ore may just as well repose in canal boats for a week, as lie at the pit's mouth. It is well known that there are vast quantities of goods in the transport of which time is no object whatever. But the railway companies insist on regarding it as valuable, and charging for a moderately quick transport at high rates. If a mine owner sells 10,000 tons of ore, it is not necessary that the ore should be sent to its destination at 30 miles an hour. A speed of 2½ miles an hour, and a charge of one-half that which the railway would make, is infinitely to be preferred in every way.

We suppose that at no time during their history have railways been so unpopular as they are just now; and this unpopularity is due to the fact that trade is being seriously injured by the extremely high rates charged for the carriage of raw materials and manufactured goods. It is evident that, without the aid of railways, English commerce must succumb to adverse influences; but the railway companies are apparently the last to recognise this fact, and they are, in many instances, now charging more than they did some years ago. If the manufacturers once turn their attention seriously to canals, they will find in them powerful weapons wherewith to afflict their oppressors. But there is more than this in canal enterprise. There are enormous sums of money lying idle, seeking investment in vain. The construction of new canals and the development of the old ought to supply that employment for money which is so much wanted, and would constitute a legitimate field for enterprise, the cultivation of which could hardly fail to prove beneficial to the country at large.

THE THAMES AT RICHMOND.

THREATENED with defeat through the opposition of the Thames Conservancy Board, the promoters of the scheme for erecting locks and a half-tidal weir at Isleworth have resolved to withdraw the Bill which they were seeking to introduce into Parliament in the coming session, and on which they had already lodged the deposit money. With the extinction of this scheme comes the consideration of what is to be the substitute. For the river to remain in its present condition between Teddington and Isleworth

would be a public scandal, unless we are to suppose—which we cannot—that, in respect to this particular evil, the resources of engineering are exhausted. The Conservators explain that they have been led to their adverse decision by "looking at the whole circumstances of the case as affecting the various interests connected with the river." This review has made them feel it to be their duty to oppose the Bill. The interests hostile to the scheme are very strong at Brentford, from which town a deputation waited upon the Conservators last November, making sundry statements which seem to have been received with considerable attention. More than 400,000 tons of goods are said to be carried annually on the Thames between Brentford and London. There are docks at Brentford, and a large number of the inhabitants is more or less dependent on the traffic connected therewith. From this quarter proceed urgent representations in opposition to the wishes which prevail in Richmond and its neighbourhood. The two sides of the proposed weir resemble the two sides of a groyne on the seashore, and the fight in this case is particularly severe. So far as the barge interest is opposed to the scheme, the influence on the Conservators is likely to be somewhat weighty. As aiding their revenue, barges rather than riverside villas are possessed of claims on the consideration of the Conservancy Board; and there is an apparent difference of tone in the reception given to the two antagonistic deputations—one from the people of Richmond and its neighbourhood and the other representing Brentford and the barges. The latter objected that the weir would very seriously interfere with the flow of the tide in the river, a statement which was no doubt true up to a certain point, as the tide would receive a check at Isleworth instead of flowing uninterruptedly to Teddington Lock. With less probability it was urged that the proposed weir would aggravate the floods in the Brentford district. To all these representations the Conservators promised at the time that they would give their serious consideration, and this promise they certainly appear to have fulfilled.

The Richmond people now cling to the hope that a Select Committee will be appointed in the coming session to inquire into the state of the Thames. Should such a committee be appointed, evidence will be offered in defence of the scheme that is now upset. Whether such an opportunity presents itself or not, we hold that something ought to be done for the benefit of the river just below Teddington. The Conservators cannot say that the state of the Thames in that part of its course is what it ought to be. They were deeply concerned at the existence of mud-banks supposed to be caused by the metropolitan sewage outfalls at Barking and Crossness. A little solicitude for the state of affairs where the stream flows past Twickenham and Richmond might be beneficial, and is earnestly sought. The question was raised more than twenty years ago, since which period the necessity for action has become greater year by year. More than ten years ago the Conservators took counsel with two eminent engineers, who advised them to expend £35,000 in an effectual dredging of the river along the present afflicted spot. The Conservators have simply gone so far as to create a sort of trench down the middle of the stream, which helps to concentrate what little water there is at low tide, thus exposing the foreshore still more effectually, and increasing the annoyance arising from the offensive mud. The half-tidal weir was designed to keep the greater part of the mud under water, and it was thought that this concession might have been granted. In former years a full tidal weir was proposed, to which there were strong objections. That even the half-tidal weir would act somewhat to the detriment of the river immediately below it may be acknowledged; but the reduced height of the weir would mitigate any such mischief, and it is part of the plan that the river should be properly dredged from Isleworth to Kew. The objection as to floods above the weir is lessened by the fact that the channel would be widened on the Middlesex side of the Isleworth eyot. If Mr. Abernethy's plan for the locks and weir were adopted, a moderate amount of dredging would bring things right below. If the weir plan is to be permanently rejected, dredging must be carried out on a large scale. That opposition to the weir should be offered by the people a little further down the stream is natural. But it is equally natural that there should be serious complaints as to the present state of the river from those who reside above the site of the proposed works. There is this difference between the two—that in the former case the evil is prospective, and may not come to pass, or, at least, may be prevented; while in the latter case the mischief already presents itself, has been long endured, and is constantly becoming worse. With every increase in the scour of the river below Chelsea there is a more rapid exhaustion of the water at Richmond when the tide is on the ebb. For two or three miles below Teddington the evil effects are apparent, and the remedy must take one of two forms—either the ebb must be checked by means of a weir, or the volume of water must be increased by the practice of dredging. In the end the locks and weir might be found the most economical, but dredging would be the least objectionable.

That which lends force to the Richmond agitation is the circumstance that the *régime* of the Thames has been altered during recent years by artificial measures. The nature of the change has been described in these columns, and we need only just refer to it now. As far back as the time when old London Bridge was removed the process began, and every reconstruction of a bridge in the metropolitan area has added to the effect. The Thames Embankment is another factor in the case, though this is often disputed, and the deep dredging below London Bridge is especially potent. The increased volume of water abstracted above Teddington by the London water companies may also be taken into account, though the result has, perhaps, been exaggerated. The scour of the river is shown by the effect produced on bridge foundations, and the change is plainly indicated by the increased height of the maximum tides in the metropolis. High water has become higher, and low water has become lower. At Richmond the river shows itself for a short period in the day, and then almost vanishes from view, leaving the residents on the banks to contemplate an acreage of mud. The enjoyment to be derived from the presence of the river is thus lost, not merely to those who actually reside on its banks, but to those who visit it from a distance. In these days, when the "open spaces" in and about London are so highly valued, and when even a scrap of churchyard becomes a battle-ground for the Commons Preservation Society against the railway companies, we ought to remember the river—that which no art could create, but which neglect may injure.

THE WEAR AND TEAR OF PLANT.

Not long since a discussion took place in our pages set up by Mr. Ewing Matheson's excellent and suggestive paper "On the Depreciation of Factories," which appeared in The Engineer for September 14th and October 12th and 19th, 1883. It can hardly be said that the discussion in question was brought to a satisfactory conclusion; indeed, our correspondents left the matter, we fear, much as they found it. But a certain amount of information was elicited, and remains available for present and future readers of this journal. We propose here to reopen the whole subject, by directing special attention to one branch of it which does not seem to receive the consideration it deserves.

It will be remembered that among the points dealt with by Mr. Matheson and our correspondents, was the sum which should be set aside for repairs, or, if our readers like the word better, for maintenance. Various opinions have been expressed on this question, but scarcely anything has been said about those who either do not repair machinery at all, or wait until it is too late, in the ordinary acceptation of the phrase. The old adage goes that a "stitch in time saves nine." Is this applicable to machinery? If it is applicable, is it worth reducing to practice? Now it is obvious to the most shallow intellect that if a steam engine, let us say, gets out of order, it ought to be stopped and repaired at once, because a stitch in time will save nine; that is to say, a small repair done at once may prevent the necessity for nine times as much repair work subsequently. But perhaps the obviousness of this is only recognised by the shallow mind because it is shallow. It is at least certain that in very few establishments do we find the stitch-in-time principle carried fully into practice. In all engineering work the tools, &c., will be found after a little time to be more or less out of order as compared with their condition when new—how much more or how much less depends on circumstances; and we would ask here, whether it is or is not the best policy to keep tools and plant up to the highest possible standard of efficiency? Those of our readers who would say that there can be but one answer to this question will do well to think before they speak. As we have said, it is the exception to find the stitch which saves nine; yet to say that it ought to be set is to say that hundreds of highly competent works' managers and works' owners do not know what is commercially best for them. It may be taken for granted that nothing exists without a reason; and that what is apparently wrong can often be proved to be really right from the standpoint of those who know all about the matter, as compared with those who only know a good deal. Let us take a case in point. The machinery of a cotton mill is driven by a single steam engine; this engine begins to get out of repair, but to stop it means the stoppage of the entire mill, and so it is kept at work, mischief being done daily. Five pounds sterling would have repaired it at first, £50 are required at last. Would it have been right to stop in the first instance? Here is a question well worth discussion. On the one side it may be urged that not only was expense incurred by the delay, but risk of a total breakdown; and that, furthermore, whereas a day's stoppage would have sufficed in the first instance, a delay of a week was incurred in the second. All this may be very true or it may be simply specious. We may leave theorising on this point and go at once to the hard dry commercial fact.

Men do not set a stitch in time with their plant. There can be no doubt at all on this point. Not long since we passed through a factory where many small steam engines are used. These engines were all out of order, thumping and banging and blowing steam about. We suggested to the manager that there was a reason for this, and he told us there was. The engines ran almost night and day, and there was no time to make repairs of any kind just then. There would be a slack time at Christmas, and then they would have a general overhaul, not before. It was worth while to run the risk of a breakdown because of the return got from the engines' work. This, and much more to the same purpose, we were told. Legree was a highly reprehensible individual, but he seems to have had the commercial element well developed, and he stated as a result of his dealings with niggers, that it was "cheapest in the long run to use up and buy more." This was precisely the conclusion at which our factory friend had arrived. Very likely he was quite right. It is certain that we, possessing no practical experience in the special manufacture which he was engaged in carrying out, cannot say he was wrong of our own knowledge, and our conscience stands in the way, and prevents us from affirming that he must be wrong on abstract principles. It seems to be clear, however, that the use-up-and-buy-more system can be pushed too far. We remember hearing of a case in which a manufacturer had to use several small machines all alike for carrying out a process, the nature of which we have forgotten or never knew. He bought machines as cheap as he could get them. When it was urged that if he paid more he could get a better article, and cheaper in the long run, he replied that this was an utter mistake. Certain parts of the machine must wear out, good or bad, and he found it more economical to buy new machines when the old were worn out than to repair them. Abroad, in various places, when the fire-box of a portable engine is burned out, the engine is heaved into a ditch and a new one started. It is cheaper to have a new one than it would be to repair the fire-box of the old engine—at least, so we have been told. Lincoln can no doubt put us right if we be wrong on this point.

We think we have said enough to prove, first, that the stitch-in-time system is not invariably adopted by engineers in their dealings with their plant; and secondly, that there may be something to urge in favour of those who do not believe fully in the moral and physical virtues of old saws. The question now is, what is the proper way to deal with the depreciation of machinery under such circumstances? There must be some point between keeping machinery in very excellent and in very bad order which is the best for the manufacturer. Whereabouts does this line lie? It is quite evident that if machinery is to be kept in first-class order always, then it must be excellent to begin with and plentiful to go on with. If a man has every planing machine in his shops running day and night, they cannot be kept in splendid order. If he has a few spare planers, the case is different. How many ought an engineer to have? Can it pay at all to have tools which must certainly stand idle now and then—being bought with that object indeed—in order that all the tools may have the stitch in time which saves nine set? It seems to us that this is really an extremely important question. It is very easy to see why it has never as yet been adequately discussed. The reason is this: The political economists have only one opinion on the matter, which is embodied in the old saw. They will refuse to discuss the matter, "because of course there is really nothing to discuss;" and the criminals who will not repair their engines, and lathes, and mills, and furnaces the very moment they ought are ashamed of themselves, and hold their peace. They do not assert themselves because they are afraid. This is not right. It will be for the benefit of all parties that the truth should be made plain. We have no hesitation in saying that it lies between the two, and some indication ought to be given of the place where the line ought to be drawn. Even the most sincere opponent of the stitch-in-time system must admit that it may be cheaper to spend £20 in repairing an old lathe than £200 in buying a new one. We shall be glad to see the matter taken up in our columns and fully discussed.

AGRICULTURAL AND GENERAL EXHIBITIONS IN 1884.

In the interest of British exhibitors of the hundred-and-one requirements invariably looked for, and generally to be found, at the most important National or International Exhibitions in Europe, it may be worth while to call attention to a few of the forthcoming shows for which prospectuses have now been issued. Under the patronage of the King of Bavaria a comprehensive exhibition of dairy industry will shortly be held at Munich by the Bavarian Agricultural Union, in co-operation with the Bremen Milk Industry Association. Only one section of this exhibition will be restricted to German products, while the second and third sections will, it is hoped, attract competition from many other countries. We are informed that on account of the technical and scientific progress observable of late years in English dairying, the Bavarian Government are very anxious to secure a large representation of dairy utensils of English manufacture. As far as we can ascertain, however, no arrangements have been made for receiving applications for space except at head-quarters. An influential committee is in course of formation in London with a view to promote the International Agricultural Exhibition to be held at Amsterdam this year, but as yet no important details have been communicated to us. The approaching Exhibition at Pesth, to which reference has already been made in The Engineer, will be opened on the 1st of May and closed on the 15th of October. From the programme we have we learn that the precise object of the International Section—the arrangements for which have been entrusted to a special committee—is to promote the improvement and development of the smaller trades, by exhibiting all the resources by means of which they can be improved sufficiently to compete with the powerful wholesale manufacturers, and properly occupy the place designed for them by nature; and especially to extend in Hungary and in the adjacent countries to the east and south the progress that has been made in western and northern countries in the manufacture of machines and implements of husbandry, together with their inventions and improvements; to offer opportunities for inventors to bring their machines, tools, improvements, or inventions before the public; to encourage the improvement of motors, engines, tools, as well as agricultural implements; and to advance the realisation of new industrial ideas. Finally, to bring consumer and producer, contractor and inventor, into closer connection for their mutual advantage. Verily, an ambitious project! We may add that as far as possible exhibits will be shown in motion by means of gas, water, steam, hot air, electricity, carbonic acid gas, &c. In the first section will be included engines and machines and tools for artisans in the smaller trades; and in the second will be found machines and tools for an endless variety of purposes, such as for working in wood; for working metals; for the production of tacks, screws, bolts, rivets, and needles; machines and tools for mechanicians; for leather trades; sewing, knitting, and spinning machines of all kinds; machines and tools for hatters, brushmakers, potters, and makers of all sorts of earthenware, workers in bone and horn, printers, photographers, typefounders, bookbinders, and machinery for the preparation of food and drink. With regard to agricultural machines, it should be mentioned that only those of the newest and most improved construction, or those showing essential alterations, will be eligible for exhibition.

RAILWAY RATES AND THE IRON AND COAL TRADES.

The abundant need for the existence of the Freighters' Protection Association, whose formation in Wolverhampton was confirmed, as we last week stated, on Thursday in Birmingham, appears in the facts sketched by the chairman of the meeting and others. The chairman, Mr. Alfred Hickman, spoke not only as president of the Wolverhampton Chamber of Commerce, but also as the largest melter of pig iron in South Staffordshire. He had found, he said, after very careful examination, that on the average every ton of pig iron made in that district had paid the railway companies something like 10s., when in bars the freightage cost per ton had risen to 15s., and in hardwares to 55s. There was no district, he urged, in the kingdom where railway rates were so high. Nay, traders there were charged more than were those in any manufacturing centre in the world. For the carriage of hardware in France the cost from Paris to Marseilles was 1¾d. per ton; to Bordeaux, 2$\frac{1}{10}$d.; to Havre, 2½d.; and to Antwerp, 1$\frac{9}{10}$d.; the average being about 2d. per ton per mile. The cost of the carriage of hardware from Wolverhampton to London was 3d.; to Sheffield, 4d.; and to Liverpool, also 4d.

The chairman and other speakers drew attention likewise to the fact that there had been no relief upon the rates charged at the time of the wild height to which trade rose a dozen years ago. Although steel rails could now be bought at £4 2s. 6d., the rates of carriage were as high now as they were in 1872. This was, perhaps, capped by the announcement of Mr. T. J. Perry, who is the chairman of the Ironfounders' Association. He made known that he had received a notice from the Great Western Company to the effect that the rates for goods which the South Staffordshire ironfounders were making and sending into other iron-producing districts were to be raised to a point which he estimated would be an increase of from 56 to 93 per cent. upon the present charges. The traders of South Staffordshire have not been hasty in forming this Protection Association. Again and again, as individuals and as separate organisations, they have approached the railway carriers, but without substantial success. Their committee may be safely trusted to formulate a code of rules which, backed by a good guarantee fund, should enable South Staffordshire to remove some at least of the trading disadvantages which it suffers from the not very liberal policy of the railway carriers on whom it so largely depends.

THE OLD AND NEW PATENT LAW.

A CORRESPONDENT has submitted the following important question to us:—"A." got in October, 1883, a provisional protection for an invention for improvements in horseshoe-making machinery. He now proposes to let this drop and take out a complete patent under the new law. Query, will the provisional of October, 1883, vitiate the complete patent of January, 1884, by anticipation? The answer is, that it will not. The Patent-office authorities will not take the prior application into consideration at all; and inasmuch as the provisional will not be made public until April, it cannot anticipate an invention patented any time before that date. It follows that all those inventors who now hold provisional protections can, if they please, abandon them, and go to work under the new law, thus saving at least £16 in fees. It is further to be remarked that if since New Year's Day "A." has been anticipated, he will be told as much by the Patent-office authorities, and he can then fall back on his provisional and go on with a patent under the old law. However, if the course we recommend be pursued, the date will be altered. "A.'s" invention will, for example, be dated from January, 1884, instead of October, 1883; but this will in most cases be a matter of secondary importance, though not in all.

PRIVATE BILL LEGISLATION.

ON the 18th inst. the examiners of petitions for private Bills met as usual to hear evidence in proof of the necessary forms with which it is necessary that promoters should comply in order to fulfil the requirements of the Standing Orders. The list contained the names of twenty-eight Bills, ten of which were set down as opposed, but no matter of importance occupied the attention of either of the examiners on the first day of their sitting. Of the unopposed Bills the Barrmill and Kilwinning Railway Bill, the Easton and Church Hope Railway Bill, the Great Northern Railway Bill, and the Avonmouth and South Wales Junction Railway Bill, were amongst those which satisfied the examiners of compliance with the Standing Orders, while in the case of the Dundee Suburban Railway Bill the petition was withdrawn, and the Bill passed its first stage without opposition. The South-Eastern Metropolitan—Lewisham, Greenwich, and District—Tramways Bill was objected to by Messrs. Alfred Ashton and others, who alleged that the width of the roads through which the lines were to pass was insufficient, and that they, as abutting occupiers, had not been served with notice by the promoters. These allegations were declared to be bad by the examiners, as the name of the road in question was wrongly specified by the objecting petitioners. Another allegation of the petitioners was that the notices did not set out fully the objects of the Bill, inasmuch as the promoters might from the construction of their line run railway trucks. Mr. Hanley, the agent for the Bill, contended that this was not the intention of the promoters, and urged that it was a physical impossibility owing to the construction both of the lines and of the wheels of the railway trucks. Mr. Mackay, engineer to the petitioners, pointed out that to run railway trucks on tram lines was quite feasible, as the flange of the truck would not rest in the groove but simply get hold of it. On this point also the examiner was of opinion that the allegation could not be sustained, but Mr. Robinson held that on the objection as to the level of the roads the petitioners had made out their case, and decided to report accordingly. Proofs of compliance with the Standing Orders were again taken by the Examiners of Petitions for Private Bills throughout the week. The promoters of the following Bills satisfied the Examiners that the requirements of the rules had been met:—Denbighshire and Shropshire Junction Railway Bill; Lincoln and Skegness Railway Bill; London, Brighton, and South Coast Railway (Various Powers) Bill; Midland Railway (Additional Powers) Bill; Manchester, Sheffield, and Lincolnshire Railway (Additional Powers) Bill; Manchester, Sheffield, and Lincolnshire Railway (Chester to Connah's Quay) Bill; Hull, Barnsley, and West Riding Junction Railway and Dock Bill; Scarborough and East Riding Railway Bill; Stockton Carrs Railway Bill; Kilsyth and Bonnybridge Railway Bill; Swindon and Cheltenham Extension Railway Bill; Swindon, Andover, and Marlborough Railway Bill; Skipton and North-Eastern Junction Railway Bill; London, Tilbury, and Southend Railway Bill; Metropolitan Board of Works (District Railway Ventilators) Bill; Great Western Railway (No. 1) Bill; Glasgow and South-Western Railway Bill; London and North-Western Railway Bill; Croydon Central Station and Railways Bill; Golden Valley Railway (Hay Extension) Bill; West Lancashire Railway (Extensions) Bill; Liverpool, Southport, and Preston Junction Railway Bill; London, Chatham, and Dover Railway (Shortlands and Nunhead) Bill; East of London, Crystal Palace, and South-Eastern Junction Railway Bill; London Central Electric Railway Bill; Central Wales and Carmarthen Junction Railway Bill; Taff Vale Railway Bill; Lancashire and Yorkshire Railway and London and North-Western Railway Companies (Preston and Wyre Railway) Bill. The Barry Docks and Railway Bill was objected to in a petition lodged by Mr. A. G. Laker and others. The questions arising on the allegations (of which there were 109) were discussed before Mr. Robinson, the Examiner, at great length. The matters in dispute consisted in alleged inaccuracies or omissions in the deposited plans and sections, and complaint was also made that in certain cases the promoters had failed to serve the necessary notices. The petitioners did not succeed in establishing any of their allegations, and the Examiner will accordingly report to the House in due course that the Standing Orders have been complied with. In connection with the Treferig Valley Railway Bill, a question arose as to whether the promoters were required to deposit with the Taff and Ely Conservators copies of the plans and sections of a railway passing along the River Ely, which is within the jurisdiction of the Board. The Examiner held that they were not so required, and therefore the Standing Orders had not been infringed,

THE HULL AND BARNSLEY RAILWAY AND DOCK.

