RUSSIAN ARTELS OR CO-OPERATIVE LABOUR SYSTEMS.

The labour conditions of Russia are peculiar to that empire. From the nature of the governmental and social systems, as well as the heterogeneous and segregated condition of the working classes, labour unions in the general sense of the term do not exist. Wages are more a matter of bargain than of fixed rate. The vastness of the country and the absence of communication localises industries, and especially owing to the first-named cause, much work can only be carried on during summer. The system of boarding and lodging employés extensively prevails; and although serfdom is legally abolished, much of the feudal relationship of employed to employer remains. From all these causes it is nearly impossible to compare labour in Russia with that in the other countries of Europe.

An additional element in the question, and one well worthy of attention at the present time, is the artel or co-operative labour system. These societies exist in all branches of industry and trade to such an extent that if they were abolished the entire business of the empire would be at a standstill. They have existed from early times, are governed by a community of interests and a collective and unlimited liability. They may be divided into (1) Handicraft artels, (2) Labourers' artels, (3) Independent artels, (4) Exchange or trade artels, (5) Dragil companies.

Handicraft artels.—Ancient Russia formed one immense plain. In this vast territory the occupation was uniform, while its size encouraged a tendency to roaming, and there was no distinction between craftsmen and husbandmen. In the rest of Europe much of the rural population had settled in the fortified towns, and adopted new habits and trades. The cities in Russia being but walled villages, had no attractions for the surrounding peasantry; from the earliest times the peasants had to seek supplementary employment in addition to tilling the soil, and in the course of time whole villages abandoned the care of the fields to the aged men and women, while they went forth to seek easier and more profitable means of subsistence. Those who found employment organised themselves as a guild, dividing, as when at home, equally profit and work. Gradually the system developed into three classes—the city, village, and wandering industries. The period of serfdom interrupted all progress, and hindered any association for individual advantage or profit. The serf was compelled to leave his association and work for some merchant or factory owner. Through the antipathy of the Russian peasant to the methodical work of factories, only the worst class of workmen, or those to whom the factories were the last resource, entered them, and to remedy this state of things manufacturers, under an edict of 1723, acquired land and serfs by purchase. The Russian artisan class was chiefly recruited from the serfs, who had no interest in an institution which neither afforded them their freedom or lightened their burdens. Skilled artificers were not produced, but a mass of half-trained craftsmen, who became artisans to escape field labour. This system went on until the emancipation of the serfs. A committee was appointed in 1852, and after sitting until 1869, recommended "the repeal of existing laws, and a return to the earlier system of artels and trade associations." Each body was to be afforded full freedom and protection as soon as it had organised itself. The urban workmen have returned to their original starting point, and the rural labourers have, to a certain extent, followed their example. Until the seventeenth century these associations were called "vataga;" they then began to be called "artels," and this borrowed word, whose derivation is uncertain, has become the name of a particularly Russian institution. Artel means an association of several persons who have united their capital and labour, or the latter only, for the purpose of carrying on trades or work with a collective and individual responsibility. It is generally a cardinal principle of the association that labour only, and not borrowed or endowed capital, can confer membership, and that as all the members are upon an equality they receive the same wages. In the artel the proportional risk is accompanied by an unlimited responsibility, thereby the credit of associations with small capital is increased, as well as a guarantee given for the execution of work. The unlimited responsibility necessitates a limited membership, and calls forth a certain amount of caution. This is all the more necessary since the contracting party is not an individual employer but a working body. The book-keeping is restricted by the absolute equality of all the members to a simple registration of income and outlay. As examples of artels the following may be given:—The first is of a thoroughly primitive nature. It exists in the government of Vladimir. Several villagers unite their capital to purchase iron, which is then made into scythes at the village smithy. These scythes are entrusted to a member for sale in the neighbouring towns and villages, who also takes orders for additional ones. Orders are promptly executed, and the profit is equally divided among the members. In the government of Moscow the artels are more completely organised. There the blacksmiths, joiners, and locksmiths of neighbouring villages unite. The amount of capital being decided upon, it is raised by voluntary contributions. Only inhabitants of those villages who take active part in the association can become members. Any member can be elected upon the committee of management, who procure the raw materials and sell the products. After deducting the cost of the raw materials, 70 per cent. of the receipts are divided among the working members, and 30 per cent. put aside as a reserve fund. Idle members are either expelled or must submit to a deduction, determined by the vote of all. All business transactions are based on mutual confidence, conducted by word of mouth, and at the close of the yearly accounts the same round is begun again, the artels annually renewing and reconstructing themselves. Another instance is that when certain Government factories for the manufacture of percussion caps for artillery were closed as being too expensive, several artisans familiar with the process of manufacture formed an artel and undertook to execute the Government orders. Thirty-three thousand caps were ordered, and the artel, which consisted of sixty members, was allowed to use the Government works. The order was executed within the stipulated time, and a cap which had cost the Government from 1s. 6¾d. to 3s. 1½d., was furnished by the artel for 1s. 4½d. The artel was then increased in number to 150, and undertook to supply 180,000 caps under the conditions that the caps were to be made in the artel's workshop, and the price reduced 1¼d. per cap. Although the conditions involved an expense of £2735, the order was executed to the satisfaction of all concerned. Larger orders were executed at still lower prices, and as the Government orders could only keep them employed for nine months in the year, they began to manufacture for their own risk and accounts. There being no purchasers for artillery caps besides the Government, it is difficult to see the advantage of this course. Besides its financial success, this artel has been a source of benefit in many ways to the district in which it is situate. City and town artels differ only in the Government requiring a written constitution and bye-laws, which must be sanctioned by the Minister of the Interior. The condition of the artels of the wandering trades, though they are the most numerous in members, is not so satisfactory. From want of capital they are compelled to work for some builder or contractor, who employs them as carpenters, masons, &c. An elder instructs them in their work, and is the connecting link between them and their employer. These artels are only such in name, all independence having been lost. One of their number, chosen for the purpose, procures each week's supplies; if the workmen are fed by their employer, his duties are confined to providing lodging for and advocating the interests of the artel before the elder.