A BRIEF reference to this important new line of railway was made in our impression of the 4th inst. Since that date, namely on the 10th, an inspection of the whole line, a part of which, that between Howden and Hull, is now nearly completed, and will be opened for traffic in about three months, was made by the directors and others. This line is over sixty miles in length, and as it is being made a first-class line throughout from the first, it is the most extensive piece of railway work which has occupied contractors at home for some time. The inspection commenced at the western end of the line, namely, at the Stairfoot Junction of the Manchester, Sheffield, and Lincolnshire Railway, a point at which all the South Yorkshire coal railways may be held to converge. From this point to the South Kirkby tunnel the line may be said to present no features worthy of special remark—that is to say, there are cuttings and banks of no great depth or height, bridges of small span, and a tunnel of a third of a mile in length. The South Kirkby tunnel is, however, a heavy piece of work, as it has been constructed chiefly through hard magnesian limestone in under two and a-half years, its length being 1224 yards. The next works of importance are a girder bridge of 115ft. span over the Knottington and Goole Canal, and a bowstring bridge of 125ft. span over the river Aire. The next work is the chief constructive engineering feature of the line, namely, the swing bridge over the river Ouse, which we illustrate by the engravings given on page 72. To this we shall return hereafter. The works attracting notice between this point and Hull are a bridge of three spans over the Market Weighton Canal, the Weedley Tunnel, the Sugar Loaf Tunnel, so-called because its profile in the distorted scale drawings suggests the name; the Drewton tunnel of 2112 yards through the peculiarly hard chalk which is met with in the line of hills which runs southward from the Wolds, and which has been very largely used in some parts of Yorkshire for building purposes. It appears that this chalk may be very safely used for even important buildings, so long as it is protected from the direct action of the frost. It has considerable strength, and will carry heavy loads. In the tunnel referred to it supports the brick lining, only a few parts of this lining being carried by masonry sides. It will, no doubt, be remembered by many visitors that the old Flamborough beacon tower, which seems to be of Roman origin, is built of this chalk, and stands well to this day, the frost effecting only a superficial disintegration, which is slow in doing much damage. Where the chalk is used for hydraulic engineering it must be well protected by surface work in rubble of a suitable kind, or it will soon be destroyed. It is so hard that nothing short of drilling and blasting was of any use in its removal. Tonite was used as the explosive, and McCulloch's drilling machines, supplied with compressed air by Sturgeon's compressors. Following this tunnel is a very deep cutting, 83ft. in some parts, known as the Weighton cutting, which is also through this very hard chalk, the lower strata of which shows some curious and interesting lithological changes. A very considerable quantity is to be seen of a red colour, with a tendency to pinkness—a colour which suggests some other colouring medium than the ubiquitous oxide of iron. A good deal of this Weighton cutting would have been tunnel work, but chalk was wanted for embanking, and as it is very strong, there is no danger in adopting a depth of 80ft. A somewhat novel method of making this cutting was adopted. A number of shafts were sunk to formation level from the surface, and a heading was made throughout its length to connect the shafts at the bottom. After working out the shafts and getting the heading laid with rails, the trucks were run under the shafts, and the material from all round the shaft was simply dropped into the trucks, trains of which were loaded as fast as could be wished and hauled at once off to the tips for the large bank into Hull. The slope of this cutting is neatly trimmed to one to two, except where the chalk is overlaid by clay, where it is 2½ to 1. The cutting is 3000 yards in length and contained 900,000 cubic yards of this hard chalk. The total length of continuous cutting and tunnel in the crossing of these hills is about five miles. It is followed by the bank into Hull just referred to, which is six miles in length. Two and a-half miles of this bank were made in six months, although a considerable part of it is of great height. This was done by the aid of the electric light and an enormous plant. Near Hull the line runs over what is known as the Beverley-road bridge, an ornamental structure near the point at which the line branches southward to the passenger terminus and eastward to the Alexandra Dock, in its course to which it runs over a swing bridge nearly finished over the river Hull. The centre pier of this structure, which is otherwise similar to that we illustrate, is formed of wrought iron bars 8in. in diameter, with cast iron screws. The pier does not carry the weight of the span, which is 135ft., or of its load, when closed, but only acts as a turntable. There are numerous other bridges on the line in and near Hull. The total amount of excavation on the railway has been 4,653,000 cubic yards, and there are 6000 tons of ironwork in the bridges.

The leading economic feature of the Hull and Barnsley Railway is the fact that it has been long urgently demanded by the traders and shipowners of Hull. Until the present time, the West Riding as a whole, with its numerous factories, mills, and other places of industrial activity, has been mainly dependent upon two or more railway systems for access to the port of Hull, as an outlet, eastwards, for its minerals and its manufacturing produce. The one West Riding port, Goole, and Middlesbrough in the North Riding, the Durham ports of West Hartlepool and Stockton, and the Lincolnshire port of Grimsby, have all served, more or less, to meet the requirements of certain districts of Yorkshire, but under conditions which have left much to be desired by Hull. Thus the paper-makers and coalowners of South Yorkshire have actually found it necessary to look to Hartlepool, rather than to Hull or Goole, for the timber required for propping up the roofs of coal-pits, and for the foreign material used in the manufacture of paper, either because of the greater facilities in the North for shipping coal cheaply and expeditiously, for return cargoes, or because of some other artificial advantage. It was stated in evidence when the Hull and Barnsley Act was obtained that the rate for steel from Sheffield to Hull was 7s. 6d. for 59 miles, while from Sheffield to Hartlepool it was 5s. 10d.; timber, from Hull to Barnsley, 60 miles, was charged 9s. 11d., whereas from Hartlepool to Barnsley, 96 miles, the rate was 9s. 2d., and from the Tyne docks to Barnsley, 10s. Goods from Hartlepool to Hull, 111 miles, 10s.; Hartlepool to Halifax, 82 miles, 10s.; Hull to Halifax, 70 miles, 10s.; from Hartlepool to Sheffield, 111 miles, 10s.; and the same rates were charged from Hull to towns 70 miles distant. Goole, being actually within the West Riding, and but a few miles from the nearest of those seats of manufacturing industry which constitute the Riding one of the busiest and most flourishing parts of the kingdom, possesses an advantage which would be enormous were it not that the river Ouse lacks the depth requisite to make Goole a first-class port. Steps are being taken which are likely to result in the river Ouse, between Goole and the Humber, being deepened so as to allow vessels of 2000 tons burden to ascend the Humber and enter the port of Goole. This itself will be a great gain to the West Riding; and the realisation of the project will, it is thought, give a great impetus to the movement for converting the existing water-way between Goole and Leeds into a ship canal. More important to the West Riding generally, and more immediate in its realisation than the proposed ship canal to Leeds, is the network of railways which is now springing up in the West Riding, giving new trading facilities to those fields which are already being worked. Some of these new railways are extensions and connections of existing systems. The North-Eastern Railway Company has attempted to do very little of late in the way of extension, so far as the West Riding is concerned; but the Great Northern Company has been more active, and both in the direction of Sheffield, and between Huddersfield and Wakefield, in connection with the Lancashire and Yorkshire Railway, has made substantial improvements in the traffic facilities of the Riding.

The Hull and Barnsley line is, of all these new transits, the most important, as it will open up direct communication from the coal-fields already active and new fields hardly touched, and important manufacturing areas to the third seaport of the kingdom, avoiding the delays that at present occur owing to the communication being in three hands, viz., two lines of railway communicating with a dock which is, again, in separate hands. Delays of even a few hours are in these days often of great importance to shipowners, and the fact has been proved by vessels leaving Hull for cargoes at Newcastle which might have been taken at the former port. The traffic, which seems to be ready for the new line as soon as completed, is very large indeed, and for this reason the line has been laid out with every requirement for conducting a large trade at once. It is a double line throughout; passing sidings have been arranged so that fast trains may pass slow trains at almost every station, and much care has been bestowed on the plans for gravitation sorting sidings. Sidings of this kind have been found to answer well on the North-Western Railway. The gradients of the new line compare favourably with most lines in Yorkshire. In planning the line the engineers had in view the fact that the heaviest traffic will be eastward, and all the ascending gradients in that direction are lighter than those coming westward. The steepest ascending gradient going east is 1 in 150 for about seven miles, and the steepest in the opposite direction is 1 in 100 for five miles. For the rest the gradients are 1 in 300 ascending eastwards, and 1 in 150 westwards. The steep gradient on the east side of the Wolds is being taken advantage of for the construction of one of the sets of sorting sidings on the gravitation principle already referred to. They will be arranged in a manner similar to those designed by Mr. Footner, of the London and North-Western Railway. It is estimated that a saving of £10,000 per annum would be thus effected in the marshalling of the present traffic to and from Hull. The whole line is laid with steel rails weighing 80 lb. per yard, upon squared and untreated sleepers.

Owing to the way in which the construction of the line has been directed, and to the energy put into the work by the contractors, Messrs. Lucas and Aird, and the enormous number of men they have employed, 4900 as a maximum, a greater quantity of work has been carried out on this line than has ever been done on a line in England.

Referring now to the engravings which we give on page 72, of the swing bridge over the Ouse, it will be seen that it has three bowstring spans, namely, two shore spans of 81ft. each, and a centre swing span 248ft. in length, giving openings 100ft. clear. The central pier consists of eight outer cast iron cylinders, the upper length being 6ft. in diameter, and one central cylinder as shown, 7ft. 6in. in diameter, this one carrying the pivot upon which the bridge turns. The ends of the swing span and the river ends of the shore span rest upon girders supported on four cast iron columns 6ft. in diameter. These columns are sunk down to the hard sand, which is almost a sandstone, the position of which is shown by the strata section given at the top of page 72. It has come specially within the province of Mr. W. Shelford to consider the design and construction of the bridges on the railway, and after a visit of inspection to large numbers of the railway bridges of the Continent, paid with a view to test the often-asserted superiority in design and economy of French and German bridges over those of England, he came to the conclusion that while there was much to be admired in some of the foreign bridges, there was not a little to be shunned. An endeavour was made in the design of the bridges—the Ouse swing bridge included—to dispose the metal to the best advantage and secure a good appearance. The total quantity of wrought iron in the superstructure is 649 tons. The weight per foot run is 1·58 tons. The character of the bridge will be readily gathered from our engravings. It differs from the North-Eastern Company's swing bridge of the same span a few miles up the river, in that it is of the simple lattice instead of the plate girder form, and it certainly has secured the better appearance.

The depth of the main girder at the centre is 21ft. Here it is surmounted by a watch tower to be occupied by a signalman, under whom the whole of the movements of the bridge and the locking of the railway signals will be controlled. The positions of the hydraulic machinery will be readily gathered from Fig. 2, showing the apparatus for turning the bridge, while Fig. 4 shows the cylinder and knuckle gear by which the ends are slightly raised to admit the resting blocks as soon as they are over the outer piers. Before opening the bridge the ends are again raised and the blocks withdrawn from under the ends to leave it free to turn.

The hydraulic pumps and engines by which they are worked are situated in one end of the long central pier, by which the swing span is protected when open from injury by vessels not in control. Part of this end of this pier is shown at Fig. 2.

There is a great deal on this line which we have not described; but our readers would not be thankful for a minute description of the things which are of common occurrence either as structures or as events in the construction of a line. We shall return to the Ouse Bridge in another impression, when we shall say something more of the hydraulic machinery. The ironwork has been constructed by Messrs. Handyside and Co., of Derby, and the hydraulic machinery by Messrs. Sir W. G. Armstrong, Mitchell, and Co., for Messrs. Lucas and Aird. Mr. W. Shelford, Westminster, and Mr. G. Bohn, Hull, are joint engineers of the railway, Mr. Shelford being chief adviser of the company.

The work now most conspicuously attracting attention is the development to which the Hull and Barnsley line has given rise, viz., the extension of that line by the same company to Halifax and Huddersfield. Not only will the two important centres of industry just named be brought into communication with the port of Hull on advantageous terms which previously no company or companies could offer to them, but a company is now promoting a scheme which will connect the Hull and Barnsley Railway with Holmfield by means of a high level railway. This will effect a junction with the Halifax, Thornton, and Keighley

PNEUMATIC MALTING AT TROYES FOR 120 QUARTERS PER DAY

M. SALADIN, PARIS, ENGINEER.

(*For description see page 69.*)

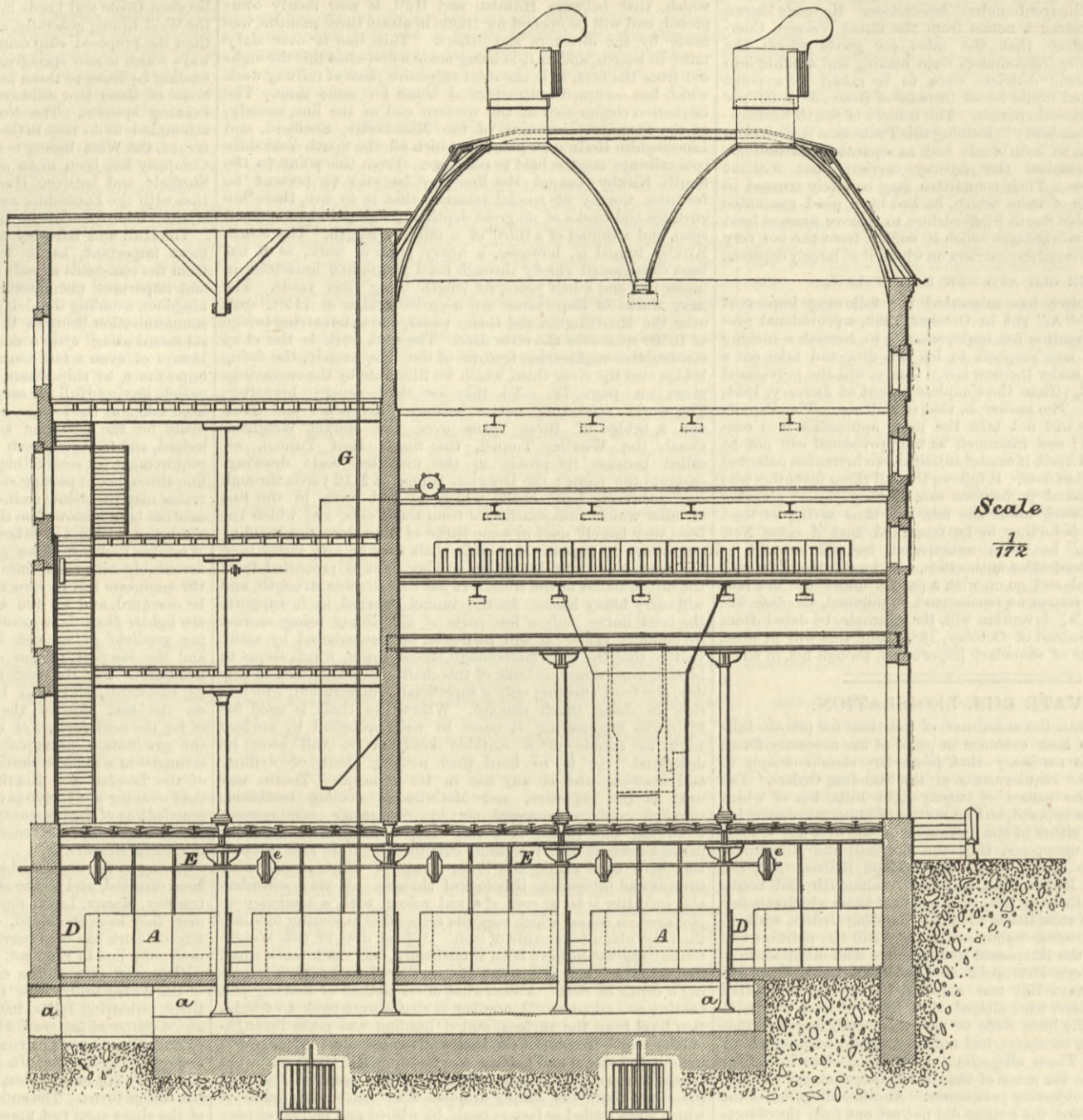

Fig. 3.
Section on line C.D Fig. 2.

Scale $\frac{1}{172}$

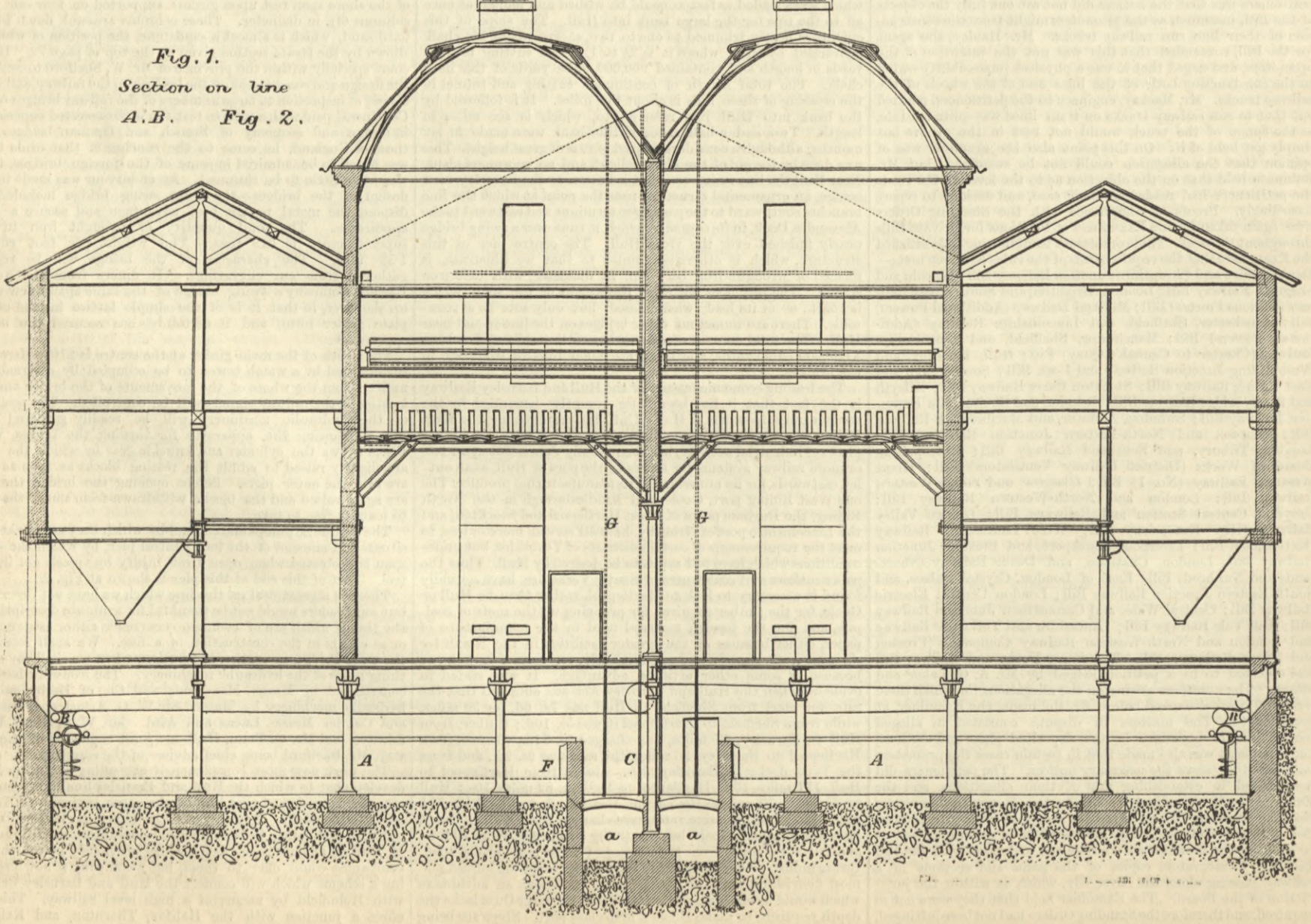

Fig. 1.
Section on line A.B. Fig. 2.

Railway, and greatly improve the communication both with the North of England and Scotland. The extension to Huddersfield and Halifax will also admit the Midland Company to these towns. To this extension, which will present some features of engineering interest, we shall at a future time return.

Of the Alexandra Docks, for which Mr. Abernethy, Westminster, is chief engineer, and Messrs. Oldham and Bohn, acting engineers, we shall have also to speak in another impression, as this is a work of very great magnitude and of much interest.

ON THE METALLURGY OF NICKEL IN THE UNITED STATES.

BELOW we print a *resumé* of a lecture given by Mr. W. P. Blake, F.G.S., of New Haven, Conn., at the Boston meeting of the American Institute of Mining Engineers, on the recent progress which has been made in the preparation of the purer forms of this metal. At the outset he gives the discovery of nickel in 1751 by Cronstedt. It is, however, now some years since it was shown by Dr. Walter Flight, F.R.S., of the British Museum, South Kensington, that it was used in coins in India more than 2000 years ago. The kings of Bactria, Euthydemos, Agathocles, and Pantalon had oboli, not of silver, as had their predecessors and successors, but of an alloy of copper and nickel, about intermediate in composition between that used by the Belgians when they employed this alloy about thirty years ago and that more recently employed in Germany, the British colonies, and elsewhere for more recent coinage; containing, in short, about 23 per cent. of nickel and 77 per cent. of copper.

Nickel ore is more generally distributed throughout the mineral-bearing portions of the United States than is generally supposed. It is commonly associated with chrome over the Pacific slope, notably in Oregon. It is also a common associate of magnetic pyrites in the Archæan rocks, being found in Litchfield county, in Connecticut, in the Highlands of the Hudson, in New York, and in New Jersey; and especially at Lancaster Gap, in Pennsylvania, where the chief supply of nickel has been obtained for the United States. This ore yields from 1½ to 2 per cent. of nickel, but is enriched by smelting it at the mine into a matte containing 10 per cent. or more of the metal. This locality was worked some thirty years later by Professor James C. Booth, and others, of Philadelphia, and some nickel alloy was made. Some ten years later Mr. Joseph Wharton purchased the works and established the industry at Camden, N.J., opposite Philadelphia, where it has since been carried forward. Since the development of nickelling by galvanism, a large part of the products of their works has been put into the form of nickel salts and anodes. But Mr. Wharton, not being content with the production of impure nickel, early commenced experiments to determine whether nickel could not be produced in a pure and malleable condition, susceptible of being worked in nearly the same manner as iron, and of being applied in the manufacture of various objects requiring strength of material, and a material that could not easily be oxidised. One of his earliest experiments was to take the somewhat spongy mass got by reduction of the oxide of nickel, and after heating it to a full redness, working it under a steam hammer into a bar. In 1873 Mr. Wharton sent to the Vienna Exhibition a sample of nickel in the form of axles and axle-bearings, and at the Exhibition in Philadelphia in 1876 he exhibited a remarkable series of objects made of wrought nickel, such as bars, rods, a cube, a horseshoe magnet, and magnetic needles of forged nickel. These did not excite the interest to which they were entitled as a remarkable advance in the working of this little-known metal. The exhibit did not cause much comment, and it was not especially described or reported upon, so far as I am aware, except by the judges, who reported the exhibit to the Commission as worthy of an award in the following terms:—"A fine collection of nickel ores from Lancaster county, Pa., with nickel-matte, metallic nickel in grains and cubes, and manufactured nickel both cast and wrought; nickel magnets and magnetic needles, cast cobalt, electro-plating with nickel and cobalt, and salts and oxides of both these metals; the whole showing a remarkable degree of progress in their metallurgical treatment." Some of the same objects, formed of wrought nickel, were sent over to Paris two years later, and were exhibited in the American section in 1878. There, as in Philadelphia, they did not excite any surprise or receive any special attention. Very few persons realised what the objects really were, and that they were very different from alloys of nickel. In fact, very few chemists had ever seen nickel. Pure nickel was a rarity, a curiosity, just as specimens of indium or thallium are to-day. You can then, perhaps, imagine the incredulity of the expert chemists and metallurgists of Europe when whole ingots and forged bars of metal and numerous finished articles of pure wrought nickel without alloy were offered for their inspection. These articles not differing greatly in appearance from the higher grades of nickel alloys or from electro-nickelled objects, they passed them without surprise. No previous exhibition had been so rich in exhibits of the use of nickel and in the products from them. The influx of the pure carbonised and oxidised ores from New Caledonia had greatly stimulated the nickel industry in Europe, and had improved the quality of the alloys of nickel. New companies had been formed to manufacture nickel silver and to produce nickel from these superior ores at a lower cost than had before been possible. Christofle, of Paris, had just erected extensive works at St. Denis, and had made a most brilliant display of this product in one of the main avenues of the Exposition. The Vivians of Swansea and other exhibitors had large cases filled with beautiful objects of hollow and solid ware made of nickel silver. Amid these various exhibits of striking *tours de force*, the modest little show-case from the United States with examples of manufacture of *pure wrought nickel*, not alloy, could hardly be expected to excite attention and win the golden award, which was most cheerfully accorded as soon as the fact was demonstrated by analysis that the objects were really of the pure metal. Some of the objects now shown were of that Exhibition, and have retained their polish and lustre unimpaired. These notable advances in the metallurgy of nickel, made with the lean and sulphuretted ores of Lancaster Gap, prepared the way for further advances. Dr. Fleitman, of Iserlohn, Westphalia, Prussia, has improved and cheapened the operation of preparing the nickel and toughening it, and has reduced the liability to the presence of blow-holes in castings by adding to the molten charge in the pot, when ready to pour, a very small quantity of magnesium. This is at once decomposed, says Mr. Blake—rather should we say, is at once acted upon—magnesia is formed, and graphite is separated. It would seem that the magnesium decomposes the occluded carbonic oxide or reduces it to a minimum. The magnesium must be added with great care and in small portions, as it unites explosively with the charge. It is stirred in. About one ounce of magnesium is sufficient for 60 lb. of nickel. Three-quarters of an ounce to 54 lb. of metal has been used with success by Mr. Wharton. The nickel from the ore at Lancaster Gap seems not to require as much as the foreign metal. It is to be noted that complete malleability of nickel was obtained at Wharton's works, in Camden, before Fleitman's invention or process, but this last plan is more rapid, and better than the old method. The metal so treated becomes remarkably tough and malleable, and may be rolled into sheets and drawn into wire. Cast plates can be successfully rolled. The cast plates, such as are made for anodes, are reheated and rolled down to the desired thickness. It is found that it is a great improvement to the nickel anode plates to roll them down. They dissolve with greater uniformity in the bath. Nickel so treated with magnesium has been rolled into sheets as thin as paper. Extensive works for rolling the metal have been erected by Mr. Wharton at Camden. There is already a train of 40in. rolls, 18in. in diameter, with annealing ovens and gas-furnaces and their adjuncts, and a 90-horse power engine. At present this mill, as well as the works for producing the metal, and the mine also, are "shut down." The largest sheet yet rolled at Camden was 72in. long and 24in. wide, of pure nickel. Dr. Fleitman has also succeeded in welding nickel upon iron and upon steel plates, so as to coat them equally on each face with a layer of nickel. The quantity preferred by weight is 8-10ths iron and 3-10ths nickel, 1-10th of nickel being placed on each surface. To secure union, the iron or steel must be perfectly flat and clean. A pile is made of outer facings of sheet iron to protect the nickel from scaling. When the whole is heated to the proper degree, it is passed through the rolls. The two metals become so firmly united that they may afterwards be rolled down, two or three together, or separately, to the thinness desired. The samples exhibited at Mr. Blake's lecture have been cut from sheets made at Mr. Wharton's works at Camden. One sample, No. 20 gauge, contained 10 per cent. of nickel; another sample, No. 22 gauge, 10 per cent. of nickel; and one sample showed the edge of the sheet. These were all examples of pure nickel on iron. He also showed a thin sheet of pure nickel annealed. The physical properties of the two metals, iron and nickel, are so nearly the same that they work well together. The nickel surface cannot be removed or regained from the scrap and waste except by dissolving out the iron core by dilute sulphuric acid. In the earlier experiments the ingots or cast plates were beaten under the hammer; this produced a great deal of scale and waste, as with iron; but this is now avoided, partly by the device of a thin covering of sheet iron, which is afterwards dissolved off. Dr. Fleitman claims to have produced steel wire similarly coated, and proposes to make nickelled boiler plates.

The application in the arts of such nickelled iron sheets as I have described will readily suggest themselves. Up to this time the most direct uses seem to be in making hollow ware, particularly culinary vessels. The manufacture has already begun at Schwerte, by Dr. Fleitman, and a great variety of vessels, such as saucepans and kettles, have been turned out, some of them of pure sheet nickel. They are very beautiful in appearance, resembling highly-finished platinum vessels more than ordinary ware. When planished and buffed off, the surface becomes like a mirror, and will answer the purpose of one.

This ware is believed to be far superior to tinned iron or tinned copper for cooking in. The nickel is not only less liable to corrosion, but is harder, will wear longer, and cannot be melted off by overheating. The ware is lighter and stronger than tin or copper ware, is susceptible of a high polish, and is not easily tarnished. The coating of nickel applied by welding is stronger and tougher than that deposited by electrolysis, and appears to be less liable to scale off.

Mr. Joseph Wharton produced at his works at Camden *pure nickel* before the year 1876 in a malleable state, and in considerable quantities.

THE UNITED STATES PATENT-OFFICE.

As those applications for patents on which the final fees were paid on the 13th inst. will not be issued until January 1st, 1884, all the patents which will be issued in the year 1883 have now been determined upon, and the total issues for the year may be obtained. A calculation shows that during the year 1883 there have been issued 21,196 patents, 167 re-issues, 1020 designs, 902 trade-marks, and 906 labels. The total number issued since July, 1836, when the record was first started, is 289,793 patents, 10,418 re-issues, 14,465 designs, 10,769 trade-marks, and 3743 labels. These figures indicate in some degree the immense amount of labour performed by the Patent-office, and the record for the present year shows how rapidly the spirit of invention is increasing.

In the second week in December the speaking telephone interference cases were heard before the Examiner-in-chief in Appeals from the decision of the Examiner of Interferences. The occasion was a notable one from the number of distinguished counsel who appeared for the different claimants, among them Mr. Roscoe Conkling.

These interferences were declared in 1878, and they involve not only the art or method broadly of transmitting articulate speech by throwing electrical undulations corresponding to the sonorous vibrations of the spoken words upon a wire, but the various forms of application that had been suggested up to that time for carrying this method into practical operation. According to the *Scientific American*, seven parties now lay claim to the merit of this striking invention, viz., Alexander Graham Bell, J. W. McDonnough, Thos. A. Edison, Elisha Gray, A. E. Dolbear, Francis Blake, and J. H. Irwin. A vast amount of testimony was submitted, and the Examiner of Interferences, after a long delay, announced his opinion last June in a pamphlet of 350 printed pages.

This opinion is an epitome of the case. The first thirty pages are devoted to an examination of the state of the art as described in prior publications. An explanation and construction of the various issues involved occupies the next thirty-five pages, and in 271 pages following the examiner traces the history of the invention of each party as disclosed in the testimony. The conclusion is then drawn that Bell is entitled to judgment of priority for the fundamental invention of the telephone as a whole and for the greater part of the particular devices involved in the interference. Mr. McDonnough is, however, adjudged the first inventor of the telephone receiver, which is a constituent and necessary part of any speaking apparatus; and Mr. Edison is awarded a particular form of the water telephone, an instrument now out of use and of very little importance.

While the examiner enters upon a minute investigation of the facts of the case, he declares that he is controlled to some extent by certain technical presumptions arising upon the face of the papers. These state that he is not entirely clear that Bell had any knowledge, at the time his application was filed, of any practical apparatus for speaking purposes, but that he must assume, as in other cases, that the invention was made at least as early as that time. The examiner's rulings upon these points, as well as his findings of fact, were arraigned as errors upon the appeal. It was argued before the Board that the controversy should be determined upon its merits, and not upon strained constructions of the issue and technical presumptions at variance with the facts in the case. The hearing was concluded on December 15th, and it will probably be some months before the Board will formulate its decision.

That Congress not only made no increase in the clerical force of the Patent-office last year, but actually reduced their number by twenty, is being prominently brought to the attention of Congress men. It is undeniably a strong argument for ample force in the Patent-office that there is now a surplus of 2,500,000 dols. in the National Treasury belonging to the Patent Department. A system of lessening the cost of patents by a graduated scale of fees has been proposed, but excessive cost is not so often complained of as the sometimes inevitable delays, many of which might be avoided by a more generous use of the money of patentees in paying for help in the Patent-office. The Commissioner of Patents is required by law to make a report to Congress at the close of each calendar year, and it seems there has been an increase in nearly every branch of the office last year, and the receipts for money paid in during 1883 over 1882 is, in round numbers, £27,000. This, however, does not equal the increase of 1882 over 1881, which was over £31,000. The increase in correspondence has been about 10 per cent., and in applications of every kind nearly 20 per cent. The number of patents forfeited during the year is about 2000.

The Civil Service Committee has completed its rules for the examination of applicants for positions in the Patent-office. For the position of assistant-examiner the applicant will be required to show a knowledge of arithmetic, of algebra to equations of the second degree, of geometry and trigonometry, of chemistry and physics. For draughtsmen, drawing from mechanical models and explanations of certain rules for mechanical drawing will be required. For the position of assistant librarian, which is now vacant, a knowledge of French and German, and the ability to properly translate those languages into idiomatic English, is required, as well as explanations of methods of cataloguing, and the proper arrangement of books by classification of subjects. This knowledge of German is also made desirable in those seeking positions as assistant-examiners.

The controversy respecting the electric railway is now fairly inaugurated in the Patent-office. The proceedings have been somewhat delayed by the taking of testimony abroad under a commission in support of the claims of the celebrated German scientist, Dr. Werner Siemens, of Berlin. Counsel were heard in December upon the merits of the case before the Examiner of Interferences. A small section of road was built and operated by Messrs. Siemens, at the Exposition at Berlin in 1879, and there are now several short lines in operation in various parts of Europe, and notably one at the Giant's Causeway, in Ireland, familiar to travellers. Edison has a line two miles and a-half long at Menlo Park, New Jersey, fully equipped and in daily operation, for the benefit of visitors and pilgrims to the shrine. There is also an experimental road at Saratoga Springs, and another claimant is Stephen D. Field, of New York, a nephew of Cyrus W. Field.

The Commissioner recently gave a decision in a case which has been long pending, the application having been filed January 6th, 1883, wherein it was claimed that John T. Berchers had discovered a method to effectually and fully preserve fish in cans. His method he described as cutting the fish longitudinally and in thin slices, instead of transversely and in thick lumps or chunks. Both the examiner who had the case in the first instance and the Board of Examiners-in-Chief decided that there was nothing patentable in the application, and the Commissioner, after fully setting forth the facts in the application, sustains the opinion of the examiners. —*Scientific American.*

THE MINERAL PRODUCTS OF THE UNITED STATES.

A REPORT entitled "The Mineral Resources of the United States," has recently been published by Mr. Albert Williams, jun., chief of the Division of Mining Statistics and Technology, United States Geological Survey, Hon. J. W. Powell, Director. This report is for the calendar year 1882 and the first six months of 1883. It contains detailed statistics for these periods and also for preceding years, together with much technical and descriptive matter. The compilation of special statistics has been placed by Mr. Williams in the charge of leading authorities in the several branches, and the results will therefore be accepted with confidence. The following totals of the production of the more important mineral substances are from advanced proofs.

Coal.—The only statistics in which the trade is interested are those relating to the amount of coal which is mined for and reaches the market. There is, besides, a local and colliery consumption which is usually disregarded in statistics, and which ranges from 5 to 6½ per cent. on the total shipments. Of what may be called the commercial product, the quantities in 1882 were: Pennsylvania anthracite, 29,120,096 gross tons; bituminous, brown coal lignite, and small lots of anthracite mined outside of Pennsylvania, 57,963,038 gross tons; total, 87,083,134 gross tons. The spot value of the commercial product was as follows: Anthracite, 65,520,216 dols.; bituminous and other coals, 72,453,797 dols.; total, 137,974,013 dols. During the first six months of 1883 the output was. Pennsylvania anthracite, 14,010,767 gross tons; bituminous and all other coals, 30,000,000 gross tons; total, 44,010,767 gross tons. The spot value of the commercial product during the first half of 1883 was: Pennsylvania anthracite, 31,524,226 dols.; bituminous and other coals, 37,500,000 dols.; total, 69,024,226 dols. Including the local consumption, &c., the total product in 1882 may be stated at 92,219,454 gross tons, namely, 31,358,264 tons of Pennsylvania anthracite and 60,861,190 gross tons of other coals; and the value at the mines was: Pennsylvania anthracite, 70,556,094 dols.: bituminous coal, &c., 76,076,487 dols.; total, 146,632,581 dols.

Iron.—The principal iron statistics for 1882 are as follows:—Pig iron made, 4,623,323 gross tons; spot value, 106,336,429 dols. Iron ore mined, 9,000,000 gross tons; spot value, 32,400,000 dols. Domestic iron ore consumed, 8,700,000 gross tons; spot value, 31,320,000 dols. Imported iron ore consumed, 589,655 gross tons. Total iron ore consumed, 9,289,655 gross tons. Total spot value of all iron and steel in the first stage of manufacture, excluding all duplications, 171,336,429 dols. Anthracite consumed in all iron and steel works, including furnaces, 3,800,000 gross tons. Bituminous coal consumed in all iron and steel works, including furnaces, 6,600,000 gross tons. Coke consumed in all iron and steel works, including furnaces, 3,350,000 gross tons. Charcoal consumed in all iron and steel works, including furnaces, 107,000,000 bushels. Limestone consumed as flux, 3,850,000 gross tons; spot value, 2,310,000 dols. For the first six months of 1883 the totals are as follows:—Pig iron made, 2,352,019 gross tons: spot value, 47,040,380 dols. Iron ore mined—and consumed, 4,500,000 gross tons; spot value, 12,375,000 dols. Imported iron ore consumed, 185,000 gross tons. Total iron ore consumed, 4,685,000 gross tons. Total spot value of all iron and steel in the first stage of manufacture, excluding all duplications, 71,000,000 dols. Anthracite consumed in all iron and steel works, including furnaces, 1,810,000 gross tons. Bituminous coal consumed in all iron and steel works, including furnaces, 3,140,000 gross tons. Coke consumed in all iron and steel works, including furnaces, 1,780,000 gross tons. Charcoal consumed in all iron and steel works, including furnaces, 38,750,000 bushels. Limestone consumed as flux, 1,950,000 gross tons; spot value, 1,072,500 dols.

Gold and silver.—The Mint authorities furnish the following statistics for 1882:—Gold, 32,500,000 dols.; silver, 46,800,000 dols.; total, 79,300,000 dols.; or an increase of 1,600,000 dols. over the output in 1881. For the first six months of 1883 the product is estimated at 16,250,000 dols. gold, 23,400,000 dols. silver, and 39,650,000 dols. total; the rate of production being assumed to be the same as in 1882.

Petroleum.—The production of crude petroleum in the oil fields of Pennsylvania and New York in 1882 was 30,053,500 barrels of 42 gallons each, worth, at an average spot value of 78⅞c. per barrel, 23,704,698 dols. During the first six months of 1883 the yield was 11,291,663 barrels, worth, at an average spot value of 1·00⅛ dols. per barrel, 11,305,778 dols. In addition to the quantity above stated, California produced in 1882 about 70,000 barrels.

Copper.—The production of copper in 1882 was 91,646,232 lb., worth, at an average value of 17½c. per lb. in New York, 16,038,091 dols. For the first half of 1883 the production is estimated at 58,000,000 lb., worth, at an average price in New York of 14·65c. per lb., 8,500,000 dols. The spot value of the copper at the point of production is a matter which cannot be stated with any accuracy; nor was any attempt made to ascertain the tons of copper ore mined. In 1882, 3,325,000 lb. of bluestone, worth 191,187 dols. were made; and in the first half of 1883 the manufacture of bluestone is estimated at 1,662,500 lb., worth 95,593 dols.

Lead.—In 1882, 132,890 tons of lead were produced, worth, at an average value of 95 dols. per net ton on the eastern seaboard, 12,624,550 dols. For the first half of 1883 the production is estimated at 70,000 net tons, worth, at 90 dols. per ton, 6,300,000 dols. In this case, as with copper, it is impossible to state the average spot value of the lead, or the tons of lead ore mined. A very large proportion of the lead ore smelted is argentiferous, and is worked for its silver contents and not for the value of the lead. In the census year ending May 31st, 1880, the amount of white lead corroded was reported at 123,477,890 lb., worth 8,770,699 dols.

Zinc.—The production of metallic zinc in 1882 was 33,765 net tons, worth at an average value of 5·4c. per lb. in New York, 3,646,620 dols. The production during the first six months of 1883 is estimated at 18,000 net tons, worth, at an average value of 4⅝c. per lb. in New York, 1,665,000 dols. In addition to the spelter and sheet zinc made in this country, there is also a large manufac-

ture of zinc oxide made directly from the ore. As in the case of copper and lead, it is impossible to fix an average spot value for the product, and the collection of statistics of zinc ore mined has not been attempted. In the census year, 1880, the amount of zinc oxide manufactured, including that made from scrap zinc, was reported at 20,121,761 lb., worth 766,337 dols.

Quicksilver.—In 1882 the production of quicksilver was 52,732 flasks—of 76½ lb. each = 4,033,998 lb.—worth, at an average price in San Francisco of 36⅞c. per lb., 1,487,537 dols. During the first six months of 1883 the production was 22,740 flasks, = 1,739,610 lb., worth, at an average price of 35½c. per lb., 613,213 dols. During the year 1882, 700,000 lb. of vermilion were made in the United States, having a total value of 315,000 dols.

Nickel.—The production of pure grain nickel in 1882 was 277,034 lb. worth, at 1·10 dols. per pound, 304,737 dols. There was also a production of 50 per cent. copper-nickel alloy containing 4582 lb. of nickel, worth 5040 dols. The total nickel production was therefore 281,616 lb., worth 309,777 dols. The only nickel reduction works in the United States were closed during the first half of 1883.

Cobalt.—The value of cobalt ores and matte for 1882 was about 15,000 dols. The amount of cobalt oxide made was 11,653 lb., worth 32,046 dols.

Manganese.—The production of manganese ore in 1882 was 3500 gross tons, and the spot value at the mines, estimated at 15 dols. per ton, was 52,500 dols.

Chromium.—The production of chrome iron ore in 1882 was about 2500 net tons, worth, at an average price of 40 dols. per ton in Baltimore, 100,000 dols. The spot value cannot be ascertained.

Tin.—A trifling amount of tin ore was mined in 1882 and the first half of 1883, and production of metallic tin began on a small scale towards the close of the latter period.

Antimony.—The production of metallic antimony, so far as ascertained, was 60 tons in 1882, worth about 12,000 dols.

Building stone.—It is estimated that the value of the building stone quarried in 1882 was 21,000,000 dols.

Brick and tile.—It is estimated that the total value of the brick and tile made in the United States in 1882 was 34,000,000 dols.

Lime.—There were 31,000,000 barrels—of 200 lb. each—made in 1882, having a total spot value of 21,700,000 dols. at the kilns.

Cement.—The amount of artificial Portland cement made in 1882 was 85,000 barrels, worth, spot, 191,250 dols. Of the cements manufactured from natural cement rock there were 3,165,600 barrels made, worth, spot, 3,484,500 dols. The total production of cement was 3,250,000 barrels, worth 3,672,750 dols.

Clays.—Complete statistics of the quantity of fire and potters' clay mined in 1882 were not obtained. The value of the white-ware made was over 5,000,000 dols.

Precious stones.—The spot value of the precious stones found in 1882, before cutting, was between 10,000 dols. and 15,000 dols.; after cutting, between 50,000 dols. and 60,000 dols.

Corundum.—It is estimated that 500 tons were mined in 1882, worth on an average only about 12·50 dols. per ton, crude and unground; total, 6250 dols. The value of the ground corundum manufactured during the same year was about 135,000 dols.

Grindstones.—The value of the grindstones made from domestic rock in 1882 is estimated by leading dealers at 700,000 dols.

Pumice stone.—There were 70 net tons quarried in 1882, worth about 1750 dols.

Phosphates.—The production of washed phosphate rock in 1882 by the land mining companies of South Carolina was 191,305 gross tons; spot value, 1,147,830 dols. By the river mining companies, 140,772 gross tons; spot value, 844,632 dols. Total, 332,077 gross tons; spot value, 1,992,462 dols.

Marls.—In New Jersey, 1,080,000 net tons of marl were dug in 1882. The average spot value at the pits is 50c. per ton, making the total 540,000 dols. There was a small yield of marls in some of the Southern States, the amount of which has not been ascertained.

Gypsum.—The most complete statistics for 1882 are those of the output of Michigan—namely, 37,821 net tons of land plaster and 135,655 barrels—of 300 lb. each—of stucco. The manufacture of plaster of Paris on the Atlantic seaboard was 525,000 barrels—of 250 lb. each—chiefly made, however, from Nova Scotia stone. Colorado produced 10,350 sacks, of 100 lb. each. The production of California and some other States was not ascertained.

Salt.—The amount of salt made in 1882 was 6,412,373 barrels of 280 lb. each = 1,795,464,440 lb., having a spot value of 4,320,140 dols. During the first six months of 1883 the production is estimated at 3,206,186 barrels = 897,732,080 lb., worth 2,160,070 dols., the rate of production being assumed to be the same as in 1882.

Borax.—The production in 1882 was 4,236,291 lb., having a spot value at the works of 338,903 dols. For the first half of 1883 the output is estimated at 2,800,000 lb., worth, spot, 224,000 dols.

Sulphur.—Complete statistics were not obtained. The production in the census year was stated at 1,200,000 lb., worth 21,000 dols.

Barytes.—The amount of crude barytes mined in 1882 was 20,000 tons, worth at the point of production 160,000 dols. The value of refined and ground barytes manufactured from the crude product above stated was about 440,000 dols.

Mica.—The quantity of merchantable mica mined in 1882 is estimated by leading dealers at 75,000 lb., worth 250,000 dols. The production is rapidly increasing.

Soapstone.—The amount quarried in 1882 is estimated at 6000 net tons, worth 90,000 dols. at the quarries.

Quartz.—The amount of quartz mined in 1882 for glass making and abrading purposes is estimated at 75,000 net tons.

Asbestos.—Amount mined in 1882, 1200 net tons, worth 36,000 dols. at the point of production.

Graphite.—Amount mind in 1882, 425,000 lb., worth, crude, at the point of production, 34,000 dols. During the first six months of 1883 the production is estimated at 262,500 lb., worth 21,000 dols.

Carbonate of soda.—Over 1,600,000 lb. were produced in 1882 from native deposits.

Asphaltum.—The production in 1882 was 3000 net tons, having a spot value of 10,500 dols.

Alum.—No statistics. In the census year the amount of manufactured artificial alum was reported at 39,217,725 lb., worth 808,165 dols.

Copperas.—The amount of copperas manufactured in 1882 is estimated at 15,000,000 lb., worth 112,500 dols. The production of the following named substances was insignificant:—Apatite, arsenic, bismuth, infusorial earth, iridium, lithographic stone, nitrate of soda, ozoderite, platinum, strontia. No reliable statistics were obtained of the following substances:—Burrstones, chalk, feldspar, fluorspar, mineral paints, pyrites—for acid manufacture—sulphate of soda, talc—other than "soapstone." None of the following substances are known to have been mined in 1882 or in the first half of 1883:—Carbons, cryolite, rotten stone, wolfram.

Totals.—It is impossible to state the total mineral product in any form which shall not be open to just criticism. It is evident that the production of statistics of such incongruous substances as iron ore, metallic gold, and silver; the spot value of coal mined and the market value of metallic copper after having been transported hundreds of miles; the spot value of a crude substance like unground, unrefined barytes, and the value of a finished product like brick—in which the cost of manufacture is the leading item—such details cannot well be taken as items in a general summary. The statistics have been compiled with a view to giving information on those points which are of most interest and utility, and are presented in the form usual in the several branches of trade statistics. The result is that the values stated for the different products are necessarily taken at different stages of production or transportation, &c. Theoretically perfect statistics of mineral products would include first of all the actual net spot value of each substance in its crudest form, as taken from the earth; and yet for practical purposes such statistics would have little interest other than the fact that the items could be combined in a grand total in which each substance should be rated on a fairly even basis. The following groupings, therefore, are presented with a full realisation of the incongruity of many of the items:—

Values of the Metallic Products of the United States in 1882.