Labourers' artels.—The artels of the labourer are no less important than those of the craftsman, and are found in districts where neither circumstances nor nature favour their development. They may be divided into two kinds, viz., independent, or furnishing their own capital, and dependent, or relying solely upon foreign capital. To the former class belong the agricultural, hunting, and lumbering artels; to the latter class, the artels for catching marine animals and fishing. Class 1: In the strict meaning of the term, agricultural artels do not exist, with the exception of one in the government of Archangel, one in that of Olonets, and one in that of Tschernigof; but are in process of formation, with a view to solve the land question. After emancipation of the serfs, a certain quantity of land was assigned to each village peasant community, and this land was divided according to the number of male adults. The number of adults was determined by the previous census. As the interval between each census was from fifteen to twenty years, changes in the various families were often such as to render the mode of allotment unfair, some families being increased and others reduced. The average size of the allotments is not large, and suffices for the support of a family in the best years only. Another difficulty is that of procuring servants. The feeling of equality pervades the peasant to such a degree that he prefers selling his possessions, and seeking his fortune in remote districts, to taking service in his own village. The question of altering the land tenure has been under consideration for years. The peasant is holder in usufruct, and not in fee, the land being vested in the community; and this fact is considered by many as the root of all the evils which afflict the peasantry. Whilst the question of agricultural artels has been occupying the public attention, two kinds have gradually developed, viz., cheese-making artels and the female artel for tobacco planting. These artels are formed as follows:—When a village community has decided to erect a cheese factory the peasants organise themselves; all delivering milk at the factory are members, without reference to the quantity delivered. The season begins in February and ends in September, when the accounts are settled. The management of the artel is under an elder, chosen annually; that of the factory under a master, generally a foreigner—Dutch—assisted by lads of the village, whom he instructs in cheese-making, and who in time become masters themselves. In 1873 there were fourteen cheese-making artels, the members being 600. These artels are particularly important, as both sexes find in them profitable employment. In the tobacco planting artels two or three Cossack single women at the end of autumn or the beginning of winter leave their homes in search of work. Having found a farm and agreed with the owner, they enlist the necessary number of associates and organise artels of from six to nine members, according to the size of the plantation. The terms generally are that the planter provides a well-manured field, sheds for drying the tobacco, fire, light, and lodging for the members of the artel, who for their part perform all the work, from the planting of the tobacco to its preparation for the market. For remuneration they receive half the crop. Marriage excludes from all the tobacco-planting artels. The planters prefer the artels to day labourers, on account of their being much cheaper; the cost of preparing a pood, or 36·1 pounds, by the labourer is estimated at 3s., as against 2s. 5d. by the artels. Taking the entire process from the commencement, the artels are still cheaper. It is very difficult to estimate the earnings of a member, ordinarily they range from £4 14s. to £7 16s., and have risen up to from £15 10s. to £22 15s. Artels for mining are organised much on the same plan, but are less independent. Hunting, one of the most remunerative occupations in Russia, is, from its nature, but little adapted to associative societies. But the Russian is so addicted to the artel system, that he prefers even in hunting to act in common with others. Hunting artels are the most primitive known. They have no captain or leader, each member provides his own gun and ammunition, and every hunter who has participated in the hunt receives an equal share of the result, with the division of which the artel may either continue or dissolve. Often a number of peasants unite and hunt for a whole season, on absolute equality, the worst shot receiving the same share as the best. Statistics of these artels have been kept in Archangel only. The members of hunting artels number 9593, forming 4 per cent. of the population of the government. The artels for walrus hunting have existed from the 15th century; they consist of from eight to fifteen men, the captain is either the venturer or someone chosen by him. The venturer furnishes the money, provisions, utensils, &c. The animals caught, or what the venturer gives for them, are divided into as many shares as there are members in the artel. Of these shares the venturer takes two-thirds and the artel one-third. Of the artel's shares the captain takes four or five, the mate one or two, and the remainder are divided equally among the members. The number of these artels is constantly diminishing, and they will soon be extinct unless they gain more independence. Seal-hunting artels have existed for the same length of time as the preceding; their organisation varies slightly according to their hunting grounds. The Archangel artels consist of from two to five men. The boat and all supplies are furnished by the venturer, who is generally an active member; the venturer has half or three-fifths of the catch and the artel the remainder. The Mesen artels consist of seven members. The catch is divided into eight shares; to the boat is assigned one—the remainder is divided between artel and venturer as above. The number of seal-hunting artels is about 1840, with a membership of 8200. It is difficult to estimate the earning of the seal and walrus-hunting artels, as they are obliged to sell to the venturer, and receive but little, if any, payment in money. Cod-fishing artels consist of four members; these artels to the number of eight arrange to work with one venturer, who takes two-thirds of the catch. The artel is not obliged to sell to the venturer, but generally does, as he pays the current price. The number of these artels is about 700, and of members 2800; the earnings of each member are about £5 10s. a month. Salmon-fishing artels are various in their modes of organisation; in the most frequent cases they are governed by the parish or village authorities, who own the fishing grounds. Occasionally the stations are let out partly or wholly to capitalists. Capital has no influence on the organisation of these artels, but being without the means of transporting the catch to market, they are compelled to sell to capitalists and receive payment in goods. The most usual organisation is that the peasants form themselves into as many artels as there are fishing stations, and cast lots for choice; each member makes a certain proportion of the net and receives an equal share of the profits. The strictest honesty is observed, everything being common property. The number of artels is 921, with a membership of 4534. The remaining fishing artels do not differ materially from the preceding.

Exchange or trade artels.—These artels are the best known, most important, and most widely extended of all. As examples, those of St. Petersburg and Archangel are given, the artels of other cities differing from these in minor details only. Exchange artels arose in St. Petersburg about 1712, when the government and commercial enterprises had attracted a large number of labourers, who organised themselves into artels for handling the merchandise entering and leaving the ports. Being at first largely employed by individual merchants, they were originally called after their employer or their native province, but acquired later the generic name of exchange artels. According to the work performed, these artels may be divided into two classes, viz., those handling merchandise and those engaged in counting-houses. The former are employed in all places where goods and wares are laden, unladen, or stored, and are in the main concentrated in and about the custom-house. Their duties are the following:—The discharge of every vessel arriving with dutiable wares is attended on the one hand by the representatives thereof, the customs' inspector and the members of the dragil companies, and on the other by certain artelstchiks in the interest of the consignee. The latter watch their employers' goods, inspect their condition, and report on the completeness, &c., of the shipment. After both parties have completed the discharge, the merchandise is transported by the dragils, accompanied by the artelstchiks to the customs warehouses. Here, assisted by the dragils, the artelstchiks open, unpack, examine, weigh, and re-pack the merchandise, and see that the necessary seals are applied, watch the goods stored in the warehouses, and, in short, perform all and every labour attending the discharge, receipt, and transportation of the goods. The work done in counting-houses is generally limited to the cash department, although the members of these artels are often employed as trusted servants in the employers' families, &c. As cashiers, they have full control of the money, and perform all the duties relating thereto. The income of the twenty-four artels in St. Petersburg is about £312,500. Their earnings are largely dependent upon the season, being in summer thrice as much as in winter. This fluctuation of receipts prevents the artels from accepting as many members as would appear necessary, and compels them to employ for the simpler duties of carrying the merchandise, &c., the labourers' artels. All artels have a fixed tariff, beyond which they may not go; but they usually accept rates much below those of their tariff. These artels perform their work in the most conscientious manner, and are collectively responsible for every loss or injury caused by one of their number. These losses are either paid from the capital of the artel, or, in cases where the loss exceeds the capital, is worked off by the artel. But such losses are the rarest occurrences, as excessive care is exercised by every artel in the selection of its members. Every offence is punished by a larger or smaller penalty. These punishments are (1) a fine imposed by the artel; (2) exclusion from work, being either definite or indefinite, and (3) expulsion from the artel, being either ordinary or extraordinary. The first is imposed for unwarranted absence from posts, and varies from 1s. 10d. to 9s. 4d. If this fault occurs repeatedly, or if there is a decided offence on the part of an artelstchik, the fine fluctuates between 18s. 9d. and £31 5s., or the culprit is excluded from work. Expulsion is resorted to when no other punishment avails. The

minor penalties are inflicted by the elder of the artel, with the right of appeal to the whole body. Suits in the courts of law are expressly forbidden, refractory members being liable to extraordinary expulsion, *i.e.*, he forfeits at his expulsion all moneys due to him. A frequent resort to such penalties would soon ruin the artel, and admission thereto is consequently not easy. The chief qualifications are honesty and temperance ; the applicant must be known to several of the members, one of whom must become his surety. If these conditions are complied with and the applicant is sound of body and able to read and write, he is called before the general assembly, and after promising to obey all the rules of the artel, and to accept the principle of collective responsibility, signs a document to this effect; he then has to pay an initiation fee and entertain the artel. The amount of the initiation fee varies from £235 to £470, and may be paid in one sum or gradually. This fee is exacted from adult members only, minors paying an annual sum varying from £14 to £17 during their minority, and being at their majority, on payment of the balance, accepted as full members. But few are able to pay this fee at once, and most are engaged for years in working it off. These payments are divided among the members once or twice a year in the following manner:—The elder makes up three lists, viz. (1) a list of the share of each member, less the initiation fees; (2) a statement of the number of days worked by each member, and the wages due to him; and (3) a list of all the fines and other receipts; and each member receives his share according to these lists. The inequality of these shares depends upon the proportion of the entrance fee actually paid and the work performed by the members. From the share of each artelstchik certain deductions are made for the reserve and guarantee funds, as well as for charitable purposes. Every member, if not in debt, may leave the artel at will, and receives, if his retirement takes place within six months, his entrance fee in full, but later only one-third thereof is paid. The twenty-four St. Petersburg exchange artels have at present about 5000 members, whose average earnings a year are £62 10s. each.

Dragil companies.—These associations, although not designated as artels, are, both in their principles and management, identical with artels. The only difference is that the custom department, whose interests they represent, retains the right of confirming every new member, and of expelling unsatisfactory ones. Such artels have existed in St. Petersburg since 1724, and draw their revenues from the dues paid for handling all wares and merchandise entering and leaving the Custom House. Membership is open to every respectable man, the entrance fee is £93 15s., and the artel is managed by an elder chosen annually. Such artels have existed in Archangel since the sixteenth century, and are evidently the prototypes of those of St. Petersburg. In the present state of the labour question this ancient and still-existing form of co-operation is worthy of study. The artels are carried out strictly on business principles, and have no rules beyond that all must share and work alike, and do not in any way restrict the liberty of the members, and have nothing in common with the benefit provident society or trade union. Where independent they are very successful. It must be noted that the system is deeply rooted in the Russian character, does not suffer much from competition, and that the artels are composed of comparatively few members, and generally confine themselves to one kind of work.

THE INSTITUTION OF NAVAL ARCHITECTS.