	Dols.
Pig iron, spot value	106,336,429
Silver, coining value	46,800,000
Gold, coining value	32,500,000
Copper, value at New York City	16,038,091
Lead, value at New York City	12,624,550
Zinc, value at New York City	3,646,620
Quicksilver, value at San Francisco	1,487,537
Nickel, value at Philadelphia	309,777
Antimony, value at San Francisco	12,000
Platinum, value at New York City	1,000
Total	219,756,004

Values of some of the Non-metallic Products of the United States in 1882 (*all Spot Values, except Chrome Iron Ore*).

	Dols.
Bituminous coal, brown coal, lignite, and anthracite mined outside of Pennsylvania	76,076,487
Pennsylvania anthracite	70,556,094
Crude petroleum	23,704,698
Lime	21,700,000
Building stone	21,000,000
Salt	4,320,140
Cement	3,672,750
Limestone for iron flux	2,310,000
Phosphate rock	1,147,830
New Jersey marls	540,000
Crude borax	338,903
Mica	250,000
Crude barytes	160,000
Chrome iron ore, value at Baltimore	100,000
Soapstone	90,000
Manganese ore	52,500
Asbestus	36,000
Graphite	34,000
Sulphur	21,000
Cobalt ore and matte	15,000
Precious stones, uncut	12,500
Asphaltum	10,500
Corundum	6,250
Pumice-stone	1,750
Total	226,156,402

Résumé of the values of the Metallic and Non-metallic Mineral Substances produced in the United States in 1882.

	Dols.
Metals	219,756,004
Mineral substances named in the foregoing table	226,156,402
	445,912,406
Fire-clay, kaolin, potter's clay, common brick clay, terra-cotta, limestone used as flux in copper and lead smelting, iron ore used as flux in lead smelting, pyrites—for acid making—zinc white made directly from ore, marls—other than New Jersey—apatite, gypsum, tin ore, bismuth, arsenic, iridosmine, mill burstone and stone for making grindstones, lithographic stone, talc—other than "soapstone"—quartz, feldspar, fluorspar, terra-alba, chalk, crude mineral paints, nitrate of soda, carbonate of soda, sulphate of soda, native alum, ozokerite, mineral soap, strontia, &c., certainly not less than	8,000,000
Grand total	453,912,406

The grand total might be considerably reduced by substituting the value of the iron ore mined for that of the pig iron made; by deducting the discount on silver; and by considering lime, salt, cement, borax, &c., as munufactures. It will also be remarked that the spot values of copper, lead, zinc, and chrome iron ore are much less than their respective values after transportation to market.

THE NIAGARA CANTILEVER BRIDGE.

THE following statement of the dimensions of this bridge, which is exciting a good deal of attention in America, has been prepared by its chief engineer, Mr. C. C. Schneider. The general dimensions are as follows:—Length of bridge proper, from centre to centre of end of pins, 910ft. 1⅛in., divided into two cantilevers of 395ft. 2·5in. each, and one intermediate span of 119ft. 9in. The towers are braced wrought iron structures, 130ft. 6½in. high, resting upon masonry piers 39ft. high; the foundations under the towers are of beton, 8ft. thick, directly on the rock, forming a uniform, solid, and enduring mass. The trusses are two in number, 28ft. apart between centres; the panels are 25ft. long, excepting those of the intermediate span, which are 24ft., and the end panels of the shore arms of the cantilevers, which are 20ft. 2·5in. long. The depth of the cantilever trusses, over the towers, is 56ft., and at the ends 21ft. for shore ends, and 26ft. at the river ends. The structure has been proportioned to carry, in addition to its own weight, a freight train on each track at the same time, weighing 1 ton per lineal foot, with each train headed by two 76-ton Consolidation engines. The factor of safety is 5. Wind bracing has been proportioned for a pressure of 30 lb. per square foot on a surface twice the area of one face of the truss, plus area of floor system, plus the area of face of train taken at 10ft. vertical height.

The material used in the superstructure is open-hearth steel and wrought iron. Towers and heavy compression members, such as lower chords and centre posts, are of steel, as are all the pins. All tension members are wrought iron. The only use made of cast iron is in the pedestals on the masonry and in filling rings; the castings at the top of the towers are all steel. The whole of the superstructure is pin-connected. The towers contain four columns each, and each column is made up of plates and angles in sections of about 25ft. in length, braced with horizontal struts and with tie-rods. The batter of columns at right angles and the centre line of the bridge is 1 in 8. In the cantilever trusses the lower chords and centre posts are made of plates and angles latticed; the intermediate posts are made of 12in. and 15in. channels, latticed. The upper chords of the cantilevers are 8in. eye-bars, the shore arm having a compression member 18in. deep, composed of plates and angles packed between the chord bars. The shore ends of the cantilevers are attached to short links revolving on pins anchored to the masonry; these links serve as rockers and allow for the expansion and contraction of the shore ends of the cantilevers. Expansion joints are also provided for at the connection of the intermediate span with the river ends of the two cantilevers, the intermediate span being suspended from the extreme ends of the river arms. The floor beams are 4ft. deep, and are made of plates and angles; they are rivetted to the posts. There are four lines of longitudinal stringers, resting on top of the floor beams; these stringers are plate girders 2ft. 6in. deep. The ties are white oak 9in. by 9in., spaced 18in. between centres; every other tie projects to support a plank walk and hand railing, which latter is made of cast iron posts 6ft. apart, and four longitudinal lines of 1¼in. gas piping. The guard timbers are of white oak 8in. by 8in.

All masonry is built of Queenstown limestone, in courses of 2ft. rise. The piers for the towers are 12ft. square under the coping, and have a batter of ½in. to the foot; each pair of piers is connected by a wall 3ft. 9in. thick at the top, and battering the same as the piers. The anchorage piers are 11ft. by 37ft. 6in. under coping, with a batter of ½in. to the foot. They rest on a platform consisting of twelve iron plate girders 2ft. 6in. deep and 36ft. long; under these plate girders are eighteen 15in. I beams, through which the anchorage bars pass, in such manner as to distribute the pressure over the entire mass of masonry. Each anchorage pier contains 460 cubic yards of masonry, weighing 2,000,000 lb.; as the maximum uplifting force from the cantilevers under the most unfavourable position of load is only 678,000 lb., it will be seen that this upward force is amply counterbalanced.

The shore arms of the cantilevers have been erected on false works in the usual manner, and after their completion the river arms were built out panel by panel by means of a travelling crane projecting over the completed portion, and advancing as each panel was in place and its bracing adjusted. The centre, or intermediate span of 120ft., is of a design which allowed its being built out from the river arm of the cantilever until reaching the middle panel, which was accurately fitted to close the gap between the two sides. The near approaches to the main structure, on both sides, are substantial iron trestles resting on masonry foundations erected upon solid rock.

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

(*From our own Correspondent.*)

JANUARY has not so far brought out much valuable business. Export merchants do not appear desirous of buying beyond early necessities, notwithstanding that the prices at which they could to-day secure supplies were scarcely ever lower. It is still not an easy matter to persuade local consumers to accept deliveries under old contracts. Hence the works are this week only partially occupied, numbers of them not beginning until Tuesday and Wednesday night.

On 'Change this—Thursday—afternoon in Birmingham, makers of best sheets of iron and mild steel were still able to report themselves as exceptionally active. Next to sheets, second and third-class bars were in most enquiry, and tire iron, angles, and tees were in fair request. The prices attached to some merchant enquiries were, however, so low that they had to be unceremoniously refused.

Marked bars were £8 2s. 6d. to £7 10s. and £7. Second-class qualities were £6 15s. to £6 10s.; and third-class, £6 7s. 6d. to £6. Hurdle bars were here and there to be had at £5 17s. 6d. Hoop makers were very various in their quotations. When orders were wanted, and the quality not very special, £6 was accepted, but the general price was £6 5s. to £6 10s., and on to £6 15s. Qualities rolled by the "list" iron houses were quoted £8.

Hoops were in tolerable call by Manchester and Liverpool merchants, but competition from Warrington, North Staffordshire, and other districts is increasing. The United States demand is conspicuous by its absence.

Plate makers did not meet with any large demand whether for boiler or tank qualities, and only part of the mills is running. Girder plates are in slightly better request, and also iron for building purposes. Tank plates were £7 10s. easy for common sorts, and boiler plates £8 10s. For superior sorts £9 to £9 10s. was asked.

The open market price for sheet singles was about £7 10s. to £7 15s.; doubles, £8 to £8 2s. 6d., and occasionally £8 5s.; and lattens, £9 easy. Working-up sheets remained at £10 to £11.

Pig makers spoke with satisfaction of the continued improvement in the Scotch and Cleveland markets. Cleveland No. 3 foundry pigs were quoted at 49s. 6d. per ton delivered, an advance on the week of 6d. There were, however, no sales. Derbyshire pig agents reported a better business in favourite brands, for which they firmly demanded 46s. Northamptons were 44s. to 45s. Native cinder pigs, 42s. 6d. to 38s. Hematites were slow at 57s. 6d. to 60s., and native all-mines still less active at 60s. Some of the Derbyshire pig makers, I learn, are about to blow out furnaces.

It is noteworthy that the magnates of the South Staffordshire pig iron trade at date are Messrs. Joseph Pearson, Alfred Hickman, Roberts, and P. and T. Bradley, gentlemen who were unknown to fame say twenty years ago, and who have risen to eminence upon the manufacture of cinder pig. These four firms have, I believe, sixteen furnaces in blast, and are extending their plant.

It is an important consideration at the present time that if the railway companies serving South Staffordshire would reduce the carriage of Northampton mine, Pottery mine, Ulverstone hematite, and Spanish ore 1s. 6d. per ton all round, it would largely reduce the cost of making pig iron in this district, and enable us to make our own pigs, without bringing so much of our supplies from other parts.

The demand for mill and forge coal is quieter this week than last, and the collieries are doing less work. Forge coal is 6s. to 6s. 6d., and best mill coal 7s. to 7s. 6d.

Some of our present mineowners and ironmasters are much dissatisfied with the present short hours system among the colliers, which, they urge, has greatly increased the cost of raising the minerals in this district. A few of them hold that the Mines Regulation Act and the eight hours' system was the cause of the confiscation of the ironstone mines of South Staffordshire, and of the drowning out of the Bilston district, which was the ironstone district of South Staffordshire. Such owners contend that the colliers and miners ought now to revert to a system of nine hours. Any attempt, however, to bring about such a change would be worse than futile—at any rate at the present time.

The miners in the Old Hill district who struck work against the introduction of certain new rules at two or three collieries have now resumed, the masters having agreed to reinstate the old rules.

Manufacturers engaged in the production of railway ironwork, carriage fittings, and signal fitting work are actively employed.

Merchants do not report any great activity in the hardware trades. Orders from Calcutta and the surrounding districts are not arriving with freedom, since many consumers are postponing buying until after the close of the Exhibition, when they will purchase the large stocks of goods now on show here.

Yet some makers of cultivating tools have, since the beginning of the month, received a most encouraging influx of Indian orders, which are directly the result of their display at the Exhibition.

The Canadian spring buying will, merchants anticipate, shortly open very satisfactorily. Already manufactured goods are being consigned to agents out there with some vigour. Cycles are getting into increased use in Canada, and makers are now executing big orders for that market, as also for New Zealand, Germany, Switzerland, Holland, and elsewhere abroad.

The three railway companies serving the Wolverhampton and the surrounding district have been applied to by the Corporation Committee who are promoting the forthcoming Fine Arts and Industrial Exhibition in Wolverhampton to make some concessions in passenger fares and other charges for traffic on the occasion.

At Mason's College, Birmingham, on Monday, Professor Poynting, professor of physics, addressed a large audience upon "Some Modern Applications of Electricity." In explanation of why he used the word "modern," the professor reminded his hearers that it was only within the last fifty years that the telegraph had been employed to any extent, and that electro-plating had been introduced even since then. But the science of electricity had made rapid progress, and by "modern applications" he meant those which we saw coming into use every day, such as the dynamo machine, which, though invented many years ago, was only now establishing itself; and the telephone, which had been invented in the last six or seven years. The lecturer gave a number of interesting experiments with a dynamo machine, and, concluding with a description of the telephone, observed that beginning with the Bell instrument, in which the speaker was made to do the work, there had been a great saving of human labour effected by the present time, for the voice was now merely the regulator of the natural force stored up in the battery.

The North Staffordshire finished iron trade is quiet. Orders are irregularly distributed, and on an average the specifications arriving are not more than find employment for the mills about four days a week. Bars and hoops are selling with most freedom upon the basis of £7 for best crown bars, £6 12s. 6d. to £6 10s. for inferior sorts, and £6 5s. to £6 for common qualities. Best hoops are quoted as high as £7 10s., but it is in the less valuable qualities that business is chiefly doing. Common angles are abundant at

£6 10s. to £6 15s., and best at £7 5s. Crown tees range from £7 up to £7 10s. nominal.

The export trade is dull. A few specifications from the colonies and South America are coming in, but business with Russia, America, and Canada is almost *nil*. Yet inquiries from these places are being received for lots to be delivered in spring. The demand for plates is not up to the average, although orders for some sorts have lately shown a little more briskness.

Crown plates are £7 12s. 6d. to £8 5s., delivered Liverpool or equal, although the list rates of the best firms are still—Plates, £8 10s.; best ditto, £9; double best, £10; and treble best, £12 per ton. In the heavy ironfounding and engineering trades of North Staffordshire a brisk business is being done, and this activity stretches back for several months past.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—During the past week there has been a considerable weight of buying going on in pig iron in this district, and this has given a steadier tone to the market. It can, however, scarcely be said that there is any actual improvement in trade based upon any really enlarged requirements. The buying which has been going on is not so much an indication that the wants of consumers are increasing, but rather that they have thought it prudent to take advantage of the low prices to give out contracts for forward delivery, and there is no disposition to follow any upward movement in values. Makers, however, are now holding out for a slight advance upon the very low prices that have recently been taken, and the blowing out of furnaces in the North of England, with the prospect of a similar movement in the Cumberland districts, also tend to lessen the pressure to sell.

At the Manchester market on Tuesday there was generally a firm tone so far as quotations for pig iron were concerned, at a slight advance upon the minimum rates taken last week. Lancashire pig iron makers, who have recently sold some tolerably large lots on the basis of about 44s. to 44s. 6d. less 2½ for forge and foundry qualities delivered equal to Manchester, were asking about 6d. per ton above these figures for further orders. For district brands the average quoted prices were about 44s. 4d. to 44s. 10d. for forge, and 45s. 4d. to 45s. 10d. for foundry Lincolnshire, less 2½ per cent. delivered here. In some cases there are sellers at a little under these figures, and there are buyers in the market for considerable quantities at 6d. to 1s. per ton under the quoted rates. Middlesbrough iron is now quoted at 45s. 4d. net cash for good named brands of foundry delivered equal to Manchester, but the quantity of North-country iron coming into this district is very small.

In hematites the business doing is still very limited, but in some cases rather better prices are being realised, 56s. 6d. less 2½ having been got this week for good foundry brands delivered equal to Manchester. The average selling prices are, however, 6d. to 1s. per ton under this figure.

The finished iron trade shows no improvement. For good local and North Staffordshire bars delivered into the Manchester district the average price is about £6 per ton, and at this figure a few sales are made, but there are inferior brands to be bought in some cases at 2s. 6d. per ton less, and prices generally may be said to be weak.

In the engineering trades there is a continued quieting down generally. Tool makers are still well employed upon old orders, but the new inquiries coming forward are limited, and do not offer any prospect of the busy demand of the past twelve months being kept up. Where tools are inquired for they are chiefly in connection with ordnance work or for plant required in locomotive construction. The present keen competition in trade compels locomotive builders to secure the best modern tools for turning out their work, and the demand is largely for special tools of a universal character to meet the varied requirements of a locomotive shop. Amongst the special classes of tools which are being largely introduced are the milling machines, which, to a considerable extent, are taking the place of the slotting machine. These milling machines are now being made to take out a cut 12in. deep by 6in. wide, and they leave the crank pin roughed out in circular form, whereas the ordinary slotting machine generally employed for the purpose left them square, and this necessitated a great deal more work in the turning. Locomotive builders in this district, as I have stated in previous reports, have still a large weight of work in hand which will keep this branch of industry well employed for some time to come.

Messrs. Hetherington and Co., of Manchester, have in hand for the Government Dockyard at Portsmouth a couple of specially constructed circular saws for cutting cold iron. The bed of the saw is made in box form; along the top slides a saddle which carries the mandril upon which the saw is fixed. Over one portion of the bed is a fixed, and over the other a movable, table, and the saw travels down the joint of each of the two tables, which are provided with T-head slots for holding in position the iron to be operated upon. In the bottom of the bed is a water trough in which the saw works and is thus kept cool. One feature in the machine is that the slide worm has been replaced by a continuous worm working into the worm wheel driving the saw, thus getting over the objection usually found to the slide in existing machines. The machine table is 6ft. long by 3ft. 6in. wide, and the diameter of the saw 25in. The machines are constructed to cut through a section of 30in. by 6in. or flat plates 3ft. long, and the driving pulleys are provided with universal strap shifting motion.

The same firm have just completed for Messrs. Musgrave, of Bolton, an exceptionally large planing machine, to take in 30ft. long by 10ft. square. I referred briefly to this machine some time back, when it was in course of construction, and the following particulars, now that it is completed, will be of interest. The machine carries two tool boxes upon the cross slide, and one upon each standard. The carriages on the cross slide are also arranged to carry special tool boxes for cross planing, so that an object can be operated upon in two different directions at one setting. The bed is made in three and the table in two sections, and provided with double racks, whilst a special feature is that the table has a longitudinal feed motion. The total weight of the machine is about 100 tons. The special purpose for which it has been designed is the planing of engine beds, and with machines of this description an engine bed can be practically finished before it comes off the table, requiring afterwards little or no handwork, which was a very serious item in the old class of machines planing simply in a longitudinal direction.

The coal trade of this district continues in a depressed condition. For all classes of round coal the demand is extremely limited, and stocks are accumulating, with very few of the pits being kept on full time. Engine classes of fuel move off moderately, but in the East Lancashire districts there is a good deal of this class of fuel being thrown upon the market by the strike in the cotton trade. Quoted rates nominally are unchanged, but there is so much underselling in the market to secure orders that it is difficult to say what prices are being taken. Stocks under load at collieries are being pushed for sale at extremely low figures, and the general tendency of prices is downwards. At the pit mouth best coal averages 10s.; seconds, 8s.; common, 6s. to 6s. 6d.; burgy, 4s. 6d. to 5s.; good slack, 3s. 6d. to 4s.; and common, about 3s. per ton.

The shipping trade has been very quiet, with good Lancashire steam coal delivered at the high level, Liverpool, or the Garston Docks, to be bought at about 7s. 9d. to 8s. per ton.

Barrow.—I think there is very little change to notice in the position of the hematite pig iron trade of this district; certainly it has seen no improvement during the past week. In all departments of the trade a very quiet tone exists, and there are no signs of any revival taking place for some months to come; indeed, I don't think makers expect it. The sales have been very few and inextensive, and the business that has come to the hands of makers is equally small. The orders received on foreign and American account are practically *nil*. I hear that the stocks of metal are still very heavy, although the output has been considerably reduced by the blowing out and damping down of several furnaces. Prices are lower this week than ever they have been, and makers appear willing to accept large contracts at even lower prices than those now ruling. No. 1 Bessemer is offered at 46s. 6d. per ton net at works prompt delivery, No. 2 at 46s., and No. 3 at 45s. 6d. per ton, whilst inferior samples are in small request at about 44s. per ton net. The steel trade does not improve, but from what I can hear it seems to go back, and the orders coming to hand are very few. Rails are not in great demand, and prices remain unaltered, £4 10s. per ton representing the quotations. In the merchant department a great activity prevails; some fair contracts have been booked for steel wire. Shipbuilders are remarkably quiet, and they are receiving but few inquiries; the engineers, ironfounders, and boiler makers are in a similar condition. Iron ore is in but moderate request at from 8s. 6d. per ton net at mines and upwards. Heavy stocks are held all round. Shipbuilding quiet. Coal and coke steady at easier prices.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

THERE has been more firmness in the iron markets since the proposal of the Cleveland ironmasters to restrict production by blowing out twenty furnaces, representing a production of nearly 400,000 tons per week. The immediate effect was to send up Cleveland and Scotch pig 1s. per ton, and to steady prices all round. Such a practical restriction of the output cannot fail to have an important and immediate effect; but whether it will be beneficial on the whole, and permanently, is another point.

It is gratifying to be able to state, on authority which is unquestionable, that the shafts which recently failed in the Celtic and Germanic steamers were not made by Messrs. Vickers, Sons, and Co., Limited, of the River Don Works. A rumour having been spread to this effect, it is all the more desirable that it should be promptly contradicted. Messrs. Vickers, Sons, and Co. are now making a shaft to replace that broken in the Germanic, and I understand they were offered the order for the Celtic, but were obliged to decline it because they could not undertake to make it in the short time specified for completing the work.

The present position of the coal trade is something unique. We are now in the third week of January, when colliery owners ought to be putting up prices all round. On the contrary, the announcements are continually being made of reductions; until now the Sheffield Coal Company, Limited, of the Birley Collieries—from which a heavy tonnage is sent to London—is quoting "the lowest summer prices." Its quotations at the pits are now as follows:—Hand-picked Silkstone brands, 11s. 3d. per ton; best screened Silkstone house, 8s. 4d.; screened Silkstone "seconds," 5s. 10d.; screened Silkstone nuts, 4s. 7d. Other companies are selling at low rates, and in no case is the price higher than at the corresponding period of last year. Under these circumstances, the prospects of the miners' agents in their fresh agitation for an advance of 10 per cent. in wages is very remote and shadowy. The death-blow has been given to it in this district by the determined opposition of the employers, and the utter indifference of the men. At the very important collieries of Messrs. Newton, Chambers, and Co., Thorncliffe—who send the largest tonnage of coals by rail from South Yorkshire to the metropolis—the miners have taken energetic action in opposing the agitation. At a meeting, thoroughly representative of all the collieries owned by the company, a resolution has been passed which practically amounts to a vote of censure on those who have initiated this fresh agitation, and the miners have resolved to abstain from sending any delegate to the adjourned conference called for Birmingham. The unprecedented mildness of the weather, as well as the immense accumulation of stock prior to the last agitation, are the causes of the present depression in house coal; and the languor of the cotton industries of Lancashire, as well as the iron and other heavy trades of South Yorkshire, is quite sufficient to account for the almost unsaleableness of small coal and manufacturing fuel generally.

Several vague and mysterious paragraphs have been published regarding certain meetings which have recently been held in London by steel rail manufacturers. There has been considerable anxiety shown to have the resolutions of the meeting kept private; but there can be no harm in mentioning that a very strong determination exists in the minds of the steel rail makers to reduce the make at least 20 per cent. If this can be carried out the next step would undoubtedly be an improvement in values, for which there is great need, as present prices are absurdly low and hopelessly unprofitable.

A shareholder in the Ebbw Vale Steel, Iron, and Coal Company has shown me a circular giving the statement of the accounts of the trustees for the mortgagees and debenture-holders for the twelve months ending 31st ultimo, showing, after paying off debentures during the year amounting to £26,450, a surplus balance in the hands of their bankers on that date of £54,697 11s. 10d.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

SINCE the announcement was made that a number of blast furnaces is to be blown out, a large amount of business has been done in Cleveland pig iron at advanced rates. The tone of the market held at Middlesbrough on Tuesday last was, however, somewhat quieter, and consumers endeavoured to force prices down again; but makers remained firm at the rates they obtained at the end of last week. For delivery to the end of February, No. 3 g.m.b. could not be purchased under 37s. per ton, and for March, and still more postponed delivery, 38s. was asked. Gray forge iron has advanced to 35s. 6d. with some makers, but there are yet others who will accept 35s.