On Thursday Morning, the 29th ult., the only paper read was by Mr. W. John, on—

Atlantic Steamers.

The author said that he hoped to bring before the meeting impartially certain facts which might be of interest, and which, when recorded in the pages of the "Transactions," might be found of some use as data for future reference. In dealing with passenger steamers, he would do so principally from a shipbuilder's point of view; but the moment he commenced to think over Atlantic passenger ships as a shipbuilder, he was met by the question whether the present tendency towards divorcing the passenger and cargo trade from each other is likely to continue or not. If the answer is yes, then it seems to become an important question, for the present at least, how to build, on moderately small dimensions, the fastest, safest, and most economical passenger steamer, using all the most modern improvements to make her commodious and luxurious, and an easy sea boat into the bargain. If cargo is still to be carried in the passenger ships of the future, a moderate speed only will be aimed at in the immediate future, and every effort will be devoted to economy of fuel, comfort, and safety, with a fair carrying capacity. This latter policy is one which may possibly prevail at least for a time, as it has powerful supporters in Liverpool; but he could not help thinking that very high speeds—higher than we have yet attained—must eventually gain the day. He also thought that they were on the eve of important movements, which will indicate what the next step in the passenger trade is to be; for it must be remembered, among other things, that none of our present English Transatlantic liners, even the latest, have yet been fitted with the latest modern improvements for economy of fuel or quick combustion, such as triple expansion engines or forced draught. They must therefore be at some disadvantage, other things being equal, compared with the ships of the future possessing them. The Great Eastern steaming up Milford Haven about twenty-five years ago between two lines of the Channel Fleet of old—two and three decked wooden line-of-battle ships — the whole fleet saluting with yards manned, was a sight to be remembered. More than this, that ship, with all her mournful career, has been a useful lesson and a useful warning to all naval architects who seriously study their profession—a lesson of what can be done in the safe construction of huge floating structures, and a warning that the highest flights of constructive genius may prove abortive if not strictly subordinated to the practical conditions and commercial requirements of the times. The Sirius and Great Western crossed the Atlantic in 1838, and in 1840 the first ship of the since celebrated Cunard Company made her first voyage. This was the Britannia, which with her sister ships the Arcadia, Caledonia, and Columbia, kept up the mail service regularly at a speed of about 8½ knots an hour. The Britannia was 207ft. in length between perpendiculars, and 34ft. 4in. extreme breadth, 22ft. 6in. depth of hold, 423-horse power —nominal—and 1156 tons burthen, built of wood and propelled by paddles. In 1850 the Collins Line started in opposition to the Cunard, and after a series of disasters collapsed in 1858. This was three years after the Persia, the first Cunarder built of iron, had been completed. In 1850 also the Inman Line was started with the City of Glasgow, of 1600 tons builder's measurement, and 350-horse power. She was built of iron, and was the first screw steamer sent across the Atlantic from Liverpool with passengers, and was the pioneer of the great emigrant trade which Mr. Inman, above all others, did so much to develope and make cheap and comfortable for the emigrants themselves, as well as profitable to his company. That the builders of the celebrated old Great Britain in 1843, and Mr. Inman in 1850, should have pronounced so decisively in favour of the screw propeller in preference to the paddle for ocean steaming is a proof of their true practical judgment, which time and practical experience have made abundantly clear. While the Cunard Company went on developing its fleet from the early wood paddle steamer Britannia of 1130 tons in 1840, to the iron paddle steamers Persia, &c., in 1858, the iron screw steamer China of 1862, to the still more important screw steamers Bothnia and Scythia, vessels of 4335 tons in 1874, the Inman and other lines were as rapidly developing in speed and size, if not in numbers. The year 1874 is memorable, for it saw the White Star steamers Britannic and Germanic put into the water, as well as the Inman steamer City of Berlin and the two before-mentioned Cunard steamers Bothnia and Scythia. By the addition of these two ships to their fleet the White Star Line, although started only in 1870, reached a front rank position in the New York passenger trade. The author gave in separate tables the logs of several of these ships, some from published documents, and some kindly furnished by the owners. The Great Western had crossed the Atlantic from Bristol to New York in fifteen days as early as 1838. The first Cunard steamer, the Britannic, was about the same speed, from 8¼ to 8½ knots an hour. The average duration of the Cunard voyages in the year 1856 was 12·67 days from Liverpool to New York, and 11·03 days from New York to Liverpool. The Bothnia, in 1874, reduced the passage to about 9 days. The White Star Britannic, in 1876, averaged 7 days 18 hours 26 min., outwards from Queenstown to New York, and 9 days 6 hours 44 min. homewards, and has averaged for the last ten years 8 days 9 hours 36 min. outwards, and 8 days 1 hour 48 min. homewards. The City of Berlin, of the Inman Line, also built in 1874, 8 days 10 hours 56 min., and homewards 8 days 2 hours 37 min.; and for the nine years from 1875 to 1883 inclusive, averaged outwards 8 days 19 hours 56 sec., and inwards 8 days 8 hours 34 sec.; or, putting it into rounder figures, the Britannic had reduced the average passage between the two points to 8¼ days, and the City of Berlin to 8½ days. From the year 1874 on to 1879 no further advance was made in Atlantic steaming, but in that year the Arizona was added to the Guion Line, and it soon became evident that another important stride had been made in the Atlantic passenger trade which would lead to most important results. The results, as we all know, have been sufficiently startling. The Guion Line, which had started in 1866 with the Manhattan, had now the fastest passenger ship on the Atlantic. In spite of burning some 50 per cent. more coal than the Britannic, the ship was an obvious commercial success. The spirited policy which brought her into existence was appreciated by the public, and the other lines had to move forward. Then followed a period of rivalry, the Cunard Company building the Gallia and Servia, the Inman Company the City of Rome, and the Guion Line the Alaska, all of which were completed in 1881, and afterwards the Oregon for the Guion Line—1883—the Aurania the same year for the Cunard Company, and, later still, the America for the National Line, and the Umbria and Etruria for the Cunard Company in 1885.

Since the completion of the Etruria, for various reasons there has been a pause in the tremendous strides made since 1879, and we may briefly review the results. Taking the Britannic as a standard with her ten years' average of 8¼ days across, and her quickest passage of 7 days 10 hours 53 seconds, we have now the following steamers of higher speeds. Taking them in the order of their absolutely fastest passage out or home they stand thus:—

Table I.

		Days.	Hours.	Mins.
1	Etruria	6	5	31
2	Umbria (sister ship)		slightly longer.	
3	Oregon	6	10	35
4	America	6	13	44
5	City of Rome... ...	6	18	0
6	Alaska	6	18	37
7	Servia	6	23	55
8	Aurania	7	1	1

It will thus be seen that from the 15 days' passage or thereabouts of the earliest Atlantic steamers, we had got down in the days of the Scotia to about 9 days; in the Britannic to 8¼ days, and at the present time we have got to 6¼ days with seven ships afloat that have done the passage under seven days, and capable of making their average passages range between 6½ and 7¼ days.

Ranged in order of gross tonnage, these eight vessels stand as follows:—

Table II.

1. City of Rome	8144
2. Oregon...	7375
3. Aurania	7269
4. Servia	7212
5. Umbria	7129
6. Etruria	7100
7. Alaska...	6586
8. America	5528

Here the America shows to advantage, for while being eighth in size she is fourth in point of speed, and from what the author can learn, although he had no authenticated details on the subject, he believed she is economical in coal consumption. He might perhaps be permitted to say that one of the most difficult subjects in connection with the propulsion of ships on which to get absolutely accurate data is that of coal consumption. The records of six to eight hours' trials for the purpose of ascertaining the coal consumption are absolutely worthless, as all shipbuilders and engineers know, and so far as English ships are concerned, they are never attempted. Foreign owners frequently stipulate for such trials in their contracts with English shipbuilders, and get wonderfully economical results on paper, but the fact that the trials only extend over a few hours renders them valueless, however carefully the coal may be weighed during that period. An authentic record of the absolute quantity of coal consumed, say by each of the eight fastest Atlantic liners, together with their average indicated horse-power on the voyage for a series of voyages, would be extremely valuable.

He gave in Table III., p. 125, the consumption per indicated horse-power per hour for a number of ships. This table affords valuable data, for it gives, in addition to the dimensions, the moulded draught of water, the midship area, the displacement, the indicated horse-power, the speed on trial, the coefficients for the lines both from the block or parallelopipedon, and also from the midship section prism, together with the length and angle of entrance obtained by Kirk's rule, the Admiralty displacement coefficient, together with the coal consumption per day and per indicated horse-power per hour.