At an adjourned meeting of the Cleveland Ironmasters' Association, held at Middlesbrough on the 17th inst., it was definitely decided that eighteen blast furnaces should be blown out by the end of February. This is equivalent to a reduction of about 20 per cent. on the output. It applies only to furnaces making Cleveland, and not to those on hematite, basic, or spiegel iron. There is a rumour afloat to the effect that the hematite smelters intend to take similar action at an early date.

Warrants are almost unsaleable; the price nominally remains at 37s. per ton.

For the first time for many months the stock of Cleveland pig iron in Messrs. Connal and Co.'s Middlesbrough store shows an increase. The quantity held on Monday last was 62,181 tons, being 121 tons more than when last reported. The stock at Glasgow decreased 224 tons during the week.

Exports from the Tees continue at a satisfactory rate. The quantity of pig iron sent away from the first of this month up to Monday last, amounted to 46,409 tons, being about 3000 tons more than last month, and 5000 tons more than in January, 1883.

There is no improvement to report in the finished iron trade. Orders are very scarce, and it is not at all unlikely that some of the mills will have to stop or work intermittently before long. Although pig iron has advanced, the prices of manufactured iron remain about the same as quoted last week, namely, ship plates, £5 15s. per ton; angles for shipbuilding, £5 5s. to £5 10s.; and common bars, £5 7s. 6d. to £5 12s. 6d.—all free on rails at makers' works less 2½ per cent. Puddled bars are £3 7s. 6d. net on rails.

Messrs. Gjers, Mills, and Co. have given fourteen days' notice to leave to about forty of their miners at Slopewath Mines, near Guisbrough.

A limited company is being formed at Newcastle-on-Tyne, entitled, The River Tyne Dry Docks, Engineering, and Boiler-making Company, Limited. Land is to be purchased at Wallsend where engine, boiler, and ship repairing works will be built. There will also be a dry dock 500ft. long, a pontoon dock for steamers up to 300ft. long, and a gridiron. The capital is fixed at £125,000 in £10 shares, and Mr. George Renwick, shipowner, of Newcastle, is to be the chairman.

It is said that there are nearly sixty steamers lying idle at the ports situated between the Tyne and the Tees inclusive, owing to want of cargoes at remunerative rates.

Messrs. Short Bros., shipbuilders, of Sunderland, paid off thirty-six sets of rivetters on Saturday last owing to absence of work for them to do.

The Bowesfield men are still on strike, and there is little prospect of an early settlement. The men have held two or three meetings, and at one of them a ballot was taken, when only five voted for returning to work and 135 were in favour of continuing the strike. There were about 170 men present out of 370 employed at works.

The Eston Steelworks are also still idle. Several meetings have been held, and deputations have waited upon the managers; but so far no arrangement for resuming work has been come to. The men offered to go in at a reduction of 5 per cent. all round, but were informed that nothing less than the 10 per cent. originally demanded would do. At a sectional meeting held on Monday last a vote was taken as to whether the 10 per cent. reduction should be accepted or not; only 13 voted in favour, and 117 against. It was then resolved to resume work if the firm would agree to a reduction to be settled by a neutral committee, chosen by masters and men, and a deputation was appointed to wait upon Mr. Richards to arrange for this if possible.

At the Darlington County Court, on the 16th inst., Mr. John Dobbing, engineer and cartwright, brought an action against Mr. William Richards, of the Dinsdale Rolling Mills, Fighting Cocks, to recover £22 damages for medical fees and attendance on plaintiff's wife, whose illness it was alleged was caused by the noise made at defendant's works. Plaintiff also asked for an injunction to restrain defendant or his servants from making any noise in future, which might be a nuisance to himself or any occupant of his house, which is situated only 140ft. from the works. Two or three medical men were called and proved that plaintiff's wife had suffered in health through loss of sleep caused by the noise of machinery at the works in question. Judge Turner awarded £10 damages, and granted an injunction restraining the defendant from permitting any noise to be made which might have an ill effect on the health of the Dobbin family. The works have therefore been closed, and some 50 to 60 men are thrown out of employment.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

THE Glasgow warrant market has been in an active state during the past week, and a large amount of business has been done at advanced prices. The increased quotations result from the resolution to curtail production in Cleveland in the first instance, this circumstance having given rise to a considerable amount of speculative business; and the upward turn in prices thus appears to have called consumers into the market, under the apprehension of having to pay higher rates presently for supplies of iron which they required. It also appears that the same cause has induced a better demand for Scotch pig iron from America and the Continent. The Scotch ironmasters, while not entering into any formal combination to restrict the output of pig iron, are perfectly alive to the importance of keeping down the production to workable limits, and, in point of fact, they have already taken measures in that direction. This week Messrs. William Baird and Co. have damped out four furnaces, which reduces the number in blast to 97, as compared with 106 at the same date last year. Further reductions of the furnaces will be made as these may appear necessary or convenient. The past week's shipments of pig iron are fairly good, the additions to stock are not so large, and altogether the pig iron trade wears a rather more promising aspect.

Business was done in the warrant market on Friday up to 44s. 6d. cash. The feeling on Monday forenoon was not quite so strong, the quotations being 44s. 7½d. to 44s. 4d. cash, and 44s. 9d. to 44s. 6d. one month. In the afternoon the prices were 44s. 3d. to 43s. 10½d. cash, and 44s. 5d. to 44s. one month. Transactions took place on Tuesday forenoon at 43s. 7½d. to 43s. 10d. cash, the afternoon figurer being 43s. 8½d. to 43s. 11½d. cash. Business was done on Wednesday at 43s. 9½d. to 43s. 11½d. cash. To-day—Thursday—the market was quieter, with transactions at 43s. 8½d. and 43s. 7d.

The values of makers' iron are all increased as follows:—Gartsherrie, f.o.b., at Glasgow, per ton, No. 1, 54s. 6d.; No. 3, 52s. 6d.; Coltness, 58s. and 52s. 6d.; Langloan, 55s. and 52s.; Summerlee, 53s. and 49s.; Calder, 54s. 6d. and 48s. 6d.; Carnbroe, 52s. 6d. and 48s. 6d.; Clyde, 48s. 6d. and 46s.; Monkland, 45s. 6d. and 43s. 6d.; Quarter, 45s. and 43s.; Govan, at Broomielaw, 45s. 6d. and 43s. 6d.; Shotts, at Leith, 54s. and 52s.; Carron, at Grangemouth, 49s.—specially selected, 56s. 6d.—and 47s. 6d.; Kinneil, at Bo'ness, 46s. 6d. and 46s.; Glengarnock, at Ardrossan, 52s. 6d. and 46s. 6d.; Eglinton, 46s. 6d. and 44s.; Dalmellington, 49s. 6d. and 47s. 6d.

The malleable iron trade continues quiet, and any orders booked are at very low rates, fully 10s. per ton below the nominal quotations.

Much inconvenience has resulted from the prolongation of the strike in the steel trade into the present week. There could not be a doubt from the outside of the dispute that the employers were in earnest, and that a reduction of wages was essential if the works were to be carried on at all. But the men were very reluctant to yield, and the strike has consequently last much longer than was anticipated.

Reductions of wages are also being made in a great variety of trades, it being essential that the cost of production as well as production itself should in many cases be curtailed. The movement is becoming more general every week. Some days ago the ironmasters in the West of Scotland resolved that the wages of furnacemen, miners, and all other workmen should be reduced, and intimations to that effect are now being made. Employers of labour are now so much agreed as to the expediency of such a course, and are prepared to act with such unanimity, that resistance on the part of workmen will be hopeless; and there is reason to believe that this fact is clearly perceived by many of the working classes.

About £70,000 worth of manufactured iron articles was exported from Glasgow in the past week, there being scarcely any steel goods sent away owing to the strike.

The coal trade is just now in a somewhat backward condition. The mild weather has reduced the demand for household consumption, and the stopping of the steelworks has curtailed the consumption of coal by a large quantity per week. As the shipping department of the trade is likewise quiet at present, the position of affairs is rather discouraging. The belief is that a good business will be experienced in the course of the spring and summer months; but in the meantime the outlook is not satisfactory, and some coalmasters have this week issued notices to the colliers that their wages are to be reduced by the amount they were increased last autumn—6d. a day. There are grave complaints against the railway companies in Lanarkshire as to their failure to supply a sufficient number of wagons for the traffic. It is argued, apparently with much reason, on 'Change that there is no excuse for the lack of vehicles at the present season of quiet trade. Business in the coal trade on the east coast has also been dull this week, and prices are a shade easier.

The collieries belonging to the trust estate of the West of Fife Coal Company have been acquired by Messrs. Alexander Mitchell and William Wallace, of the Alloa Coal Company, and it is expected they will begin operations without delay.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

A PORTION of the large viaduct on the Newport, Pontypridd, and Caerphilly Railway is being taken down, with the intention of improving the connection with the Taff Vale Railway; so the opening day is still further postponed. Considerable stir is being made amongst railway projectors and promoters, and a largebusiness from South Wales will figure in the early days of the coming session. I hope there will be no petty obstacle raised in the path of the Cardiff and Monmouthshire Railway. Lord Tredegar is understood to have lodged an objection; but this is probably only to secure some privileges by certain clauses. On the broad features of the Bill he would, in all likelihood, be found in agreement. It is important for the interests of a great virgin district that a railway be conceded, and already I hear of a number of mining projections, notably in the Sirhowy Valley.

The surveyors of the Great Western Railway contemplate an extension of Hall's tramway from near Argoed to Troedyrhiwgwair. This will be on the Llanover property.

It is probable that two pits will be sunk at Abernantfelin by a company composed of London capitalists. The work will be directed by a Cardiff firm of engineers.

Two pits are contemplated by the Dowlais Company at Deri.

I am glad to hear that the Bedlinog speculation is improving.

There is further a new colliery speculation near Holly Bush, and a large area of coal land has been taken. The company is being formed by a Monmouthshire firm.

A tunnel from Pochin collieries to New Tredegar has been sketched out, and will be put in hand shortly. In fact, in Monmouthshire and in Glamorgan there is no lack of mining enterprise.

The Pontypridd and Ogmore Railway scheme is to be postponed, and the reason alleged is that undivided energy may be given to the Barry Dock Bill. This is now before the Examiner of Standing Orders, who has a small mountain of obstacle to clear away in the form of allegations. The Cardiff Corporation have agreed, by a distinct majority, to oppose it. Corporations, as a rule, are slow in the exercise of the perceptive faculties, principally by reason of their being composed of such varied and opposed elements, and it is some credit to that of Cardiff that it has seen so readily the importance of the Barry Dock movement. The promoters, in seeking for powers, do not consider that seventy years will see the Rhondda practically worked out—as regards a paying get of coal, do not consider the enormous sacrifices made by the Marquis of Bute to meet their requirements, and of the Taff Vale to facilitate. They only regard temporary difficulties, and waive the greater good for the smaller numbers. This is the antithesis of the law which should govern, and should be diligently criticised by the Committee of the Bill.

The output of coal continues large throughout the district, and the price is well maintained for all varieties.

The auditor of the Ferndale sliding scale reports that he has examined the books of the colliery, but that prices do not warrant an advance. I shall not be surprised if the result of the audit of the Association books is again at variance with this.

Mr. De Soldenoff, of Merthyr, has, I see, obtained a patent for the application of the Coppée oven to the collection of bye-products. This brings the Coppée before us in a two-fold capacity, either in the make simply of an excellent coke, or yielding also a maximum of bye-products. It was full time for this utilising feature to be brought into practice, as any one conversant with the Welsh coke districts can testify.

I have no improvement to record in connection with our ironworks. Spring business may come in more freely than expected. At present things are dull, and even quotations, if accepted, are not remunerative.

Tin-plate is looking up. Coke wasters fetch 14s. 6d. to 15s., and the demand for these is steadily increasing. Best cokes are at 16s.; charcoal, 19s. 6d.

A pit cage at one of the Rhymney Iron Company's pits fell down the shaft this week, but no one was injured. A narrow escape also occurred lately at Penrhiwceiber, in the presence of Mr. Glasbrook. By some simple accident the cage was overwound, and, but for a patent catch, a great deal of ruinous mischief would have ensued.

It seems probable that the sad colliery accident, resulting in the death of ten men by the breaking of the pit rope, was due to running out "slack" and then a sudden jerk. The rope was turned out at Sir George Elliott's manufactory.

I regret to hear that Mr. Fisher, of Swansea, a well-known mining engineer died suddenly when returning from an inspection of the rope.

In the centre of the best coal in the world for steam purposes we appear to have some inferior. I hear of a steamer which had to return to Cardiff and ship fresh bunker coal, having been quite unable to get up steam. This should be looked to, otherwise our cargo of dead worthless coal will spoil the whole. My advice as to new speculative prospects is borne out by the present condition of the steamer mania at Cardiff. "We have built twelve months ahead," is the verdict of speculators. The building mania is now the leading feature at Cardiff, and if the great coal strain should give way, direful would be the collapse.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—Frederick E. Shean, chief engineer, to the Asia, for service in the Warrior, vice Eckersley; James J. Stuart, engineer, to the Asia, for service in the Devastation, vice Gyles; Charles M. B. Dyer, engineer, to the Asia, for service in the Triumph, vice Nye; and Peter Murray, engineer, to the Asia, for service in the Cyclops, vice Dyer; C. A. Vogwell, W. A. Stewart, S. B. Williams, W. P. Davis, and Edward Eckersley, chief engineers, to the Vernon, additional, for torpedo instruction, to join on the 4th of February.

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.

15th January, 1884.

1435. DOUGHING, &c., MACHINES, W. J. Menzies and G. Johnston, Glasgow.
1436. LASTS, &c., T. and B. Hartley, Accrington.
1437. EXHIBITING ARTICLES for SALE, E. H. Ledger, Broseley.
1438. CLEANSING WATER of STEAM GENERATORS, J. Smith, Wakefield.
1439. WINDOW FASTENERS, J. Parry, Birmingham.
1440. EAR-RING FASTENER, E. Hemming, Birmingham.
1441. TRANSMITTING POWER, R. H. Charsley, Oxford.
1442. CUTTING COAL, &c., G. F. Wynne and J. S. Borlaise, Minera.
1443. CORKSCREWS, &c., W. H. R. Bradford, London.
1444. A HUMANE TRAP, W. Burgess, Malvern Wells.
1445. MATCHES, G. Oldfield, Hunslet.
1446. WINDING UP WINDOW BLINDS, &c., S. Bennett, Stretford.
1447. BOLTS, J. G. Dodd, Liverpool.
1448. PROPELLERS for SHIPS, J Drysdale, Manchester.
1449. MECHANICAL STENOGRAPHIC REPORTING, W. P. Thompson.—(*J. C. Zachos, New York, U.S.*)
1450. SAVING LIFE from FIRE, W. T. Davy, London.
1451. PREPARING, &c., PEAT, J. A. London, Newcastle-upon-Tyne.
1452. BEARING the DEAD to the GRAVE, W. H. Jessop, Kettering.
1453. PROTECTING the PUBLIC from FALLING TELEGRAPH WIRES, A. T. Archer, Bitterne.
1454. PORTABLE, &c., FOUNTAINS, A. J. and H. C. Needham, London.
1455. CART WHEELS, T Mellor, Rochdale.
1456. FAST WARP LACE MACHINES, W. Smedley, Nottingham.
1457. PRODUCING MOTIVE POWER, F. Wirth.—(*A. Bernstein, Boston, U.S.*)
1458. A COMPOUND BOTTLE, J. H. Lindsey, Hazelmere.
1459. PRESSURE ROLLERS, H. J. Allison.—(*H. Honegger, Vienna.*)
1460. DYNAMO MACHINES, R. Sutcliffe, Idle.
1461. LOOMS for WEAVING, H. Lomax, Darwen.
1462. FIRE HOLES, W. Hassall, Beeston.
1463. STRENGTHENING the HUMAN VOICE, R. C. Moffat, Newarthill, and T. G. Bowick, Bedford.
1464. MAKING NICKEL, &c., from their ORES, C. D. Abel.—(*A. Krupp, Bernsdorff.*)
1465. EXTENDING TRELLIS-WORK in IRON, A. Koritschoner.—(*F. Klotz, Dresden.*)
1466. GALVANISING SHEET IRON, W. A. Jones, London.
1467. SAFETY SADDLE STIRRUP BARS, W. Letheren, Exeter.
1468. OIL PIPES of COOKING OVENS, &c., R. Storey, Darlington.
1469. OIL CANS, J. Heselwood, Leeds.
1470. MILLS for GRINDING CEREALS, H. J. Haddan.—(*B. Touja fils, France.*)
1471. HARVESTING MACHINES, W. Wilkinson, Kempston.
1472. ALCALOIDES of QUININA, F. Wirth.—(*P. Giacosa, Turin.*)
1473. PULLEYS, J. Holt, Cradley Heath.
1474. ROAD VEHICLES, J. Whittington, Croydon.
1475. CABLE APPARATUS, T. Cockshott, East Greenwich, and H. M. Goodman, Avalon.
1476. LAMPS, A. D. Turner and W. Flatau, London.
1477. GLOVE FASTENINGS, S. W. Richards, Birmingham.
1478. UMBRELLAS, W. Holland, Greet.
1479. GOVERNORS, D. Andrew, Kilbarchan.
1480. HURDLES, G. Nisbet, Rumbleton.
1481. BLOCKING PIECE GOODS, J. J. Musgrave, Folkestone.
1482. MOVABLE WHEELS, F. Oppenheim, London.
1483. SPINNING MACHINERY, N. Wilkinson, Nottingham.
1484. FEED-WATER REGULULATOR, A. M. Clark.—(*P. Brown and C. W. Johnston, Philadelphia, U.S.*)
1485. TREATING and UTILISING RESIDUARY PRODUCTS, W. R. Lake.—(*G. Baumert, Germany.*)
1486. SULPHURIC ACID, W. R. Lake.—(*A. M. Walsh, Camden, New Jersey, U.S.*)

16th January, 1884.

1487. LIFT and FORCE PUMPS, W. Adair, Liverpool.
1488. MATTRESSES, T. Capper, Northwich, and J. T. Lockey, Manchester.
1489. STOP MOTION for DOUBLING FRAMES, J. T. Fletcher and T. Quinn, Brinnington.
1490. MINE VENTILATION TRAP, M. Gill, Huddersfield.
1491. STEPS of VEHICLES, W. H. Slade, Wolverhampton.
1492. LOOMS for WEAVING, S. Crosland, Huddersfield.
1493. HOLLOW SPINDLE HALL DOOR KNOB, &c., J. and W. Roper, Birmingham.
1494. STEAM BOILERS, F. D. Rose, Flixton.
1495. DOOR BELLS, W. F. Allcock, Birmingham.
1496. MOVABLE SAFETY HOLD for PASSENGERS, C. S. Young, Lozells.
1497. INCREASING the FOCAL LENGTH of PHOTOGRAPHIC CAMERAS, D. H. Cussons and W. Turner, Liverpool.
1498. VICE, W. P. Thompson.—(*O. Flagstad, Hamar.*)
1499. BELT PULLEYS, J. E. Palmer, Kildare.
1500. PEAT BEDDING, P. H. Bracher, Wincanton.
1501. BICYCLES, H. D. Taylor, Haworth.
1502. HOSE-PIPE, A. E. Clibborn.—(*The Société de Crédit, Paris.*)
1503. RAILWAY CHAIR, J. Huddleston, Barrow-in-Furness.
1504. CEMENTS, F. W. Gerhard, Wolverhampton.
1505. VELOCIPEDES, A. W. Hirst, West Croydon.
1506. WATER-GAUGES, H. H. Lake.—(*E. Schneider, Gaarden, near Kiel.*)
1507. SPINNING MACHINERY, J. Camm, Burnley.
1508. EGG-CUTTERS, J. F. Atkinson.—(*J. W. Otto, Copenhagen.*)
1509. STEAM GENERATORS, F. Hocking, Liverpool.
1510. RE-ROLLING SCRAP RAILWAY RAILS, &c., C. J. Green, Brightside.
1511. HAND PLANES, W. Seedhouse and S. Smith, Sheffield.
1512. TILES, F. Bosshardt.—(*P. Vincent, Privas.*)
1513. SHAPING the UPPERS of BOOTS, F. Bosshardt.—(*C. Poirier, Hazebrouck.*)
1514. SASH FASTENER, W. Wade, Leeds.
1515. CLEANING KNIVES, &c., D. Jackson, Batley Carr.
1516. STEAM EXHAUSTER, J. H. Adams, Wandsworth.
1517. VENTILATOR, G. T. Jenkins, London.
1518. BUSHES for CASKS, &c., R. Muggeridge, London.
1519. SAFETY ATTACHMENT for STIRRUP BAR, B. S. Weston, Dalston, and H. S. Wilton, London.
1520. WATER-WASTE PREVENTERS, W. Haigh, London.
1521. MINERS' SAFETY LAMPS, F. W. Pittuck, Hebburn-on-Tyne.
1522. SAFETY VALVE, A. Schmid, Zurich.
1523. PRODUCING MECHANICAL EFFECTS, J. J. Ebel, New Charlton.
1524. PROTECTING SHIPS and BOATS from INJURY by COLLISION, &c., G. Barnley, Dundee.
1525. DOUBLE TRACING WHEEL, N. Hanbury, London.
1526. SILENT VENTILATOR, C. Kite, London.
1527. SAFETY LAMPS, W. G. Thresher, Wilton, and H. J. L. Farebrother, Salisbury.
1528. FLOATING STRUCTURES, J. B. Stoner, London.
1529. HOLDING SACKS and BAGS while being FILLED, J. B. Stoner, London.
1530. ENGINE, &c., D. Gallafent, Woolwich.
1531. CASING for PHARMACEUTICAL SUBSTANCES, T. S. Stephenson, London.
1532. MUSICAL STRINGED INSTRUMENTS, C. Burn, London.
1533. METALLIC SASH LIFTS, C. Showeli, Birmingham.
1534. METALLIC NEEDLE-CASES, W. Avery, Worcester.
1535. CLARIFYING CIDER, W. C. Henley, London.
1536. PURIFYING YEAST, C. R. Bonne, Manchester.
1337. FASTENERS, J. W. Sisson, London.
1538. SCREW TAPS, D. Gill, Weston-super-Mare.
1539. SETTING-OUT or DRAWING GEOMETRICAL FIGURES, F. H. Wood, Chiswick.
1540. PIPE JOINTS, J. Mewburn.—(*C. Bon & Co., Paris.*)
1541. SEPARATING VEGETABLE MATTERS from WOOL, J. C. Mewburn.—(*P. Lamourette, France.*)
1542. OVENS, E. Naylor, Bradford.
1543. SHIRT COLLARS, G. J. Gissing, London.
1544. OXIDISING LIQUIDS, J. MacIlwraith, Glasgow, and T. Thomson, Barrhead
1545. WEFT STOP MECHANISM for LOOMS, D. Morrison, Hawick.
1546. WRITING-DESKS, C. Banks, Walthamstow.
1547. JOINTS and TUBES, J. Elliott, Leeds.
1548. ELECTRIC LAMPS, J. G Lorrain, London.
1549. MIRROR, J. L. A. Hope, London.
1550. SHOEING HORSES, T. Nugent, Walthamstow.
1551. HANGING MILLSTONES, W. E. Gedge.—(*E. L. F. Lemouettre, France.*)
1552. LIGHTING, &c., ROOMS, T. D. Griffiths, Swansea.
1553. FIREPLACES, T. D. Griffiths, Swansea.
1554. PENCIL-CASES, &c., H. J. Haddan.—(*Schwanhäusser, Nürnberg.*)
1555. EXHIBITING APPARATUS, H. J. Haddan.—(*J. A. Geets and Co., Bruxelles.*)
1556. PRINTING PILED FABRICS, A. Rothwell, Bury, and W. Spencer, Waterfoot.
1557. MOORING SUBMERGED FLOATING TORPEDOES, &c., C. A. McEvoy, London.
1558. PREVENTING SMOKE in the COMBUSTION of COAL, R. Wright, Richmond.
1559. ATTRITION MILLS, S. Pitt.—(*T. Sturtevant, U.S.*)
1560. MEASURING ELECTRICITY, L. B. Miller, Battersea.
1561. COMMUNICATING between PASSENGERS and DRIVERS of VEHICLES, J. Byron, Nottingham.
1562. HAT SUSPENDERS, J. Porter, Coalville.
1563. WATER PURIFIERS, A. J. Boult.—(*E. W. Vanduzen, Newport, U.S.*)
1564. RUMBLES for SCOURING CASTINGS, &c., A. J. Boult.—(*E. W. Vanduzen, Newport, U.S.*)
1565. TESTING FABRICS, A. J. Boult.—(*E. Morrison and J. P. Herron, Washington, U.S.*)
1566. BEDSTEADS, J. Martin, London.
1567. TOOL HANDLES, J. A. King, St. Louis, U.S.
1568. DISPLAYING NOTICES, &c., A. Bruckner, London.
1569. INSOLES, &c., for BOOTS, A. Bruckner, London.
1570. COPYING PRESSES, M. am Ende, London.
1571. INDIA-RUBBER, &c., COMPOUNDS, A. Huth, London.
1572. BOILERS, F. J. Burrell, Thetford.