This table, as will be seen, contains some of the most important of the Atlantic liners, and also a number of other typical ships, which will add a variety to its interest and a value to it. The coefficient, which is contained in the thirteenth column of the table, viz.:—

$$\frac{\text{Dis}\ \frac{2}{3} \times \text{speed}^3}{\text{I.H.P.} \times \frac{\sqrt{\text{entrance.}}}{10}}$$

generally comes out for ships of similar type more nearly a constant in the true sense of the word than the corresponding Admiralty constant. As an example, we have the curves of resistance and horse-power for the City of Rome and the Normandie, a large vessel of 6000 tons, which the Barrow Company built for the Compagnie Générale Transatlantique, in which the coefficient of fineness and the form of the lines pretty closely resemble each other below water, and if we take from the curves the corresponding speeds and horse-powers, and work out the constants by the two systems, we have at 14 knots the Admiralty constant for the City of Rome 322·2, and for the Normandie 304·8, and taking for a modified form of constant, the City of Rome gives 253·7 and the Normandie 251·9, which, as will be seen, are much closer together; similarly, at 15 knots the Admiralty constant for the City of Rome is 310, and for the Normandie 295·2, while a modified constant comes out for the former at 245, and for the latter 244, again agreeing almost identically. The same at 16 knots, for the City of Rome the Admiralty constant comes out 297·6, and for the Normandie 282·8, while a modified constant comes out for the two ships 234·4 and 233·7 respectively, again showing marked agreement. It may be mentioned that in these two ships the engines are of a similar type, being three-crank tandem engines, and the propellers have in both pitch and surface practically the same proportions to the power and speed. The value of these modified constants will probably be found to increase as the speeds increase up to the limit and beyond that point at which wave resistance becomes an important factor.

The author next considered the strains to which a ship is exposed, and stated that he had before him the calculations for three of the largest vessels, two of them of iron and the other of steel; and he found in the case of the iron, the maximum tension on the gunwale during the greatest hogging strains likely to be endured at sea would not exceed about six tons per square inch, while in the case of he steel

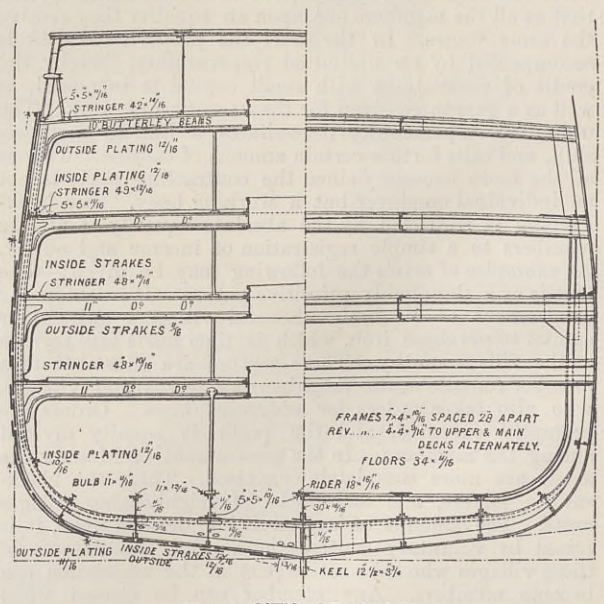


Fig. 1—CITY OF ROME.

ship it is only about 6½ tons. These strains are well within the limits of safety, and a comparison of the scantlings of these with the others justify the assertion as to their general safety from a structural point of view. The sections of these three ships are shown in Figs. 1, 2, and 3, with their principal scantlings. It will be seen from these sections that the three ships differ materially in their mode of construction. In the case of Fig. 1, which represents the City of Rome, the largest of the three, it will be seen that the main framing of the vessel

thought that was likely to be the vessel of the future, and that it would be quite as commercially successful as the Umbria or Etruria.

Mr. J. Campbell remarked that at present the great American liners had only the ordinary compound engines, and he thought that, instead of converting them to triple expansion, they should take a step further at once, and adopt quadruple expansion engines. This class of engines was being very successfully built in various parts of the country. He should recommend the adoption of a three-crank six-cylinder engine.

Mr. Hamilton did not think it had been demonstrated that greater efficiency had been got out of twin screws than out of single screws; but there was no doubt they would tend to additional safety.

Mr. Martell said that when they had got satisfactory data twin screws would be adopted for ships requiring great speed; but they had not got that data at present.

Admiral Sir John Hay, referring to twin screws as applying to sea-going steamers which might be employed for Imperial defence, said it was quite certain that the defence of their extended commerce would always require to be assisted by ships such as the Oregon and other magnificent vessels which had been used for that purpose on a recent occasion. He believed that for war purposes the twin screw was recognised by all naval men as having very many advantages. If that were so, it was quite evident that it would be a great advantage, under such conditions as occurred at the loss of the Oregon, if the compartments could be made completely water-tight; and the twin screw, with the separation of the ship longitudinally, gave them the very greatest possible protection. They could not trust to bulkheads that were only closed occasionally by doors. What was required for war purposes was the entire and complete isolation of different parts of the ship, having always practically closed communications between them.

Mr. John then replied on the general discussion. He was pleased to find that they had faith in the future of the twin screw and of sub-division. The public had a right to demand greater safety than they at present had on the Atlantic, or could have with a single screw.

With the conclusion of this discussion the business of the session terminated. A number of candidates were elected members of the Institution, and a vote of thanks was unanimously passed to the Mayor for his kindness, courtesy, and liberality in his entertainment of the visitors. Sir David Radcliffe replied, and the summer session of the Institution was brought to a close.

The members then adjourned, by special invitation, to the Mersey Tunnel. Passing through this to the Cheshire shore, they were taken up in the lift, and conducted to the Birkenhead Pumping Station, no less than 800 gals. of water having to be pumped out per minute from a depth of about 150ft. The Guibal fan, 20ft. in diameter, which ventilates the tunnel, was also examined.

The party then proceeded on board the fine tender of the Cunard Company, which conveyed them to the Etruria, lying in the river. We have referred at some length to this splendid ship in another page. The visitors saw the crew exercised at boat and fire drill.

Re-embarking on board the tender, they were then conveyed to the works of Messrs. Laird Bros., of Birkenhead, where an admirable luncheon had been hospitably provided in the principal drawing-office. After this the company proceeded over the yard, and examined with much interest the ships and machinery in progress. The new torpedo gun-boat Rattlesnake attracted most attention. She is being built in dock, and is of the following dimensions :—

Length over all	214ft.
do. between perpendiculars	200ft.
Breadth moulded	23ft.
Depth do.	12ft.
Tonnage, O.M.	524 tons.
Draught of water when ready for sea { forward	6ft. 6in.
{ aft	9ft. 6in.
Engines: Triple expansion surface-condensing, to develope under forced draught	collectively 2700 I.H.P.
Speed on trial	19 to 20 knots.
Coal bunkers to contain	80 tons.
Equal to about 3500 knots at	10 knots speed.

Her armament will consist of—

Torpedo tubes	4
4in. centre pivot B.L. gun	1
3 pr. quick firing guns	6
Cylinders, diameter—High-pressure	18½in.
Intermediate	27in.
Low-pressure	42in.
Stroke	18in.
Boilers, four locomotive type, with wet bottom furnaces	140 lb. working pressure.

In another part of the works the steel paddle-wheel despatch boat Lawrence, constructed for the Indian Government, was being completed. The Lawrence has a length of 209ft., with 32ft. 3in. beam, and 15ft. 6in. depth in hold, and her tonnage is 1033 tons O.M. She will be fitted with a set of compound oscillating engines of 1200 to 1300 indicated horse-power, which have been constructed by Messrs. Laird, and are now ready to go on board. Cylinders: High-pressure, 42½in.; low-pressure, 77½in.; stroke, 4ft. 9in. Boilers: Two circular return tubular type, 80 lb. working pressure. All the arrangements of the vessel have been most carefully studied to fit her for her intended service in the Indian seas, and she will carry a light armament of rifled and quick-firing guns.

There were also being completed in the docks two small steel gunboats, for the Portuguese Government; 220 tons and 380 indicated horse-power. In the works we also saw taken down and prepared for shipment, to be re-erected abroad, two small light-draught paddle steamers, about 2ft. draught, for service in the Portuguese colonies in West Africa. Also, in course of construction, a small stern-wheel river steamer and two cargo barges, for foreign service. The keels are laid for five stern-wheel river steamers, for the Indian State Railways—four of them 150ft. by 30ft., with a draught of 1ft. 9in., and to be fitted with compound engines of 300 indicated horse-power; one 120ft. by 29ft., with a draught of water of 2ft., and to be fitted with compound engines of 230 indicated horse-power. In the shops the engines of the Rattlesnake attracted no small attention, and we also observed a spare cylinder, weighing about 33 tons, for the mail steamer Ireland.