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1573. SIZING WOOLLEN WARPS, F. Millo, Manchester.
1574. TABLE MATS, A. Jamieson, Nunhead.
1575. PORTABLE FILTERS, L. A. White, Manchester.
1576. TESTING the NUMBER of PICKS in a LOOM for WEAVING, R. H. Harrison, Dukinfield.
1577. MOTIVE-POWER, F. Cutlan, Cardiff.
1578. INCREASING the ILLUMINATING POWER of GAS, W. G. Little, Yorkshire.
1579. SCREW FASTENINGS, S. Rideal, Manchester.
1580. LOOMS for WEAVING, T. H. Blamires, York.
1581. CENTRE VALVES, R. Dempster, jun., Elland.
1582. CLOSING, &c., RETORT LIDS, R. Dempster, jun., Elland.
1583. MACHINES for SEWING, &c., STRAW-PLAIT, O. and F. Robinson, Kettering.
1584. MAGNETO, &c., MACHINES, J. Riley, Alfreton.
1585. SPINNING, &c., YARNS, D. Maitland, Lancaster.
1586. SPRING CLIPS, F. R. Baker, Birmingham.
1587. FASTENINGS for GLOVES, F. J. Martin, London.
1588. BOLT for DOORS, &c., J. Hummerston, Leeds.
1589. LIFE-SAVING APPARATUS, F. Byrnes, Liverpool.
1590. GAS-MOTOR ENGINES, W. Briscall and A. Blackwell, Liverpool.
1591. WITHDRAWING, &c., WATER from a VESSEL, P. and J. Garton, Golborne.
1592. SOLES of BOOTS, G. Shelton, Northamptonshire.
1593. DRIVING GEAR, W. H. Hockley, Birmingham.
1594. SHAFT COUPLINGS, S. Alley, Glasgow.
1595. LAMPS, J. and H. Lucas, Birmingham.
1596. FLUSHING CLOSETS, W. Devoll, Erdington.
1597. HALLS and BUILDINGS, W. H. Duncan, Coalbrookdale.
1598. ALARM BELL, J Cheshire, Birmingham.
1599. DETACHABLE HUBS, &c., T. Hitching, London.
1600. APPARATUS for RECEIVING MONEY, &c., J. M. Kelly and M. Ullmann, London.
1601. RAISING LIQUIDS, G. Macaulay-Cruikshank.—(*M. E. B. de Marais and P. D. de la Grèe, Algiers.*)
1602. CARPET LINING, &c., G. M. Smyth, London.
1603. SOUNDING at SEA by ELECTRICITY, W. Balch, Greenwich.
1604. SIGNALLING at SEA, W. Balch, Greenwich.
1605. ELECTRIC BRAKE, B. F. Howard, Forest Hill.
1606. BICYCLES, &c., B. R. Mills, London.
1607. FASTENING BASKETS, J. P. Milbourne and T. Humphreys, Manchester.
1608. SELF-ACTING RAILWAY SIGNALS, F. Bosshardt.—(*A. and O. Boulfroy, France.*)
1609. PERAMBULATORS, T. McGrah, Sheffield.
1610. SHOVELS, G. W. Willford and V. J. O'Donnell, Sheffield.
1611. CARPETS, &c., T. Pogson, Moldgreen.
1612. FORMING UNDERGROUND CONDUITS, J. H. Johnson.—(*C. Detrick, New York, and E. Bond, Springfield.*)
1613. AUTOMATIC DOWNCAST INLET VENTILATOR, C. Kite, London.
1614. PRINTING COMPOSER for PIANOFORTES, &c., C. J. Allen, Brixton.
1615. WHEELS, G. Knowling, London.
1616. TENSION SADDLE, J. Forster, Birmingham.
1617. WIRING CORKS in BOTTLES, H. J. Allison.—(*O. C. Carpenter, Brooklyn.*)
1618. VERTICAL BARS of METAL FENCING, S. Bayliss, Wolverhampton.
1619. TINNING IRON WIRE, F. Bywater, Birmingham.
1620. TOBACCO PIPES, &c., T. Dillon, Galway.
1621. CHEMICAL FIRE-ENGINES, J. Gibbs, Glasgow.
1622. PHOTOGRAPHIC CAMERAS, A. C. Lamb, Dundee.
1623. GROUNDS of ARTISTS' CANVAS, A. W. MacDougall, London.
1624. HAND BLOWERS, W. Gedge.—(*G. Cumming, U.S.*)
1625. WEIGHING APPARATUS, T. Moy, London.
1626. SCREW PROPELLERS, J. Sample, Blyth.
1627. INSTANTANEOUSLY HEATING WATER, W. J. Righton, London.
1628. PROPELLING a DESIGN in the AIR in IMITATION of a FLIGHT of the BIRD, A. Arbenz.—(*M. Flurscheim, Germany.*)
1629. MEASURING, &c., INSTRUMENTS, P. S. Marks, London.
1630. WINDOW FASTENERS, T. Sanders, Birmingham, and T. Stubbs, Surrey.
1631. SCORING GAMES, E. R. Kesterton, London.
1632. CHECKING FARES, J. Bartlett, London.
1633. CONTROLLING SIGNALS, C. Hodgson, London.
1634. COMBINED CAPE, &c., I. Pick, London.
1635. BENDING RODS, &c., R. Storey, Darlington.
1636. LAYING BRICKS, H. W. Hart, London.
1637. FASTENING PIN, J. Offord and J. Nadal, London.
1638. ELEMENTS for ELECTRIC BATTERIES, S. J. Coxeter and A. Nehmer, London.
1639. EXTRACTING ALUMINIUM, W. R. Lake.—(*S. J. Seymour and W. H. Brown, New York.*)
1640. WHEELS, W. R. Lake.—(*S. Williams and G. Rushing, New Jersey, U.S.*)
1641 GRATES, &c., W. R. Lake.—(*L. Bannister, U.S.*)
1642. CUTTING BOTTLE WIRE, &c., P. Maignen.—(*A. Moguet, France.*)
1643. COMBINED MILK JUG and SUGAR HOLDER, E. Bramwell, Chorlton-upon-Medlock.
1644. BALLS to be USED as TARGETS, J. S. Elmore, London.
1645. ELECTRIC CURRENT GENERATORS, J. D. Gibbs, London.
1646. BEDSTEADS, T. Allen, Bristol.
1647. SECONDARY BATTERIES, &c., T. J. Jones, London.
1648. SAFETY LAMP, R. Purdy, near Sheffield.
1649. SUSPENDING POLES, &c., G. A. Woolley and H. Hart, London.
1650. STEAM ENGINES, W. H. Barker, Lincoln.

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1651. BUTTONS, &c., R. Elsdon, Brockley.
1652. PITCH CHAINS, R. Steele, Salford.
1653. HOROLOGICAL APPARATUS, B. Sudlow, Lancaster.
1654. LUBRICATING APPARATUS, T. H. and H. Blamires, Huddersfield.
1655. COMPOUND TUBE, T. B. Sharp, Smethwick.
1656. BATTLEDORE, J. Tyldesley, Manchester.
1657. HAMMERLESS GUNS, T. Keight, Warwick.
1658. ORNAMENTING WATERPROOF FABRICS, J. Hebblethwaite and E. Holt, Manchester.
1659. FIRE-ESCAPES, J. C. Morrell, Wrexham.
1660. ROLLING MILLS, G. Legge, Warrington.
1661. DRILLING, &c., APPARATUS, G. F. Wynne, Minera.
1662. SALOPIAN MACHINE, T. Hotchkiss, Newcastle-upon-Tyne.
1663. UMBRELLAS, &c., R. Pawson, London.
1664. GAS-BURNER and TAP, G. Edwards, Dukinfield.
1665. POTATO DIGGER, W. Richardson, Rainford.
1666. ENGINES, A. Bever, Bradford.
1667. RAILWAY CARRIAGE LEVER LOCKS, &c., S. Wilkes, Bloxwich, and H. Baynton, Birmingham.
1668. RING THROSTLE SPINNING, &c., W., J., and A. Collinge, Rochdale.
1669. RETORTS, G. Valentine, Liverpool
1670. KILNS, J. Robertson, Glasgow, and G. A. Bishop, Coatbridge.
1671. WINE COCKS, J. S. Rhodes and C. J. Clarke, Birmingham.
1672. NUT LOCK, E. Cooper, Sheffield.
1673. PRESERVING MEAT, &c., J. W. Moon, Southsea.
1674. ELECTRIC LIGHTING, J. P. Hall, Oldham.
1675. RAG ENGINES, R. Brodie, Leith.
1676. HYDROPHRACTIC AIR BELTS, A. Harivel, France.
1677. BENCH PLANE PROTECTOR, A. H. Valda, Hammersmith.
1678. TAPS, R. Aspden, Darwen.
1679. PUMPS, J. Keogh.—(*J. H. Halil, Smyrna.*)
1680. FORGING NUTS, W. Leyland, Bolton.
1681. WINDING-UP and REGULATING CLOCKS, B. J. B. Mills.—(*C. Diener and C. A. Mayrhofer, Vienna.*)
1682. DIE PLATES, G. K. Gooke, London.
1683. SELF-INKING ENDORSING PRESSES, G. K. Cooke, London.
1684. RAISING, &c., CARRIAGE HEADS, W. H. Bailey, South Hornsey.
1685. NUTS for BOLTS, W. P. Kelly, Mount Brandon.
1686. RETAINING in POSITION WINDOW-BLIND ROLLERS W. P. Kelly, Mount Brandon.
1687. PACKING-CASE, &c., J. Chaplin, London, and J. Pearson, East Dulwich.
1688. HEATING RAILWAY CARRIAGES, J. R. Watson, Glasgow.
1689. ACTUATING AUTOMATICALLY DAMPERS of KITCHE RANGES, R. McDonald, Glasgow.
1690. SASH BARS, J. D. Mackenzie, London.
1691. SPINNING MACHINERY, T. Muter Bradford.
1692. GALVANOMETERS, C. D. Abel.—(*E. Bousau, Italy.*)
1693. WHITE LEAD, &c., H. J. B. Condy, Battersea.
1694. ROTARY ENGINES, &c., C. T. Colebrook, London
1695. KETTLE DRUMS, H. Potter, London.
1696. MOWING MACHINES, S. B. Bamford, Uttoxeter.
1697. GRINDING, &c., CHICORY, M. Robinson and R. Lee, Manchester, and A. Mellor, Oldham.
1698. PORTABLE TENTS, E. C. Jones, London.
1699. BENCH VICES, P. Lawrence.—(*J. Thompson, U.S.*
1700. HEATING, &c., APPARATUS, L. Sterne and C. D Wainwright, London.
1701. GAS RETORTS, W. D. Cliff, Wortley.
1702. FANCY YARNS, G. A. J. Schott, Bradford.
1703. LANTERNS, A. J. Boult.—(*W. D. Doremus, U.S.*
1704. WASHING MACHINES, M. H. Pearson, Leeds.
1705. FIRE-STOVE SCREENS, J. Spear, London.
1706. WASHING MACHINES, M. H. Pearson, Leeds.
1707. PORTLAND CEMENT, E. W. Harding, Bishop Wearmouth.
1708. SEPARATING MAGNETIC from other SUBSTANCES, G. Sonnenthal.—(*H. Lamprecht, Germany.*)
1709. SECONDARY BATTERIES, E. P. Alexander.—(*J. L. Moisy, jun., Paris.*)
1710. ROLLER MILLS, H. J. Haddan.—(*C. O. Dost, Ravensburg.*)
1711. MILL, H. J. Haddan.—(*O. Hunger, Leipsig.*)
1712. VELOCIPEDES, W. Smith, Fulham.
1713. POTATO RIDDLERS, G. Kearsley, Ripon, and G. Mangles, Borobridge.
1714. FIREPROOF STRUCTURES, J. Girdwood, London.
1715. GLAZING, R. Stevens, Bromley.
1716. SELF-OPENING and CLOSING UMBRELLAS, &c., A. M. Clark, London.—(*J. V. Mathieu & C. Falcimaigne, Paris.*)
1717. FUNNELS, J. L. Bramley, London.
1718. TRICYCLE HORSES, J. L. Bramley, London.
1719. SPADE and SHOVEL, N. W. Wallace, Southsea.
1720. WATER VANS, J. Glover and J. Watts, Warwick.
1721. PROTECTORS for the INSULATORS of AERIAL TELEGRAPH WIRES, B. Pell, London.
1722. RAILWAY SLEEPER and CHAIR, O. Imray.—(*J. Chater, Bengal.*)
1723. ATTACHING DOOR, &c., HANDLES to their SPINDLES, G. A. Birkenhead, Penarth.
1724. INDIA-RUBBER SPRINGS, G. and A. Spencer, London.

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1725. MOORING FLOATING BREAKWATERS, &c., E. Latham, Liverpool. and A. E. Carey, Newhaven.
1726. BOTTLES, &c., W. Boyle and F. Smith, Liverpool.
1727. STRAP, &c., FASTENERS, D. and J. Baxter, Manchester.
1728. RING, &c., FRAMES, W. Anderson, Stockport.
1729. LOCOMOTIVES, M. Gill, Huddersfield.
1730. DISTRIBUTING MANURE, E. Maxwell, Bedford.
1731. TELESCOPES, C. McG. Bate, London.
1732. SLIDE VALVES, J. W. O'Toole, Ireland.
1733. BELLOWS, H. Hart, Glasgow.
1734. OIL BOTTLE, &c., W. Foxcroft and A. Langford, Birmingham.
1735. PRESERVING GRASS, &c., W. Cowley and J. Makin, Liverpool.
1736. REFRACTORY MATERIAL, E. Brooke, York.
1737. CALCINING KILNS, J. T. Raynes, Birkenhead and B. D. Healey, Liverpool.
1738. TERRA-COTTA, &c., GOODS, R. Stanley and J. Sharratt, Stockingford, near Nuneaton.
1739. EQUILIBRIUM BALL VALVE, W. Bright, Exeter.
1740. FACILITATING the ROLLING of IRON, &c., H Bennett, Redcar, and H. Ronnebeck, Middlesbrough
1741. CRANK PINS, &c., A. Burton, Beighton.
1742. SCREW PROPELLERS, W. Hogarth, Liverpool.
1743. SNAPS for CONNECTING NECKLETS, &c., E. Satchwell, Birmingham.
1744. VENTILATING FLOWER, &c., HOUSES, V. Skinner and H. C. Board, Bristol.
1745. TRANSFORMING PERAMBULATOR, C. Chips, Hants
1746. MEASURING WATER, H. W. Pendred, Streatham.
1747. ROLLERS for SQUEEZER MACHINES, J. Walmsley Bolton.
1748. BRAKE APPARATUS, T. H. B. Hitching, London.
1749. STEERING GEAR, T. Archer, jun., Dunstan.
1750. DRIVING GEAR for BICYCLES, W. Downey, London.
1751. JACQUARD MACHINERY, J. Verdol, Paris.
1752. UTILISING VIRGIN COAL GAS, &c., for PRODUCING ELECTRIC CURRENTS, A. Shippey, London.
1753. MOTOR, F. Ayckbourn, London.
1754. HOLDING, &c., CARTRIDGES, C. F. Wood, London.
1755. STRIKING MECHANISM for ALARM BELLS, J. and C. E. Challis, London.
1756. PAINTING, &c., GLASS, E. Lloyd, London.
1757. ACTUATING ALARM BELL, C. Carpenter, London.
1758. STUDS, S. J. Parkman, Birmingham, and H. Blackburn, Southampton.
1759. FASTENER for CASEMENTS, E. and J. M. Verity and B. Banks, Leeds.
1760. CUTTING WHEEL RACK TEETH, J. H. Stone, Birmingham.
1761. CRADLE for DRAWBARS of WAGONS, J. Hea d Penarth.

1762. VENTILATING BOOTS, &c., J. Gerard, London.
1763. FIRE ESCAPES, W. H. Gaze, London.
1764. MACHINES for WASHING PLATES, &c., J. Jones and W. Whieldon, London.
1765. CUTLERY, C. H. Wood, Sheffield.
1766. POCKET KNIVES, G. Siddall, Sheffield.
1767. PLANT POT STANDS, R. W. Rawling, Sunderland.
1768. TRICYCLES, &c., A. S. Openshaw, Birmingham.
1769. OIL LAMPS, C. Phillips, Aston.
1770. ALARM SIGNALS, J. Marshall, Chesterfield.
1771. REGULATING VALVE, &c., E. Ayres, London.
1772. BEETLING MACHINERY, C. J. Webb, Randalstown.
1773. CONDENSING STEAM, &c., W. Wilkinson, Wigan.
1774. FISHING-ROD WINCH, C. Farlow, London.
1775. DISPLAYING ADVERTISEMENTS, A. E. Edwards.—(*A. Pelletan, Paris.*)
1776. ADVERTISING MEMORANDUM BOOK, A. E. Edwards.—(*A. Pelletan, Paris*)
1777. SPRING MATTRESSES, I. Charlton, Manchester.
1778. DIFFERENTIAL PULLEY-BLOCKS, T. F. Salter, Smethwick.
1779. COUPLING for RAILWAY VEHICLES, R. Morris, Doncaster, and J. Wood, Stockwith.
1780. BAKING OVENS, D. Grove, Berlin.
1781. CARTRIDGES, W. R. Lake.—(*E. F. y Gongova, Sevilie, Spain.*)
1782. CALORIC ENGINES, E. T. Pontine, London.
1783. BOOT STIFFENER, H. R. Minns, Maidenhead.
1784. MANUFACTURING THREADS, J. J. Delmar and W. Folliott, London.
1785. BOOT STIFFENER, H. R. Minns, Maidenhead.
1786. MICROPHONE TRANSMITTERS, W. R. Lake.—(*J. Berliner, Hanover, Germany.*)
1787. STOCKINGS, &c., J. H. Cooper, Evington, and W. J. Ford, Humberstone.
1788. KNITTING MACHINES, J. H. Cooper, Evington, and W. J. Ford, Humberstone.
1789. DYNAMO-ELECTRICAL MACHINES, M. H. Hurrell, London.
1790. ELECTRIC ARC LAMPS, M. H. Hurrell, London.

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1791. POCKET FILTERS, W. N. Wilkinson, Longsight.
1792. FIRE-GRATES, G. G. P. Brodie, Birmingham, and J. D. Prior, London.
1793 OIL LAMPS, W. Vaughan, Small Heath.
1794. PHOTOGRAPHIC SHUTTERS, R. Garde, Devonport.
1795. PREVENTING DOWN DRAUGHTS in CHIMNEYS, H. A. Phillips, York.
1796. LOOM CARDS, J. W. Crabtree and W. Ambler, Bradford.
1797. ELECTRIC-BELL FURNITURE, F. King and W. P. Mendham, Bristol.
1798. WEAVING FUSTIANS, &c., B. Crook and T. Cotton, Hebden Bridge.
1799. INCANDESCENT LAMPS, J. G. W. Aldridge, Southampton.
1800. EXHAUST CHIMNEY TOP, A. C. Smith, London.
1801. FISHING-ROD END RING, S. Allcock, Redditch.
1802. DUPLEX BURNERS, J. Titley, Walsall.
1803. FIRE-RESISTING SAFES, T. Harby, Liverpool.
1804. LASHING, &c., FIBRES, S. Roberts, Cleckheaton.
1805. GAS FITTINGS, W. Stuttle, Hulme.
1806. GAS ENGINES, H. G. Hellier, London.
1807. WINDOW-BLIND FITTINGS, J. Partridge, London.
1808. VALVES, W. W. Fyfe, Aberdeen.
1809. CRUCIBLE FURNACES, B. J. B. Mills—(*G. Fischer, Austria.*)
1810. SPRING HANDLES for BICYCLES, &c., C. J. Hart, Edgbaston.
1811. PROPULSION of VESSELS, A. Clark, Glasgow.
1812. SHIPS' BERTHS, C. J. Fox, Birkenhead.
1813. EXTINGUISHING FIRE, R. Dowson, Bolton.
1814. PORTABLE FOLDING TRIPOD STANDS, F. W. Hart, London.
1815. COOKING ANIMAL SUBSTANCES for FOOD, A. F. Richmond, Greenock.
1816. GRAPNEL for NAVAL, &c., PURPOSES, N. W. Wallace, jun., Southsea.
1817. RAILWAY CARRIAGE DOOR LOCK, J. E. Brearley, France.
1818. MOUNTS for TOBACCO PIPES, R. W. King and H. Harbord, London.
1819. GLAZING STREET LAMPS, J. Noble, Wellingborough.
1820. REVOLVERS, J. Carter, Birmingham.
1821. BOATS for SAVING LIFE at SEA, R. Rayner, London.
1822. LADIES' CORSETS, E. Clark, London.
1823. PREPARING OILS, F. Wirth.—(*L. Starck, Germany.*)
1824. DATE CALENDARS, A. W. Doery, London.
1825. GETTING COAL, T. Hudson and E. Rowe, Darlington, and C. Heslop, Stanghow.
1826. ANCHORS, R. F. Ould, London.
1827. VALVE APPARATUS, A. G. Brookes.—(*J. M. Goldsmith, Boston, U.S.*)
1828. SELF-GENERATING GAS BURNERS, J. J. Norman, London.
1829. HAIR BRUSH, F. E. Devereux, Walthamstow.
1830. HAT, &c., RAILS, W. H. Tonks, Birmingham, and J. Burn, Sparkhill.
1831. PRESS, &c., HINGES, H. Moore, Aston.
1832. PERAMBULATOR JOINTS, G. Moore, A. L. Stamps, and B. E. Saunders, Aston.
1833. TOILET GLASSES, C. P. Byrne, London.
1834. WHITE LEAD, J. S. Rigby, Widnes.
1835. WEAVING PILE FABRICS, A. Rothwell, Bury.
1836. LATCH-NEEDLE KNITTING MACHINES, J. W. Watts, Countesthorpe.
1837. STEAM ENGINE GOVERNORS, G. Barnett, South Shields.
1838. CASTING PORTS, G. Binnie, Falkirk.
1839. CURTAIN RODS, W. Pitt, Tottenham.
1840. BALL TRAPS, H. Portway, Manningham.
1841. BLOCKS and SHEAVES, R. G. Lacey and H. G. Copeland, London.
1842. EFFECTING COMMUNICATION BETWEEN OBJECTS by means of THROWING LINES, R. G. Lacey and H. G. Copeland, London.
1843. RECOVERING NITROGENOUS MATTERS, J. C. W. Stanley, London.
1844. PERAMBULATORS, T. Birks, Lenton.
1845. FRAMING WASHING MACHINES, R. W. Kenyon, Accrington.
1846. FEEDING BOTTLES, L. A. Pellegrin, Wandsworth.
1847. EGG-TESTERS, E Ritter, Hanover.
1848. ELECTRICAL SIGNALLING, G. Porter, London.
1849. PULVERISING ORES, P. M. Justice.—(*F. A. Luckenbach, New York, U.S.*)
1850. SAFETY LAMPS, E. F. Ayton, Heddon-on-the-Wall.
1851. BREAKING DOWN COAL, J. Wallace, Backworth.
1852. GLAZING GREENHOUSES, W. Harding, Exeter.
1853. STOPPING BREACHES in SHIPS, J. S. Pearce and R. Wilkinson, Southampton.
1854. CORSETS, W. Pretty, jun., Ipswich.
1855. MACHINERY BELTING, I. Harris, Fountainbridge.
1856. SOIL PIPES, H. Lake.—(*J. Barrett, Boston, U.S.*)
1857. PREPARING TANNING SUBSTANCES, F. Wirth.—(*L. Starck, Germany.*)
1858. FEEDING PURIFIED WATER to STEAM BOILERS, H. H. Lake.—(*G. Stollwerck, Germany.*)

ABSTRACTS OF SPECIFICATIONS.