LETTERS TO THE EDITOR.

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

THE RAILWAY SIGNAL RETURNS FOR 1885.

Sir,—The return relating to the railway signal arrangements and systems of working on the 31st December, 1885, has recently been issued by the Board of Trade, the details being, as usual, given under two headings. (1) The interlocking and concentration of signal and point levers; (2) the systems upon which the lines are worked relating to the block system, &c.

The details are minute and voluminous, but the facts can be seen at a glance upon reference to the following tabulated statements. No. 1 shows that the levers require concentration in 4993 cases and interlocking in 4770 instances; also that no less than 2875 pairs of safety points are requisite. From table No. 2 it will be seen that the total length of line open for passenger traffic was 18,069 miles, of which 14,185 miles were worked on the absolute block system. There are 346 miles of single railway, upon which only one engine at one time, or two coupled together are allowed; thus leaving a balance of 3538 miles, which are still worked upon inefficient principles and require the introduction of the absolute block system.

Summary No. 1.

	Number of cases in which any passenger line is connected with or crossed on the level by—				Number of cases in which the usual requirements of the Inspecting Officers of the Board of Trade have or have not been complied with in the following respects:—					
	Any other passenger line.	Any goods line	Any siding.	Any cross-over road.	Concentration of signal and point levers.		Interlocking of signal and point levers.		Addition of safety points in cases of goods lines and sidings.	
					Have.	Have not.	Have.	Have not.	Have.	Have not.
England and Wales	3973	1367	17,543	6670	26,734	2819	26,938	2615	17,316	1,594
Scotland	748	216	3,114	1024	3,979	1123	3,944	1158	2,722	608
Ireland	393	84	1,226	277	929	1051	983	997	637	673
Total: United Kingdom	5114	1667	21,883	7971	31,642	4993	21,865	4770	20,675	2,875

Summary No. 2.

	Total length of railway opened for passenger traffic.		Distance worked on the absolute block system.	
	Double.	Single.	Double.	Single.
	Miles.	Miles.	Miles.	Miles.
England and Wales	8,544½	4212¾	8239¾	3225
Scotland	1,146	1644	1109½	1114
Ireland	589	1933	169½	327¾
United Kingdom	10,279½	7789¾	9518½	4666¾
Total	18,069¼		14,185¼	

The following table gives the details relating to the block system and mileage of all the principal railways, and shows that considerable progress has been made :—

	Total length of line opened for passenger traffic.		Distance worked up'n the absolute block system.	
	Double.	Single.	Double.	Single.
	Miles.	Miles.	Miles.	Miles.
Cheshire lines	115	—	96	—
Furness	72	34	71	34
Great Eastern	494	479	494	221
Great Northern	570	169	570	99
Great Northern and G. E. Joint	111	5	111	5
Great Western	1064	1029	973	785
Lancashire and Yorkshire	424	16	424	9
London and North-Western	1375	303	1360	273
L. and N. W. and Gt. Western Joint	111	27	111	21
London and South-Western	541	207	541	199
London, Brighton, and South Coast	342	118	342	118
London, Chatham, and Dover	167	10	167	10
Manchester, Sheffield, & Lincolnshire	265	3	218	—
Midland	993	273	957	212
North-Eastern	921	449	914	436
North Staffordshire	150	18	144	18
South-Eastern	347	41	347	41
Somerset and Dorset Joint	13	78	13	78*
Taff Vale	52	12	6	1
Caledonian	427	291	421	198
Glasgow and South-Western	233	109	225	67
Great North of Scotland	23	275	23	269
Highland	6	411	6	411*
North British	401	469	380	139
Great Northern of Ireland	136	375	3	14
Great Southern and Western	206	301	49	17
Midland Great Western	148	275	70	35

* Note.—The Somerset and Dorset, Highland, and some minor railways work single lines by "crossing orders," instead of the train staff, and at the present time a signalman is undergoing six months' hard labour in connection with that dangerous-crossing system.

Clement E. Stretton.
Consulting Engineer Amalgamated Society of Railway Servants.

40, Saxe-Coburg-street, Leicester, August 6th.

CORLISS VALVES.

Sir,—In your last issue I notice with pleasure a letter from Mr. T. S. Sawyer on Corliss valves, and soliciting the best form that can be adopted. This subject wants further ventilation, and I am glad some one has been bold enough to make the venture. Corliss valves work through the intervention of a lever attached to the valve-spindle, or centre of motion, actuating the valve by an oscillating action; therefore a thrust is imparted, which gradually wears the valve-chamber, likewise the valve. Boring the chamber and renewing the valve has periodically to be resorted to.

For some years I have been working a pair of tandem engines with slide valves, or plates, worked direct from two excentrics onto the two steam-valve spindles on each high-pressure cylinder, with trip gear attached, and find the facings as bright as can be desired, accompanied with a coal consumption not yet much beaten for a continuance, providing coal-book and indicated horse-power be taken into account. If you can find a place for the foregoing in your next publication I shall feel obliged.

John Ashworth.

Astley Bridge, Bolton, August 7th.

THE PROBLEM OF FLIGHT.

Sir,—My attention has been directed to inaccuracies in my letter of April 3rd, found in The Engineer of May 14th, which a mathematician would have reason for objecting to. I was so intent on getting the general features stated that the mathematics of inclined planes was overlooked. Besides, the case has been investigated from the experimental direction so constantly, where the resolution of gravity is its beginning and end, that I have been the victim to some extent of a single idea.

It is obvious that the factors of the resolution both in quantity and direction would be identical with those of a heavy body placed on an inclined plane. For the air resists the motion of a plane in the same way that a plane resists the motion of a weight placed upon it. The nature of the resistance in both cases is normal pressure and friction. These are perpendicular to each other. The value of both factors is determined mathematically at any inclination. At the 18 deg. of the hypothetical case given, the loss would be greater than stated, but at lower inclinations of 5 deg., or 10 deg., it would be less, and the birds use the low to a greater extent than the high inclines. When the wings of birds are examined, the details of the thrusts to the front will be found.

Correcting the statement of the value of the resolved components to make it harmonise with the mathematics of inclined planes, the position taken will be consistent with the facts, and the inaccuracy corrected. The error does not invalidate the reasoning at all. Motion on the normal line is still entirely competent to neutralise the other, and cause rapid reverse motion on the upward slant, while the resolution of the direction, as well as the quantity of the gravitating force by the plane, tilts its horizon while in the act of working on air to the full value of the force.

I. Lancaster.

Chicago, July 26th.

LIGHT PORTABLE ENGINES.

Sir,—I have refrained hitherto from commenting on the very important question raised in your issue of the 30th ult. in the hope that some more competent writer than I am would open a discussion on the subject. As no one has done this, I venture to make a beginning.

The whole question of light and heavy engines resolves itself into this—Which will pay the maker best? My view is, that the heavy engine will pay best; or that, in other words, nothing can be gained by the makers in departing from the existing type, which has been arrived at by a species of natural selection, or the survival of the fittest. To this general statement I would, however, draw one exception. I believe that a good foreign trade might be done, especially in Canada, with a class of portable engines which has not yet been built in this country.

To explain my views fully would occupy a deal of space. If, however, you publish this letter, I will take it for granted that you will publish another and longer letter from me, in which I will endeavour to set forth my views more explicitly. Meanwhile perhaps some of your readers will express their opinions on the subject.

I may say that for many years I have made the portable engine a study, and that I am familiar with every engine made by any firm of repute in great Britain; and I hope to show that any considerable departure from existing practice—with the limitations I have just laid down—must end in disappointment and loss. This is, I know, not your opinion; but I know that you are too fair to permit this circumstance to induce you to decline to publish this letter.

Normal Portable.

Lincoln, August 9th.

HYDRAULIC PROPULSION.

Sir,—I was much pleased with the letter of "W. H." in The Engineer of Friday last in reference to my letter of July 23rd, on hydraulic propulsion; he is quite right about the bends in the pipes and the nozzles, also as to the latter, they would not do for a war ship as they would be liable to be shot away, or otherwise injured, and the noise of the water rushing out would be a great drawback on any vessel. I may say this much as regards my propeller, that I have not one bend in the pipes, neither have I any nozzles, and as I deliver the water below the surface of the water the vessel floats in, there is no noise or commotion whatever; and another advantage is, that I have no pipes projecting outside the vessel at all, as I said in my other letter. I made a great many experiments, and proved conclusively that this propeller could be put in any vessel, large or small, and I could safely guarantee their efficiency in every case. I also went into the test of propelling canal boats by this method, and by horse-power, and the propeller had much the best of it, taking the mileage and weight carried as my basis for the purpose, whilst it is a great advantage for every boat to carry its own motor, especially for getting through locks, &c. I have enclosed my card, and shall be glad of an interview with "W. H."

Goahead.

London, August 10th.

THE MIDDLESEX WATERWORKS' PUMPS.

Sir,—Referring to the recent description of the West Middlesex Waterworks' engine, I should be glad to learn what advantages are sought to be obtained by the four valve pump illustrated, bearing in mind the well-known efficiency of the bucket-and-plunger type, which for waterworks scarcely leaves a margin for improvement, whereas in the pump illustrated, although it is stated that the actual displacement is equal to the full value, yet the figures given show a slip of about 3¼ per cent. Of course this cannot be called a bad performance. There are, however, hundreds of bucket-and-plunger pumps doing as well and better, so that it appears to be a departure from simplicity of arrangement to complications without any beneficial result.

Beta.

August 9th.

FORTY-KNOT SHIPS.

Sir,—It seems perfectly idle to urge "shipbuilders and shipowners ought not to spend such vast sums on their ships when better results are always obtainable by a thorough research into facts, which expose fallacies and errors." What does it matter what people spend over abortive designs, as long as they are pleased with the *tout ensemble* of Brunel's Great Eastern? Yacht owners are scarcely the sort of people to make experiments with propellers and simple motors to save the pockets of suicidal traders.

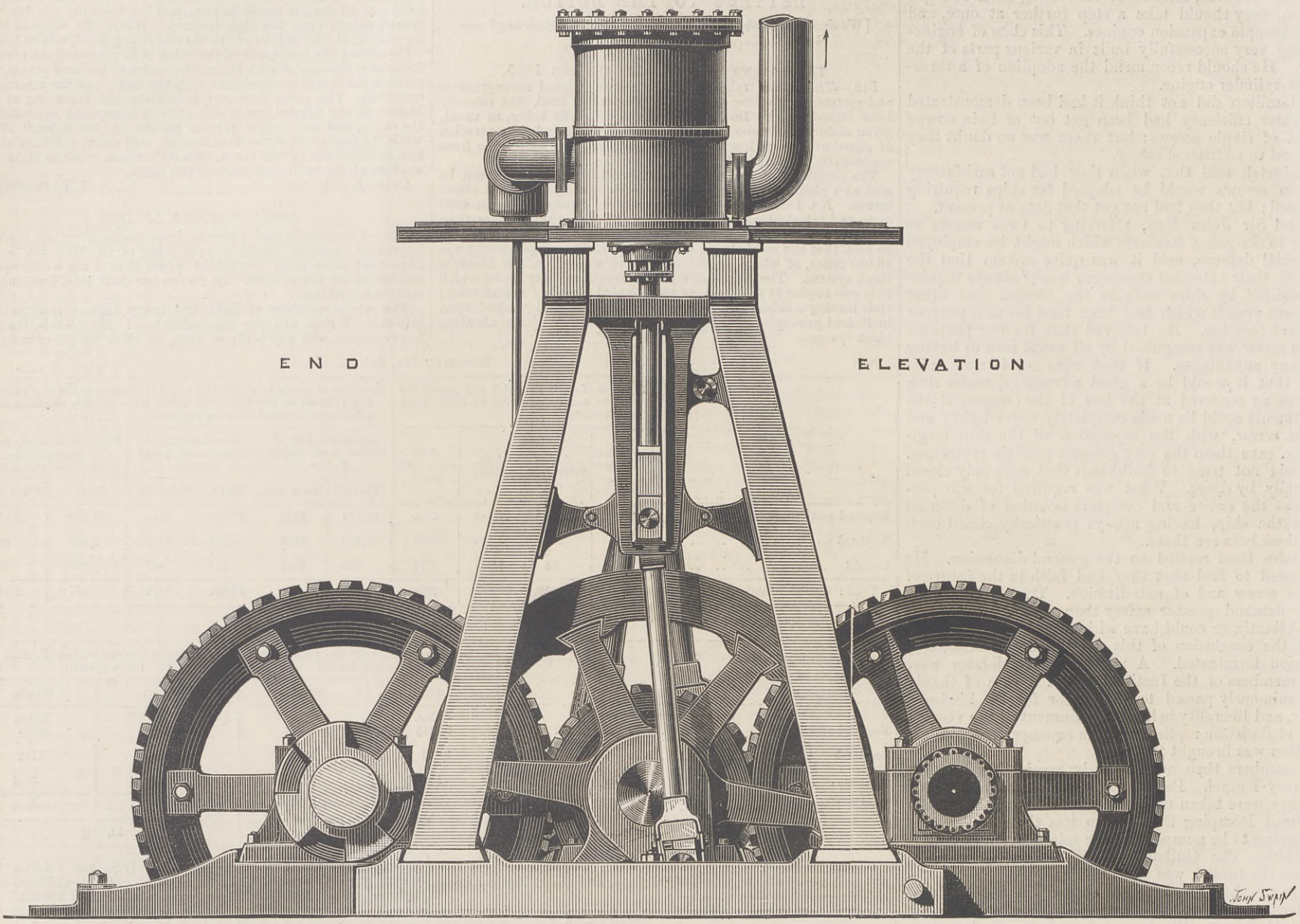
W.

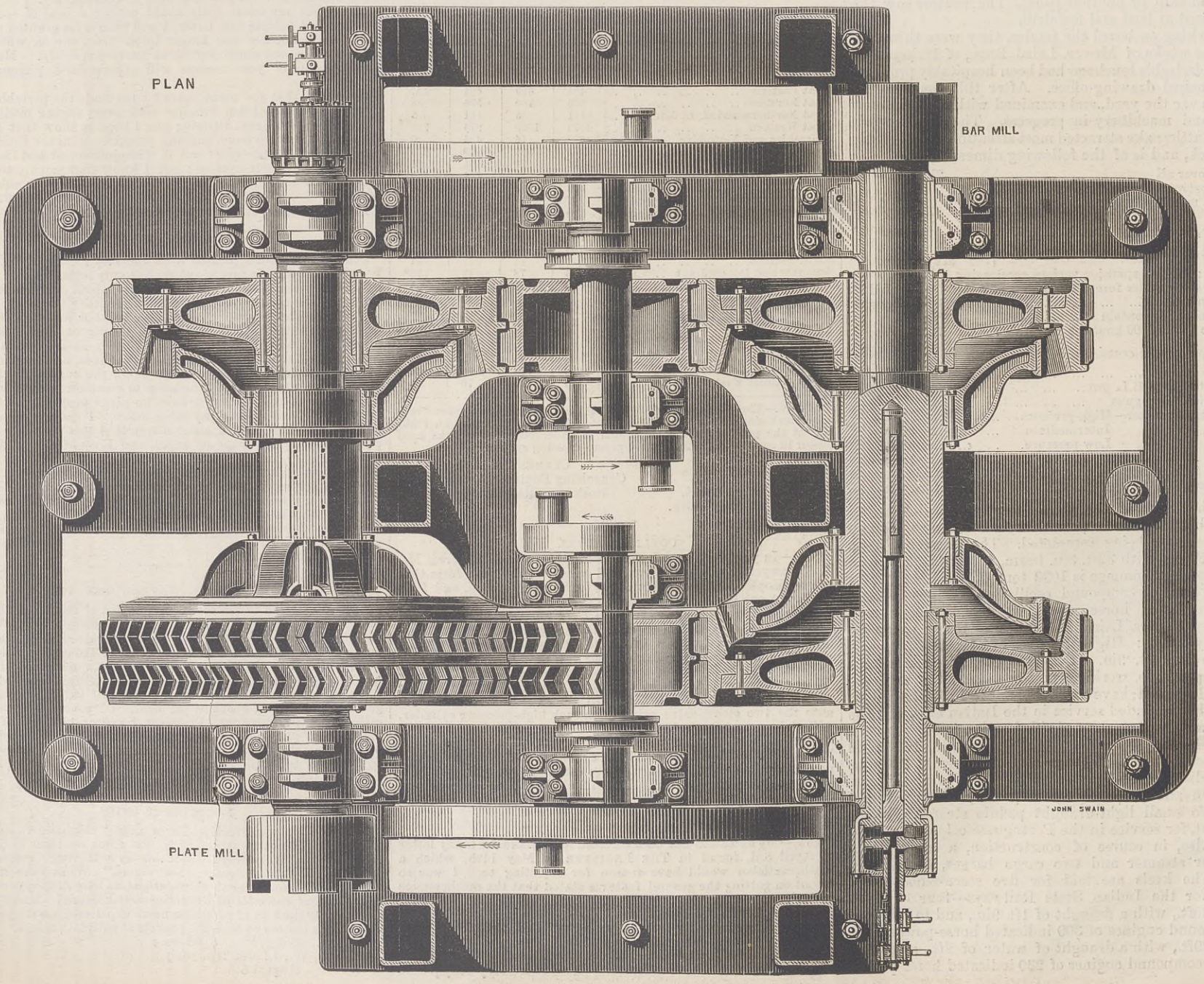
Lat., N., 53 deg. 38 min. 02 sec.;
Long., W., 12 min. 2·58 sec.;
August 6th.