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

2256. STORES, *H. J. Haddan, London.*—*3rd May*, 1883.—(*A communication from J. A. Houston, Massachusetts, U.S.*)—(*Provisional protection not allowed.*) 2*d.*

The object is to provide, in connection with the sets of goods-holding cases or shelves, counters, and the aisles of a store, means by which the cash boys can pass to and fro as occasion may require.

2264. MECHANICAL APPARATUS TO BE USED IN NAVIGATING THE AIR, *P. Sjöström, London.*—*3rd May*, 1883.—(*Provisional protection not allowed.*) 2*d.*

Relates to a screw apparatus driven by a steam engine.

2324. PERAMBULATING SANITARY, TOILET, AND ADVERTISEMENT CAR, *H. Barron, London.*—*8th May*, 1883.—(*Provisional protection not allowed.*) 2*d.*

Relates to the employment of advertisements on endless revolving bands in a car.

2470. NECKTIES, *W. T. Whiteman, London.*—*17th May*, 1883.—(*A communication from J. M. Jack and C. H. Anderson, Montreal.*)—(*Provisional protection not allowed.*) 2*d.*

This relates to ties, which consist of an imitation bow or scarf.

2483. APPARATUS FOR UTILISING LIQUID FUEL IN BOILER OR OTHER FURNACES, *H. H. Lake, London.*—*17th May*, 1883.—(*A communication from T. Urquhart, Russia.*) 6*d.*

This consists of a spray injector, which operates by means of steam or compressed air, or a combination of steam and air, which may, if desired, be superheated.

2521. COAL, IRON ORE, AND MERCHANDISE DERRICKS, *A. Lewsley, London.*—*21st May*, 1883.—(*A communication from W. E. Ludlow, Sandusky, U.S.*) 8*d.*

Relates to improvements in the general construction of derricks.

2570. ELECTRIC ARC LAMPS, *P. Jolin and J. Parsons, Bristol.*—*23rd May*, 1883. 8*d.*

The arc is established by means of a double solenoid wound with coarse wire, the cores being attached at their lower ends to an iron bar carrying a block which normally rests against one side of the upper carbon rod. To this is hinged a second block situate at the opposite side of the carbon rod, and having attached to it a spring. When the cores are lifted by the passage of the current, the spring causes the blocks to grip the carbon rod and so lift it. The feed is made by a shunt solenoid, whose core is connected to a platform free to oscillate on a pivot. When the core rises the platform is tilted, and a ring is thus made to bear against and exert a downward pressure on the carbon rod. Various methods of shunting the current from a lamp in series are described and illustrated.

2577. PROCESS FOR THE METALLISING AND ELECTRO-GILDING OR PLATING OF NON-METALLIC SUBSTANCES, SUCH AS VULCANITE, CELLULOID, AND THE LIKE, SPECIALLY ADAPTED FOR DENTAL PURPOSES, *C. G. Hammersley, London.*—*23rd May*, 1883.—(*A communication from F. J. Lynam, Santiago, Chili.*) 4*d.*

The compositions for various baths, in which the articles are to be immersed, are given.

2579. APPARATUS FOR ELECTRIC LIGHTING ON RAILWAY TRAINS, &c., *W. Stroudley, Brighton, and E. J. Houghton, London.*—*23rd May*, 1883. 6*d.*

The generators, driven by the motion of the train, supply their current to secondary batteries, from which the lamps are fed. The commutator branches are automatically reversed on the reversal of the motion of the train. The brushes and commutator are put in contact by a centrifugal governor only after the armature has attained a predetermined speed. The exciting current from the field magnets is derived from the lamp circuit, and the contact for this, as also that for the charging circuit to the secondary batteries, is only made after the generator has attained a certain speed. The generator is arranged in combination with two sets of accumulators and the lamp circuit, a switch being so arranged as to throw either set of accumulators into the charging or feeding circuit.

2581. STOPPERING BOTTLES, JARS, &c., *J. G. van der Kaa, London.*—*23rd May*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to obviate the necessity of appliances for inserting or removing the stopper.

2586. CORSETS OR STAYS, *J. T. Hellier, Glasgow.*—*24th May*, 1883.—(*Not proceeded with.*) 2*d.*

Relates to the mode of fastening the stays.

2590. APPARATUS FOR ROLLING OR COGGING INGOTS, &c., *D. Evans, Blaenavon.*—*24th May*, 1883. 8*d.*

This relates to the general construction of the apparatus.

2600. TRAMWAYS, *A. H. Rowan, London.*—*24th May*, 1883. 8*d.*

This relates to a method of laying and fastening tramway rails.

2602. CONSTRUCTION OF STEAM AND OTHER SHIPS, *T. H. Ball, Chicago.*—*24th May*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to provide a ship with two propellers placed in such positions that the pitching of the vessel will not injuriously affect their action.

2610. SADDLES, *O. Lehmann, Paris.*—*25th May*, 1883.—(*A communication from F. Verden, Hanover.*)—(*Not proceeded with.*) 2*d.*

The object is to provide the saddle with an elastic attachment, instead of the usual girth straps.

2612. APPARATUS FOR CHECKING AND REGISTERING THE NUMBER OF GAMES OR DEALS PLAYED AT CARDS AND THE AMOUNT PAID THEREFOR, &c., *G. F. Howard, London.*—*25th May*, 1883. 6*d.*

This relates to a checking and registering apparatus having a lid or cover, the opening of which serves to operate a counter so as to register the number of games or deals played at cards, and thereby allow of checking whether the proper amount has been paid.

2614. TORPEDO BOATS OR SUBMARINE VESSELS, *W. R. Lake, London.*—*25th May*, 1883.—(*A communication from W. S. Sims, Newark, N.J., U.S.*) 8*d.*

The vessel is propelled by a motor, the electricity being generated at a land station, and supplied to the motor by a conductor paid out from the boat. The steering mechanism is also operated—electro-magnetically—by the current supplied to the motor. The charge is fired by a relay arrangement. The vessel may be submerged, in which case it is supported by a float.

2617. AUTOMATIC LATHES, *F. Wirth, Frankfort.*—*25th May*, 1883.—(*A communication from E. H. Freter, Frankfort.*) 8*d.*

Relates to the general construction and arrangement of parts of an automatic tool or lathe, particularly applicable to the production of screws.

2621. EXTRACTING SULPHUROUS ACID FROM THE FUMES OF FURNACES, OVENS, &c., *E. A. Brydges, Berlin.*—*26th May*, 1883.—(*A communication from E. Hänisch and Dr. M. Schröder, Rosdzin, Germany.*) 6*d.*

This relates to a process for extracting sulphurous acid from the fumes of furnaces by means of water, and the utilising of the absorbed sulphurous acid with small consumption of firing material.

2623. MANUFACTURE OF AIR GAS FOR ILLUMINATING, HEATING, &c., *G. Macaulay-Cruikshank, Glasgow.*—*26th May*, 1883.—(*A communication from R. C. Dixon, Sidney.*) 6*d.*

This relates partly to producing or manufacturing saturated air gas by passing a current of air over or through a heated volatile liquid or hydrocarbon, and thereafter cooling the gas to return any excess of hydrocarbon vapour so that the air remains just saturated therewith, and can be conveyed through gas pipes and burned like ordinary illuminating gas from fish-tail, batswing, argand, or other gas burners, and can also be used in cooking or heating stoves, and as the motive force in gas engines.

2626. MACHINERY FOR MOULDING OR SHAPING CLAY WARE, *W. Crawford, Glasgow, and P. Graham, Stockton-on-Tees.*—*26th May*, 1883. 6*d.*

This relates partly to the combination of a mould table, provided with rotating or stationary moulds, over which a movable tool is fitted, and means for imparting an intermittent rotary motion to the table.

2627. SAFETY STIRRUP BARS, *R. W. Hunt, Scarbro'.*—*26th May*, 1883.—(*Nol proceeded with.*) 2*d.*

The object is so to arrange the stirrup bar that the stirrup is freed therefrom in case the rider is thrown off.

2628. BICYCLES, TRICYCLES, &c., *J. Hix, London.*—*26th May*, 1883.—(*Not proceeded with.*) 2*d.*

This relates principally to the propelling mechanism.

2631. REVERBERATORY SMELTING FURNACES, *H. J. Haddan, London.*—*26th May*, 1883.—(*A communication from R. P. Wilson, Cleveland, U.S.*) 6*d.*

The inventor uses a combination of two or more reverberatory furnaces, so arranged that the last furnace is adapted to receive fluid metal from the other furnaces, being common reverberatory, and having a depressed hearth as a receiving furnace.

2630. CONSTRUCTION OF SILOS, *J. W. Butler, Blackheath.*—*26th May*, 1883. 6*d.*

This relates to the framework and general construction of silos.

2632. MACHINE FOR STRETCHING AND DRYING FABRICS, *H. B. Barlow, Manchester.*—*26th May*, 1883.—(*A communication from E. Welter, Mulhouse, Alsace.*) 6*d.*

This relates to the construction of a hot air machine.

2633. CONSTRUCTION OF PROPELLERS FOR NAVIGABLE VESSELS, AND IN THE MODE OF MOUNTING AND WORKING THE SAME, *N. D. Spartali, Liverpool.*—*22nd May*, 1883. 10*d.*

Consists in the peculiar construction of the blades of the propeller.

2634. APPARATUS FOR USE IN EFFECTING FRILLING, PLEATING, KILTING, GOFFERING, &c., UPON MUSLIN OR OTHER FABRICS, *O. McC. Chamberlain, Nottingham.*—*26th May*, 1883.—(*Not proceeded with.*) 2*d.*

Relates to improvements in the general construction of the apparatus.

2635. COUPLINGS FOR RAILWAY VEHICLES, *A. M. Clark, London.*—*26th May*, 1883.—(*A communication from W. W. Fitch and E. D. Griffin, West Bloomfield, U.S.*)—(*Not proceeded with.*) 2*d.*

This relates to an automatic coupling for railway vehicles, and it consists in the construction, arrangement, and combination of the parts.

2636. LIFEBOAT, *A. M. Clark, London.*—*26th May*, 1883.—(*A communication from T. Hamilton, Centrefield, U.S.*) 6*d.*

This relates to a lifeboat having an approximately spherical shell, segmentally cut away at its two sides, in combination with two paddle-wheels journalled in said sides, and means within the hull of the boat for propelling said wheels.

2639. AUTOMATIC CONTINUOUS BRAKE FOR RAILWAY CARRIAGES, &c., *L. A. Groth, London.*—*28th May*, 1883.—(*A communication from D. van der Linden, Hoom, Holland.*)—(*Not proceeded with.*) 2*d.*

The carriages, besides being coupled together by means of the usual loose hanging couplings, are coupled together by brake couplings, which come together at the plane of the buffers. The brake coupling consists in each carriage of a tube-like shell or socket, which is hung by a chain to a suitable part of the carriage frame. The corresponding coupling sockets of two adjacent carriages are connected by screws.

2643. STEAM BOILER AND OTHER FURNACES, *J. Elliott, jun., and T. A. Cunningham, Dalbeattie, N.B.*—*28th May*, 1883. 6*d.*

This relates to employing in, or in combination with, a steam boiler or other furnace, one or more jets of compressed and heated air, in a manner to cause a return or circulation of a portion of the fire gases through a passage or passages, leading them again over, through, or in contact with the burning fuel.

2644. LOCKING OR FASTENING DEVICE FOR WEARING APPAREL, BLINDS, UMBRELLAS, &c., *H. J. Haddan, London.*—*28th May*, 1883.—(*A communication from H. Brunner, Germany.*) 6*d.*

This relates to the employment of a cord or tape, which is bent round a tongue in a plate, and thereby hold by friction.

2645. CENTRIFUGAL CREAM SEPARATORS, *J. A. Hattersley, London.*—*28th May*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to the construction of the apparatus whereby the cream, which escapes from the revolving drum, is prevented from becoming clotted.

2648. MANUFACTURE OF HYDRATE OF STRONTIA AND HYDROSULPHIDE OF SODIUM, *C. F. Claus, London.*—*28th May*, 1883. 4*d.*

This relates to improvements in the whole process of treatment.

2649. APPARATUS FOR DRYING RAGS, WOOL, COTTON, &c., *J. Illingworth Whitelee, Batley.*—*28th May*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to the construction of a tubular boiler containing steam.

2650. MANUFACTURE OF CHILLED CASTINGS AND APPARATUS THEREFOR, *H. H. Lake, London.*—*28th May*, 1883.—(*A communication from J. A. Parks, New York.*)—(*Not proceeded with.*) 2*d.*

This consists essentially in constructing the mould or matrix with a water chamber surrounding the part to be chilled, and forcing a stream of cold water through the chamber.

2652. APPARATUS FOR STRETCHING WOVEN FABRICS, *J. Strang, Ramsbottom.*—*29th May*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to the construction of expanding rollers.

2653. PLOUGHS, *E. Edwards, London.*—*29th May*, 1883.—(*A communication from S. Boreau, France.*) 6*d.*

This relates to several improvements in the general construction of the plough.

2654. BURNERS APPLICABLE TO GAS COOKING APPARATUS, *S. Leoni, London.*—*29th May*, 1883. 6*d.*

This consists in forming the burner by casting it in two parts, one part being larger than the other, and the larger portion is so made as to form with the smaller part a hollow chamber, into which the gas and air pass and issue through notches made in its edges to produce the jets of burning gas.

2658. RING SPINNING FRAMES, *W. T. Emmott, Salford.*—*29th May*, 1883.—(*A communication from C. Verenkt and E. Appenzeller, Mulhouse.*—(*Not proceeded with.*) 2*d.*

The object is to wind the yarn at a constant angle without the assistance of a movable guide wire, and to secure a more uniform twist.

2659. HARNESS SHAFT TUGS, *S. E. Davis, Liverpool.*—*29th May*, 1883. 4*d.*

This consists in a metallic shafting formed of malleable cast iron or other like tough metal.

2661. ELECTRIC ARC LAMPS, *J. Brockie, London.*—*29th May*, 1883. 6*d.*

To produce a slow movement of the carbons when the feed mechanism is released, hollow discs having, in combination with glycerine, swinging weights in their interior, are used. The swinging weight may be of iron, an electro-magnet placed near the outside face of the disc limiting its movement. To separate the carbons in a lamp regulated by a shunt magnet, a coil is placed in the main circuit, the core of which overbalances a spring against which the regulating shunt magnet acts when there is no current, and so keeps a clutch in its feeding position. On the passage of current the main coil core frees a regulating lever and the arc is established by the descent of the shunt core. In a lamp having two pairs of carbons, two shunt coils are employed, the main coil core serving to overbalance both the regulating springs. In lamps having sudden grip clutch devices which are released by coming against a fixed stop, the inventor proposes moving the stop in an opposite direction to the clutch, thus shortening the travel of the solenoid core.

2662. TABLES AND CHAIRS, AND OTHER SEATS, &c., *H. Kinsey, Swansea.*—*29th May*, 1883.—(*Not proceeded with.*) 2*d.*

This relates partly to the arrangement and construction of the legs.

2663. ROTARY SCREENS FOR SCREENING OR SEPARATING GRAIN, SEEDS, &c., *H. Shield and W. N. Crockett, Nottingham.*—*29th May*, 1883. 6*d.*

This relates to a means whereby the screen can be cleaned without the aid of a brush.

2664. APPARATUS FOR PURIFYING MILDEWED OR MUSTY HAY OR FODDER, *C. Perkin, Northernden.*—*29th May*, 1883. 6*d.*

This relates to the use of pipes or conveyers with suitable openings therein for the carrying of steam within stacks of hay or other fodder, for the purpose of the purification of the same when mildewed or musty.

2665. SCREW STOCKS OR DIES, *W. J. McCormack, Paignton.*—*29th May*, 1883. 6*d.*

This relates, First, to the employment in combination with a screw stock or die plate of dies or bits having two sets of threads or teeth at both ends; Secondly, to the method of forcing the dies up to the work and of withdrawing them as required by means of a screw ferrule, having a flange working in a groove in the dies or bits.

2667. TELEPHONIC TRANSMITTING APPARATUS, *J Graham, London.*—*29th May*, 1883. 6*d.*

This relates to a microphonic construction of transmitter.

2668. DYEING SILK OR OTHER TEXTILE FIBRES, *T. Holliday, Huddersfield.*—*29th May*, 1883.—(*A communication from E. Rau, South Manchester, U.S.* 4*d.*

This relates to improvements in the general process of dyeing.

2669. OBTAINING AMMONIA FROM COAL GAS, *W. J. Cooper, London.*—*29th May*, 1883. 2*d.*

This consists in passing water into the condensers to dilute the ammoniacal liquor, so that it is discharged from the condensers in such a diluted state, or state of reduced strength, that practically it will not yield ammonia to the atmosphere.

2670. DYNAMO-ELECTRIC MACHINES, *W. Hochhausen, New York, U.S.*—*29th May*, 1883. 6*d.*

The copper armature discs are arranged as a series of zig-zags, the portions of the discs in which currents are induced being nearly radial strips, united two and two alternately at the outer and inner ends. A number of these discs placed together with insulating material between them are secured to each other by insulated rivets, and to a hub upon the shaft. The field magnets may be on opposite sides of the armature discs, or the discs may be a sufficient distance apart to allow of field magnets being introduced between them. The connections between the ends of the radial strips are larger than the strips in section, so as to lessen resistance. The commutator bars are connected as bars extending out from rings, and alternately so as to supply a continuous current to the brushes; the rings are grooved on their edges, and brushes may be applied to them to take off alternating currents.

2671. CONSTRUCTION OF TRAMWAYS AND APPARATUS FOR FACILITATING THE HAULING OF VEHICLES THEREON BY MEANS OF CABLES OR ROPES, *W. P. Hope, Edinborough.*—*29th May*, 1883. 1*s.*

This relates to the construction of tramways, and to apparatus for facilitating the hauling thereon by means of a rope or cable arranged within a tube placed under the ground and constituting part of the tramway.

2672. CARDING ENGINES, *A. M. Clark, London.*—*29th May*, 1883.—(*A communication from H. Woodman, Saco, U.S.*) 6*d.*

The object is to dispense with the use of cams in machinery for cleansing the flats of carding engines.

2673. GALVANIC BATTERIES, *A. M. Clark, London.*—*29th May*, 1883.—(*A communication from G. G. L. Valloni, Paris.*) 6*d.*

The batteries are charged with trichromate of potash or superoxygenated bychromate of potash or soda. The zincs are immersed in a perforated porous receptacle containing the exciting salt. The batteries are charged by means of an automatic magnetic arrangement, which by closing the circuit of an electro-magnet attracts an oscillating armature, and so turns on the supply of acid.

2674. RAILWAY BUFFERS, *H. H. Lake, London.*—*29th May*, 1883.—(*A communication from G. Turton, Boulogne-sur-Mer.*) 10*d.*

The inventor claims in or for a railway buffer the construction of the plunger and its collar, in such a manner that the said collar can be adjusted and fixed on the plunger to retain the same in the box or case, and can be readily removed to permit the withdrawal of the plunger therefrom when desired.

2675. ELECTRICAL METERS, &c., *T. J. Handford, London.*—*30th May*, 1883.—(*A communication from T. A. Edison, N.J., U.S.*) 6*d.*

This relates to the use of a "mono-electro-dynamic motor" for controlling the operation of registering apparatus. This is a uni-polar motor, its inductive portion being a straight or one-part conductor, through which the current passes in one direction only. The inductive portion is in the translation circuit, or in a shunt therefrom, the field coils being in a multiple arc circuit. Means are provided for opening the circuit of the field coils when the last lamp is removed from, and for closing it when the first lamp is placed in the circuit. The loading of the motor may be varied to compensate for variations in the strength of the current, and to insure the speed of rotation being directly proportionate to the current.

2677. APPARATUS FOR CHANGING AND STORING PHOTOGRAPHERS' BACKGROUNDS AND OTHER MOVABLE SCENERY, *A. M. Clark, London.*—*30th May*, 1883.—(*A communication from W. E. Lindop, St. Thomas, Canada.*) 6*d.*

This consists of a gate or switch-like frame provided with rails at top and bottom, together with a series of stalls, each having rails at corresponding heights to those of the gate to receive a back ground. The gate or switch is so pivotted that it may be brought opposite to any one of these stalls, so that the background therein may be readily run on to the gate for use from any one of the stalls or *vice versâ*.

2678. MACHINERY OR APPARATUS EMPLOYED IN THE MANUFACTURE OF PLATE OR LEAF SPRINGS, *G. W. Willford, Sheffield.*—*30th May*, 1883. 10*d.*

The machine consists of a pressure cylinder, piston, and rod, with a pair of dies of novel construction, the upper die and crosshead being connected to the piston-rod by a removable cotter or bolt or equivalent removable connection, and the lower die resting on a central platform fixed over a hardening tank.

2680. EXTRACTION OF GELATINE, FAT, &c., FROM BONES, HIDES, FISH, &c., *C. D. Ekman, London.*—*30th May*, 1883. 4*d.*

The inventor claims the extraction of gelatine, fat, and similar substances from bones, hides, fish, and other substances of animal origin, by boiling, under pressure, in a solution containing sulphurous acid, with or without a base or alkali.

2681. MACHINES FOR MAKING HORSE NAILS, *E. A. Bridges, Berlin.*—*30th May*, 1883.—(*A communication from A. Gross, Berlin.*) 6*d.*

The principal features of the invention consist of the special arrangement of the hammer, drum, the cut-off mechanism, the elliptical cam, the slides and the hammer slides, the feed mechanism, and the construction and arrangement of the continuous retort.