ROLLING MILL ENGINES AND FRICTIONAL REVERSING CLUTCHES.

MESSRS. DICK AND STEVENSON, AIRDRIE, ENGINEERS.

For description see page 133.)





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NEW YORK.—The Willmer and Rogers News Company, 31, *Beekman-street.*

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*** *With this week's number is issued as a Supplement, a Two-Page Engraving of an Express Locomotive for the Caledonian Railway. Every copy as issued by the Publisher contains this Supplement, and subscribers are requested to notify the fact should they not receive it.*

CONTENTS.

TO CORRESPONDENTS.

Registered Telegraphic Address—"ENGINEER NEWSPAPER, LONDON."

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

*** *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.*

D. H. and G. H. (Sunderland).—*We cannot identify the patent from your vague description.*

Lecrot Dale.—*The largest tenders we know of are some on the Midland Railway, which hold about* 3000 *gallons.*

G. W.—*If you have some knowledge of mathematics you cannot read a better book than Clerk-Maxwell's treatise on heat, which you can obtain through any bookseller.*

J. J. (Huddersfield).—*A cylinder* 7½*in. diameter and* 11*in. stroke will drive your launch at about* 5½ *miles an hour if she is of good form and the boiler will supply plenty of steam at* 90 *lb. A three-bladed propeller, about* 3*ft. in diameter, and of such a pitch that the engine can make about* 200 *revolutions per minute, will do.*

Inquirer (Whitehaven).—*We shall be very pleased to receive the information to which you refer. Lead in valve gear must be used judiciously or it will do more harm than good, too early an admission operating very prejudicially under certain circumstances, as, for example, in Cornish engines, where it will prevent the engine from going fully "out of doors," and will waste steam in consequence.*

D. L.—(1) *The work to be done on the plate is the same, and the surface speed of the roll is the same, no matter what the diameter of the roll may be. Therefore the force tending to separate the rolls will be practically the same, no matter what the diameter of the rolls.* (2) *The resistance offered to the engine in rolling a plate may all be referred to the friction of the roll necks, and to what may be termed rolling resistance, about which very little is known. As, however, it is certain that the resistance of the necks is very large, it is evident that the smaller the neck can be made in relation to the roll the less the resistance will be; and as the neck can be made smaller in proportion to the diameter of the roll as the latter is augmented in dimensions, there is reason to believe that a mill with small rolls will offer more resistance to the engine than a mill with large rolls. There is, however, no very definite information available on the subject of the distribution of work in rolling mills.*

GLASS ROLLERS.

(*To the Editor of The Engineer.*)

Sir,—I shall be obliged to any of your correspondents who can give me the names of makers of glass rollers about 3in. to 6in. diameter by 1ft. to 3ft. long, smooth and round on outer surface, and straight.

Leicester, August 10th. F. A.

FLOW OF WATER THROUGH SMALL LONG PIPES UNDER HIGH-PRESSURE.

(*To the Editor of The Engineer.*)

Sir,—Would some of your readers kindly give me a simple rule for ascertaining the velocity of water in pipes—say how soon would a pipe 1½in. bore discharge 500 gallons, there being at the supply end a vertical head of 100 yards, and afterwards a horizontal distance of 600 yards, the water thus being carried 700 yards from supply to discharge?

South Wales, August 8th. Velocity.

THE "PATENT JOURNAL."

(*To the Editor of The Engineer.*)

Sir,—I notice in the "Patent Journal" in this week's Engineer that patent No. 9812, for Improvements in Knitting Machinery, is credited to J. A. Claringburn, *London*, instead of *Nottingham*. I should not have troubled you but the same thing took place in connection with my patent No. 7396, 1885. I take The Engineer in regularly, but think if these mistakes occur always in my case they are likely to do so in others, and the "Journal" is therefore not altogether to be relied upon.

Liverpool-street, Nottingham, August 6th. J. A. Claringburn.

[We are not responsible in any way for the error.—Ed. E.]

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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.*

MEETING NEXT WEEK.

Institution of Mechanical Engineers.—The summer meeting of this Institution will be held in London on Tuesday morning, the 17th of August, and Wednesday morning, the 18th of August, at 25, Great George-street, Westminster. The chair will be taken by the president, Mr. Jeremiah Head, at ten o'clock on Tuesday morning, and at half-past nine o'clock on Wednesday morning. The following papers have been offered for reading and discussion—not necessarily in the order here given—after the address by the president:—"Experiments on the Steam-Jacketing and Compounding of Locomotives in Russia," by M. Alexander Borodin, of Kieff. "On the Working of Compound Locomotives in India," by Mr. Charles Sandiford, of Lahore. "Description of a Portable Hydraulic Drilling Machine," by M. Marc Berrier-Fontaine, of Toulon. "Description of the Blackpool Electric Tramway," by Mr. M. Holroyd Smith, of Halifax. "On Triple Expansion Marine Engines," by Mr. Robert Wyllie, of Hartlepool. Numerous excursions to works and places of engineering interest in and near London have been arranged.

THE ENGINEER.

AUGUST 13, 1886.

OFFICERS AND MANUFACTURERS.

We may expect to hear a good deal on the subject of the relations of Government officers with Elswick during the next few months, when we shall be in a position to speak more to the purpose than at present. As many of our readers must have seen, application has been made for an inquiry by officers in high position in order to dispose of reports which are circulated. Among other applicants, by the late General Reilly, the recent Inspector-General of Artillery, and for a short time Director of Artillery, a man whose transactions with Elswick were, so far as we know, only of the most formal and official character. We imagine that General Reilly had precisely the same pecuniary and personal interest in Elswick that Lord Coleridge himself has—that is, presumably, none whatever. When officers in this position ask for inquiry we imagine that reports have run so far that an investigation has become desirable for the sake of the credit of our departments as well as that of Elswick.

At present there is little to say on the subject beyond explaining one or two matters on which there appears to be misapprehension, simply for want of information. For example, we would quote the following passage from the *Times* of August 9th:—"Lord Coleridge asked if Captain Noble had ever been a member of the Ordnance Committee. Mr. Percy Gye, for the defendants, said that he could not say if Captain Noble had actually been a member, but he desired to call the attention of the Court to the following fact on the subject:—In the *Times* of July 26th, 1886, under the heading of 'The Ordnance Department,' there had appeared a letter signed 'A. Noble, Director for Sir W. G. Armstrong, Mitchell, and Co., Limited,' in which there had been the following words:—'The only ground we can conceive for this charge is that occasionally some shareholders in the company—for example, the writer of this letter—have been associated temporarily with the Ordnance Committee for the purpose of special reports.' Lord Coleridge then said that the affidavit of Captain Noble might be true and nevertheless very misleading. It might be true by the card only, for an Ordnance Committee might be presumed to have had to report upon guns—that did not seem to him to be a violent assumption." As we understand this, Lord Coleridge surmises that Captain Noble had stated that he had not been a member of the Ordnance Committee, although, as a matter of fact, he had been at times associated with it—in short, that he had based an unqualified denial of the fact of his being a member on the ground that he had not been a permanent and formal member. This Lord Coleridge suggests may have been misleading; because if he was at times acting as a member, he may have dealt with guns and matters in which Elswick was concerned. If we really understand this as Lord Coleridge's view, it argues so total a misapprehension of the circumstances of the case, that some explanation seems desirable. We have not any conception of what Captain Noble or any one else interested in the case may say or think about it. Whether Captain Noble will be shown to have behaved very badly or the reverse does not now concern us, or affect our present object, which is simply to explain, in common fairness, conditions which appear to be misunderstood. From time to time, questions come up calling for investigation by those having special experience. Recently the behaviour of gun steel was investigated by a special committee, on which representatives of the firms who had most experience of the subject were invited to sit, Sir Joseph Whitworth's firm and Elswick being both represented. The behaviour of powder in the bore of guns some years since was a somewhat similar matter. On both of these committees Captain Andrew Noble sat. He sat there recognised as a member of the Elswick firm, specially invited by the Government, to give the benefit of his experience. Had he not been a member of Elswick, he would not probably have had the experience which was needed. In the special subjects thus dealt with, knowledge and experience would only be found in conjunction with a manufacturing interest. But no Secretary of State or Surveyor-General in his senses would appoint a body of such men to decide on questions involving supply; nor could members of firms consent to deal with such questions. The investigations above mentioned concerned the action of gas in the bore of guns in the abstract, and the best treatment of steel tubes. The conclusions arrived at were applicable to all ordnance and at the service of everybody. Nothing could be more open and straightforward.