2682. MACHINE FOR PULVERISING SUBSTANCES, *H. C. Bull, Brooklyn.*—*30th May*, 1883. 6*d.*

The machine consists of a hollow cylinder with closed ends, within which are hung, from an inclined shaft, a series of rollers, which are caused to swing and rotate with the shaft, and strike and rub upon the inner surface of the cylinder as the shaft revolves.

2683. FASTENERS FOR FIBROUS, LEATHER, INDIA-RUBBER, AND OTHER DRIVING BELTS, *R. L. Kirlew, Manchester.*—*30th May*, 1883.—(*Not proceeded with.*) 2*d.*

The stud is pointed at the end, so as to pierce through the belt.

2687. SECURING TIRES TO LOCOMOTIVE AND OTHER WHEELS, *J. Spence, London.*—*30th May*, 1883.—(*A communication from A. C. Brown and R. Lindsley, South Africa.*)—(*Not proceeded with.*) 2*d.*

The inventors apply a continuous key between the rim and tire of the wheel in such a manner as to securely lock the tire to the rim, and entirely prevent its lateral displacement in the event of its becoming slightly slack.

2685. FLEXIBLE COMBINATION BUTTON AND FASTENER, *T. W. Taylor, Birmingham.*—30*th May*, 1883. 6*d.*
The button and fastener can be easily applied to the article, and requires no stitching on, being fastened by a metal tube turned back and forming an eyelet.

2688. STEAM BOILERS, *H. Johnson, Burgess Hill.*—30*th May*, 1883.—(*Void.*) 2*d.*
This consists in the use of dividing plates or water casings, which are so arranged with respect to the flue tubes that the products of combustion will be directed backwards or forwards, or in a circuitous direction through the several sets or groups into which the flue tubes are divided, and the heat of the products of combustion will be fully utilised before they escape to the smoke stack.

2689. VELOCIPEDE SADDLES, *J. White and J. Ashbury, Coventry.*—30*th May*, 1883.—(*Not proceeded with.*) 2*d.*
The object is to provide a saddle which will afford a yielding elastic seat to the rider.

2692. GOVERNORS FOR REGULATING THE SLIVER PASSING BETWEEN ROLLERS OF DRAWING MACHINERY USED IN PREPARATION OF COTTON, &c., *W. P. Thompson, Liverpool.*—30*th May*, 1883.—(*A communication from H. A. Chapin, Springfield, U.S.*)—(*Not proceeded with.*) 4*d.*
This relates to trumpet governors for railway or drawing heads.

2693. GRAINING OR ORNAMENTATION OF PAINTED OR COLOURED SURFACES, *J. A. Meginn, Liverpool.*—30*th May*, 1883. 4*d.*
The invention is based on the principle of absorbing the surplus material, instead of pressing it aside or rubbing it off.

2694. TRUCKS OR ROLLING STOCK, CHIEFLY FOR NARROW-GAUGE RAILWAYS, *A. J. Boult, London.*—30*th May*, 1883.—(*A communication from P. Dietrich, Berlin.*) 6*d.*
According to this invention a platform is carried by two small bogies, with two axles each, in such a manner that the bogies can move under the platform, within certain limits, independently of one another.

2695. COVERS OR CASES FOR CONTAINING OR ENVELOPING ARTICLES FOR TRANSMISSION BY POST OR RAIL, *J. Hertz, London.*—30*th May*, 1883.—(*Not proceeded with.*) 2*d.*
This consists of a covering with slits on each side, which overlap the boxes or goods to be contained. After these have been overlapped, the ends of the width of the box are turned over, and by means of suitable holes are laced together, and the ends thereof clamped or sealed, to prevent the opening of the package without being detected.

2696. STAITHS AND APPARATUS IN CONNECTION THEREWITH FOR FACILITATING THE SHIPPING OF COAL FROM RAILWAY WAGONS, *G. Taylor, Penarth.*—30*th May*, 1883. 10*d.*
This relates to the general arrangement and construction of portable staiths, and to the special means of rendering the same portable, and to the hoisting and tipping gear for the platform, and to other improvements in connection with staiths having for their object to facilitate the running of the wagons into the staith, tipping them, and running them out again.

2698. CHIMNEY POTS AND VENTILATORS, *J. Waple, London.*—30*th May*, 1883. 4*d.*
This relates to a chimney top or ventilator constructed with two sets of apertures, of which the lower set are provided with hoods, while the upper set are uncovered.

2699. COKE OVENS, *F. Wirth, Frankfort.*—30*th May*, 1883.—(*A communication from F. Brunck, Mannheim, Germany.*) 6*d.*
The oven is formed cup-shaped in cross section.

2700. BANJOS, *W. R. Lake, London.*—30*th May*, 1883. —(*A communication from H. McCord, St. Louis, U.S.*)—(*Complete.*) 6*d.*
Relates to several improvements in the construction of banjos.

2701. TRANSMITTING AND APPLYING POWER FOR PUNCHING, RIVETTING, &c., AND MACHINERY THEREFOR, *A. Higginson, Liverpool.*—31*st May*, 1883. 6*d.*
This relates partly to transmitting power stored or accumulated in a fly-wheel by means of a constantly moving column of liquid set in motion by means of pumps or rams in connection with the fly-wheel shaft.

2702. GAS MOTORS, *C. Pieper, Berlin.*—31*st May*, 1883. —(*A communication from E. Körting and G. Lieckfeld Hanover.*) 6*d.*
This consists, First, in so directing the current of gas and air entering into a space at the bottom end of the cylinder that the same will, by impinging against the wall of the said space, be diverted from its original direction and lose its initial velocity; Secondly, in means for igniting the gas mixture; Thirdly, in mechanism for regulating the speed of the engine.

2703. MANUFACTURE OF STARCH, *J. Polson and J. M. Harley, Paisley.*—31*st May*, 1883. 4*d.*
This consists in drying the starch in a stove whose atmosphere is charged with moisture or steam.

2704. TROUSERS, BREECHES, AND DRAWERS, *J. H. Clibran, Altrincham.*—31*st May*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to making the garment with a "full fall" at the back.

2705. SEATS DESIGNED TO SERVE ALSO FOR SUPPORTING PERSONS ON OR IN WATER, *J. A. Boxer, Folkestone.*—31*st May*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to seats furnished with tanks or vessels to make them buoyant in water.

2706. GAS CALORIC MOTIVE ENGINES, *E. and E. Crowe, Manchester, and H. Crowe, Middlesbrough.*—31*st May*, 1883. 6*d.*
This relates to several improvements in the general construction of the machine.

2707. MANUFACTURE OF SOAP, *E. A. Brydges, Berlin.* —31*st May*, 1883.—(*A communication from F. O. Spielhagen, Berlin.*)—(*Not proceeded with.*) 2*d.*
This relates to the manufacture of petroleum soap.

2709. APPARATUS FOR THE PRODUCTION OF STEAM POWER AT A MINIMUM COST, &c., *S. J. Fear and G. C. S. Hill, Bristol.*—31*st May*, 1883. 6*d.*
The inventors claim the division of the furnace into two parts or chambers, one being for the furnace and the other constituting the ashpit.

2710. PRODUCING A PROTECTING COATING OF RUST ON CAST IRON, WROUGHT IRON, OR STEEL, *L. A. Groth, London.*—31*st May*, 1883.—(*A communication from E. Nicolaus, Saxony.*) 4*d.*
This relates to improvements in the general treating of the objects to be coated.

2711. SCISSORS, HAND SHEARS, &c., *L. A. Groth, London.*—31*st May*, 1883.—(*A communication from B. Cunze, Berlin.*) 6*d.*
The implements are provided with adjustable and renewable blades.

2712. COCKS OR TAPS, *J. Ohren, Rio de Janeiro.*—31*st May*, 1883. 6*d.*
This consists in the construction of cocks or taps having an indent cut in the plug, which is secured to the barrel by a catch pivotted to a lug attached to the barrel or lower part of the "cone" or connecting piece, or both.

2713. MANUFACTURE OF "CARAMELS," AND APPARATUS THEREFOR, *H. Roberts, Greenwich.*—31*st May*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to the means of cutting the caramels into blocks.

2716. SHIPS' BERTHS, *H. J. Haddan, London.*—31*st May*, 1883.—(*A communication from G. O. Smith, Boston, U.S.*) 6*d.*
This relates to self-levelling ships' berths, and consists essentially of the following elements:—An inner section or berth pivotted to the sides of a middle section; a middle section pivotted in its ends to the ends of the outer section, the latter being pivotted in its ends to the cabin walls.

2719. TOOTHED WHEELS, AND MACHINERY FOR PREPARING WOOD PATTERNS FOR SAME, &c., *H. Shaw, Sheffield.*—31*st May*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to forming the teeth of an arched or curved shape.

2721. STEAM BOILERS, *E. Binns, Halifax.*—31*st May*, 1883.—(*Not proceeded with.*) 2*d.*
This consists of an arrangement, construction, and combination of water compartments and water tubes, fire tubes, combustion chamber, smoke-box, and apertures for facilitating cleaning and repairing and renewing the fire tubes, and a baffler plate—combined with the tubes—for diverting and turning the flames and heated gases.

2725. FLOATING VESSELS AND APPARATUS FOR CARRYING AND DISCHARGING GRAIN AND BULK CARGO, *W. Johnston, Liverpool.*—1*st June*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to the general construction of the vessel and the apparatus.

2722. ELECTRIC DEVICES FOR INDICATING SPEED AND FOR OPERATING SAFETY VALVES, *R. P. Sellon, London.*—31*st May*, 1883. 6*d.*
Relates to the combination of a centrifugal governor and a "bridge" for giving the required indications at any desired place. For operating safety valves an electro-magnetic arrangement, the circuit of which is completed by a pressure gauge, is employed.

2729. STEAM ENGINES, *W. C. Nicholson and J. Dixon, Kingston-upon-Hull.*—1*st June*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to the construction of an apparatus to be connected to a steam engine and boiler, for the purpose of effecting the return of the exhaust steam uncondensed from the engine to the boiler.

2730. MANUFACTURE OF SHOT, AND APPARATUS THEREFOR, *G. Lampen, Gateshead-on-Tyne.* — 1*st June*, 1883. 6*d.*
This consists in the method of manufacturing shot by rolling the metal into rods, cutting these into lengths corresponding with their diameters, and subsequently reducing the pieces to a spherical shape by attrition in a suitable mill.

2733. WATER-CLOSETS AND APPARATUS CONNECTED THEREWITH, *J. Smith, Blackburn.*—1*st June*, 1883. —(*Not proceeded with.*) 2*d.*
This comprises a tipping pan and regulating valve.

2734. PURIFICATION OF ALKALINE SOLUTIONS, *T. Glover, Runcorn.*—1*st June*, 1883. 2*d.*
This relates to the method or process of purifying alkaline solutions by means of a solution of a native carbonate of zinc, such as calamine in caustic alkali.

2735. POTTERY KILN, *J. Broadhurst, Fenton.*—1*st June*, 1883.—(*Not proceeded with.*) 2*d.*
Retates to the general construction of a kiln of rectangular form.

2737. ADAPTING RAILWAY VEHICLES TO LINES OF DIFFERENT GAUGE, *W. R. Lake, London.*—1*st June*, 1883.—(*A communication from J. W. H. Hullet, Port Augusta, South Australia.*) 6*d.*
This consists in arranging upon each of the axles of the vehicles a pair of wheels to correspond with the gauge of each railway over which the vehicles have to travel, the wheels, in cases where the difference between two gauges is only slight, being provided with double flanges.

2738. COAL STAITH OR TIP FOR LOADING OCEAN-GOING STEAMERS, *G. Taylor, Penarth.*—1*st June*, 1883. 8*d.*
This relates to a staith or tip capable of loading ocean-going steamers, and which is so constructed and has its machinery so arranged that the staith is transportable from place to place, to suit the hatchways of the steamer.

2740. MANUFACTURE OF BOOTS AND SHOES, *W. P. Thompson, Liverpool.*—1*st June*, 1883.—(*A communication from W. Rogers, Cincinnati.*) 6*d.*
The object is to provide means for manufacturing shoes without employing a permanent inner sole.

2741. ELECTRO-MAGNETIC ENGINES, ELECTRO-MOTORS, OR ELECTRO GENERATORS, *R. W. M. Fraser, London.*—1*st June*, 1883.—(*A communication from J. R. Fraser, Gibraltar.*) 6*d.*
Relates to an arrangement by which the whole of the current is shunted through the armatures and their field magnets when the poles would attract each other, and is shunted from them when they would repel each other.

2742. MANUFACTURE OF TOOTHED OR OTHER WHEELS, *J. Whittaker, Oldham.*—2*nd June*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to the means of interlocking the arms and the rim.

2744. MANUFACTURE OF WOOD SCREWS AND APPARATUS EMPLOYED THEREFOR, *F. C. Glaser, Berlin.*—2*nd June*, 1883.—(*A communication from H. Boesner and F. Baumgarten, Germany.*)—(*Not proceeded with.*) 2*d.*
This relates to the means of cutting the thread.

2748. TREATMENT OF CERTAIN ORES FOR PRODUCTION OF COLOURS AND PAINTS, *P. C. Bunn, Norwich.*—2*nd June*, 1883.—(*Not proceeded with.*) 2*d.*
This relates to the process for treating certain peats, clays, or earthy matters or ores which are rich in oxide of iron.

2750. MANUFACTURE OF REFINED SUGAR AND APPARATUS TO BE USED THEREIN, *J. Allen, London.*—2*nd June*, 1883. 6*d.*
This relates to the introduction of successive charges of sugar into the vacuum pan during the boiling operation without breaking the vacuum or arresting the boiling of the liquor, whereby the immediate dissemination of the charge of raw or refined grain or crystal sugar throughout the liquor is automatically effected, and the formation of the grain within the vacuum pan is accelerated.

2752. STEAM ENGINES, *W. H. Watson, Leeds, W. Strother, Ripley, and J. Spence, High Harrogate (executors of W. Watson, Leeds.)*—2*nd June*, 1883. 6*d.*
In order to preserve the piston-rods steam tight in the cylinder cover, the inventor applies a split ring or rings on the cylinder cover and round the piston-rod.

2753. FIRING GUNPOWDER FOR BLASTING PURPOSES AND APPLIANCES THEREFOR, AND CARTRIDGES, *C. W. Curtis, London.*—2*nd June*, 1883. 6*d.*
A special igniting appliance is employed containing an explosive such as gunpowder; this appliance is made as a box or tube or other suitable form, and is inserted in the blasting cartridge or charge. The fuse is connected to it.

2755. PREPARING AND CONSTRUCTING ROADS AND WAYS, *H. F. Williams, London.*—2*nd June*, 1883. 4*d.*
This relates to a combination of asphalte and wood.

2756. GLASS SYRINGES, *E. C. Williams, London.*—2*nd June*, 1883. 6*d.*
This relates to the construction of the plug.

2761. COMBING MACHINES, *E. de Pass, London.*—4*th June*, 1883.—(*A communication from J. Imbs, Paris.*) 10*d.*
This relates to several modifications in the details of "Imb's" combing machines.

2765. FIREPLACES FOR STEAM BOILERS, KILNS, &c., *P. Jensen, London.*—4*th June*, 1883.—(*A communication from F. von Callenberg and E. Fischer, Teplitz, Bohemia.*) 10*d.*
This consists essentially in providing above the grate an enclosed space, in which the fuel undergoes a preparatory drying and heating process, and is deprived of its fluid constituent parts in a manner somewhat similar to that of the coking process.

2768. APPARATUS FOR GENERATING ELECTRIC CURRENTS, &c., *H. H. Lake, London.*—4*th June*, 1883.—(*A communication from R. E. Ball, New York, U.S.*) 6*d.*
The inventor dispenses with the usual field magnets, and uses two or more armatures, which have a mutual inductive action upon each other, so as to generate continuous currents in each other. The armatures may revolve in the same or in opposite directions, or one may be stationary; but in any case they are so arranged that the inducing and induced parts move in opposite directions when in proximity to each other. Each armature is composed of an annular iron ring, wound with endless coils of insulated wire, similar to the "Pachinotti" armature. Only one or two layers of wire are used, to allow of the iron cores being in close proximity. Each armature is divided into a number of parallel circuits, with corresponding polarity points, by connecting each commutator plate to the armature at two or more points. Field magnets may be used, having pole pieces common to two or more armatures revolving on separate shafts.

2782. ELECTRICAL WIRE PROTECTORS, *J. O. Cattnell, Fanwood, N.J., U.S.*—5*th June*, 1883. 6*d.*
The wires are carried in grooves cut in a board, and are held in place by a second board, or other suitable means.

2787. MARINE STEAM ENGINES, *J. G. Kincaid, Greenock.* —5*th June*, 1883. 6*d.*
This consists in compound steam engines of the arrangement and combination with the exhaust pipe, connecting the high and low-pressure cylinders, of a change valve for directing the high-pressure exhaust to the valve casing of the low-pressure cylinder, or to the condenser, and for admitting steam—of reduced pressure—direct to the low-pressure cylinder as desired.

2792. ROCK DRILLING APPARATUS, *W. P. Thompson, Liverpool.*—5*th June*, 1883.—(*A communication from G. McC. Derby, Astoria, U.S.*) 6*d.*
This consists partly of a tubular rock drill, having its bit or cutting edge composed of wedge-shaped teeth, the cutting edges of which are wider than their bases, so arranged that lines joining their outer edges shall form a polygon, and having recesses between said teeth, and extending above their bases.

2793. HERMETICALLY CLOSING OR STOPPERING GLASS BOTTLES, JARS, AND SIMILAR VESSELS, AND MACHINERY THEREFOR, *W. E. Gedge, London.*—5*th June*, 1883.—(*A communication from Messrs. Berthe, Wulvéryck, and Servas, Paris.*) 6*d.*
This consists in the application upon the neck of the bottle or vessel previously closed by the aid of an india-rubber cap or cover, of a metal collar, which firmly clips the neck of the said vessel, thereby securing the india-rubber cap or cover. It also consists in the machine employed.

2802. STEAM AND OTHER PISTONS, *A. MacLaine, Belfast.*—6*th June*, 1883. 6*d.*
This relates to the construction of spring metallic packing rings.

2805. PENCIL-POINT PROTECTORS, *F. Byron, Chesterfield.*—6*th June*, 1883. 6*d.*
This consists chiefly in the combination of a blade with the tubular protector for the point of the pencil, and also in an arrangement for protecting the india-rubber at the opposite end of the protector.

2841. SAFETY SADDLE BARS, *Sir T. Dancer, Malmesbury.*—7*th June*, 1883. 6*d.*
This relates to means for releasing the rider should he be thrown from the horse.

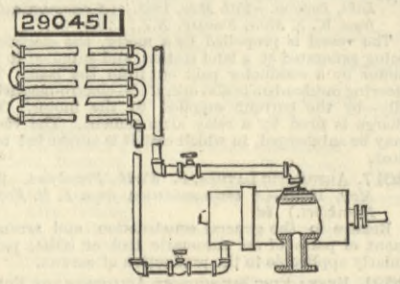
2872. MANUFACTURE OF ELECTRIC ARC LAMPS, *H. J. Allison, London.*—8*th June*, 1883.—(*A communication from W. Baxter, Jersey City, N.J., U.S.*) 6*d.*
This relates chiefly to the manufacturing of the frames and globes and their fittings so as to allow of ready access to the regulator and carbons, adjusting the latter without removing the globe; and to prevent the gases of combustion reaching the regulating mechanism.

2887. ATTACHING LAMPS TO CARRIAGES, *N. Stretton, Birmingham.*—9*th June*, 1883. 6*d.*
This consists principally in interposing between the socket of the lamp iron and those parts of the lamp fitting in and bearing against the said socket, a tubular lining or collar made preferably of vulcanised india-rubber.

SELECTED AMERICAN PATENTS.

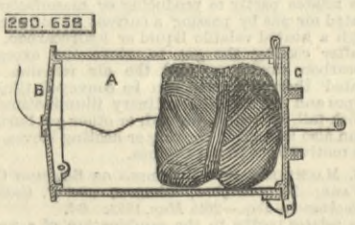
From the United States' Patent Office Official Gazette.

290,451. APPARATUS FOR UTILISING THE WASTE HEAT OF GAS ENGINES, *J. Vaughan Merrick, Philadelphia, Pa.*—*Filed June 18th*, 1883.
Claim.—The combination of the cylinder and water-jacket of a gas engine with heating apparatus and



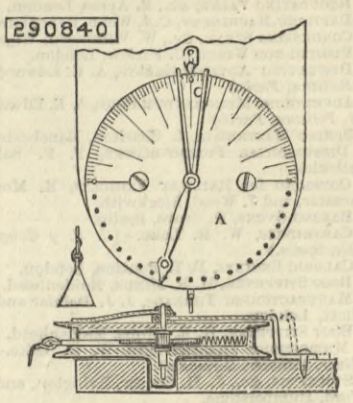
connecting pipes, by which water is caused to circulate through the jacket and through the heating apparatus, substantially as set forth.

290,658. TWINE BOX FOR GRAIN BINDERS, *John F. Appleby, Minneapolis, Minn.*—*Filed August 14th*, 1883.
Claim.—(1) A twine box for a grain binder, having a hinged cover at the bottom or end opposite that from which the twine is led to the binding mechanism. (2) The head G, clamped or otherwise secured to any



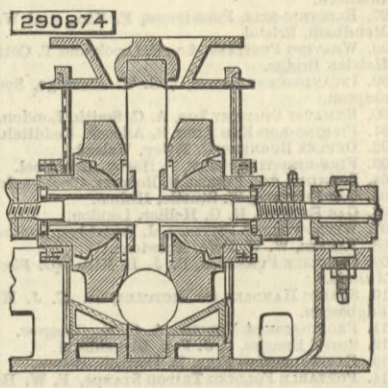
convenient part of the grain binder, and having a hinged connection with the bottom of the twine cylinder A, provided with the perforated head B, as and for the purposes set forth.

290,840. HEADWAY AND LEEWAY INDICATOR FOR VESSELS, *Burton E. Blakeslee, Cambridge, Md.*—*Filed April 16th*, 1881.
Claim.—(1) The device herein described for indicating headway and leeway of vessels, consisting of a relatively stationary pointer, a circular and centrally-pivotted case having a scale thereon, and a log and log line connected with the case and adapted to turn bodily, substantially as described. (2) The combination, wiih a relatively stationary pointer C, and the centrally-pivotted case having a scale thereon, as described, of two loose hands arranged on the centre shaft of the case, and resting one upon each side of the stationary pointer, and a log line and log adapted to move the case on its pivot to indicate the leeway, as described. (3) A case provided with devices for indicating headway or leeway of vessels, constructed with flanges at its edges to form a peripheral groove or channel, combined with the log line, and adapted to receive the coils of the same, as described. (4) A centrally-pivotted circular case provided with devices for indicating the headway and leeway of vessels, constructed with flanges at its edges to form a peripheral



groove or channel, combined with the log line and adapted to receive the coils of the same, as described. (5) The combination, with the circular case A, having a central pivot and a leeway scale on its face, of the relatively stationary pointer C, having an adjustable connection with the base plate, substantially as and for the purpose described.

290,874. PULVERISING MACHINE, *Hermann Bernhard Feldmann, Philadelphia, Pa.*—*Filed July 16th*, 1883.
Claim.—(1) In a pulverising machine, the combination of the discs, the sleeve journals, the rubber cushions, and means for retaining the rubber cushions in place against the face of the discs, substantially as



and for the purposes set forth. (2) In a pulverising machine, the combination of the discs, the sleeve journals, the annular cushions, the face plates, and the bolts, substantially as and for the purposes set forth.

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