The evil, which we understand Captain Noble to deny, is the palpable one of a man known and recognised only as a member of the Ordnance Committee having an interest in Elswick. A man who is appointed to look after the interests of the country and decide on questions involving orders to contractors must be wholly independent; and any private personal interest he has in any of the questions he decides, puts him in the position of a man who is bribed. Ignorance only can confuse this with the fact of Government asking the member of a manufacturing firm to give the benefit of his opinion on some abstract scientific question. We could hardly have believed that such a mistake could be passed unnoticed, but we see no other conclusion to arrive at in the face of the words used, and the fact that we know that Captain Noble served on these two special committees.

The question of the relations of officers who have left the service with manufacturing firms appears to be about to be opened, and is a large one. When an officer is compulsorily retired after years of manufacturing work, it is very natural for him to seek for employment, and very probable that he will find it in a private firm manufacturing war stores. There are good and sound reasons for this, and also there possibly may be bad reasons. The officer's knowledge and experience, character, and reputation may all be sound recommendations. On the other hand, it may be urged that he is receiving the reward of secret service previously done for the firm he afterwards joins. We state this broadly and plainly, because we wish to look the matter fully in the face. We should deal with it briefly as follows:—An officer who has not held a position in which he had to decide on questions of supply, has not presumably been able to render dishonest and secret service, and such an officer on his retirement appears to us to be free to go into any firm without scruple or hesitation. On the other hand, a retired officer, who has in any way guided the orders given for contracts is in a position of difficulty. Such an officer may have acted with complete independence and without a thought of the future, and may suddenly find himself out of the service, and the question may present itself to him for the first time. There may be nothing wrong, nor is there then any opportunity even of doing wrong, but an officer so placed may well find it difficult to act with a regard to his reputation. Such an officer would, we think, do well to lay the whole matter before the Government before deciding. The difficulty in which he is placed ought to be an argument against lightly superseding an officer in such a position. At the same time it must not be supposed that officers who have joined private firms have been in this difficulty at all. Those in the manufacturing departments have rather been in the position of rivals to private firms, and have had no sort of voice in the giving of orders. Even the superintendent of the gun factories could hardly influence the orders given to Elswick, unless it were by declaring the inability of his own department to undertake jobs, which would, consequently, fall to Elswick or Whitworth. As a matter of fact, superintendents of the gun factories have rather been attacked for opposite conduct, for prejudice against private work, and getting work done by their own department whenever they could manage it. We carefully abstain from mentioning names, and we do not wish to follow the subject further. We are prepared to accept any view that may be the outcome of an investigation, but we wish to give our readers a clearer general view of the position of officers and committees than appears to be entertained even by those who should be well informed.

LOCOMOTIVE ENGINES.

In the design of locomotive engines changes are still being made daily, all no doubt intended to augment their efficiency in some way. They are expected either to increase the hauling power of the machine, or to reduce its consumption of fuel, or to render repairs less frequent or less costly. We can scarcely name an instance in which an attempt is made to reduce the first cost of the machine, if we except Crewe practice. Mr. Webb has for many years endeavoured—and no doubt with much success—to reduce the price of his engines. We do not speak now of his compounds, which are necessarily very costly machines. So far as is known, his engines are not less durable or efficient than those made by other engineers; but they are certainly deficient in finish, and his success naturally leads to the question, Is the first-class workmanship deemed indispensable by the great majority of locomotive superintendents really necessary? We hold that it is, and that in the long run it pays. A great deal of course depends on the conditions under which a line is worked, and when there are plenty of engines it is less necessary that they should be of the best quality than is the case where the locomotive superintendent is hard pushed for the means of carrying on his traffic. The whole question of first cost is, however, one well worth consideration and discussion. On the one hand, it is urged that the difference between the price of a very highly-finished locomotive—and by high finish we do not mean mere polish—and one made with less care, cannot exceed £100 or thereabouts; a saving too small to be of any great importance. On the other hand, it is argued that the difference is much greater, an engine costing but £1800 at Crewe which made elsewhere will cost about £2200; and that, even if this were not the case, although £100 per engine may not be much for one engine, yet that it represents a very large sum when the equipment of a line has to be considered. Thus, for 500 engines, a saving of £100 each will represent no less than £50,000

which is surely worth having. There is a great deal to be said on both sides. Our own opinion is, as we have said, that locomotives should always be as good as it is possible to make them; and this, we may say, does not imply that money should be wasted on them.

Locomotives tend daily to become more costly because they are daily augmenting in weight. Much of this is due to traffic managers and not to the locomotive superintendents. The former insist on having more and more powerful engines, and the weight of trains is increasing. The public demand roomy carriages, and the weights of railway vehicles augment rapidly with their size. The proportion of dead weight to paying load in passenger trains is now greater than it ever was, and the locomotive must be made to comply with the altered conditions. We hear very little now of main line passenger engines with 16in. cylinders; a few years ago they were common enough. Not only have cylinder diameters increased, pressures also have augmented. They have risen from 120 lb.—which was considered high not so long ago—to 150 lb., and Mr. Webb is carrying 175 lb. in some of his boilers. These things all mean more weight, because the boiler must be heavier, and all the parts of the engine must be increased in dimensions to bear the additional strain. The use of the bogie, too, has considerably augmented weight; and we are not surprised to find that opinions differ widely among locomotive superintendents as to its value. No doubt bogie engines perform very well; the question is, do they perform better than engines of similar dimensions doing the same work without bogies? Have they proved themselves safer? Do they spare the permanent way and reduce the cost of its maintenance? Are they worth the considerable sum they cost? It is sometimes urged that the engines now built are so big that the bogie has become a necessity. This is erroneous. Some of the most powerful locomotives in the kingdom have no bogies, and get along perfectly without them.

It is a noteworthy fact that however much change may be effected in the type of a locomotive, certain proportions appear to be incapable of alteration without doing harm, two and a-half square feet of heating surface ought to be provided for each square inch of piston area, or, what comes to the same thing, the area of one piston multiplied by five will give the proper heating surface. Thus, the area of a 17in. piston is 227 square inches, and $227 \times 5 = 1135$ square feet. An 18in. cylinder has an area of 254·4in. and $254{\cdot}4 \times 5 = 1272$. In like manner, the proper surface for 19in. cylinders is 1417 square feet. Of course this is not to be regarded as a hard-and-fast rule, but it will be found that it is quite in accord with the best locomotive practice of the day, and that when an attempt has been made to reduce the proportion the engines have not proved good steamers with heavy trains. On the Great Southern and Western Railway of Ireland 18in. cylinders go with 1050ft. of surface, but the stroke is only 24in. On the Great Eastern Railway we have 1200ft. with an 18in. cylinder, 26in. stroke, and on the Brighton Railway, 1485ft., with an 18¼ cylinder, 26in. stroke. It must not be forgotten, however, that a boiler with too little heating surface may be made to steam better by increasing the size of the fire-box, and we could name instances where locomotives have been greatly improved by having had the backs of the fire-boxes taken out and the fire-boxes lengthened 12in. This brings us to a very important question for consideration. The grate ought always to bear a due proportion to the heating surface; and ought not to have less than about one square foot of area to sixty square feet of heating surface. If now we take an engine with 19in cylinders, the heating surface is, as we have seen, in round numbers, 1400 square feet, and this divided by 60 gives us, in round numbers, 23 square feet of grate. But to get such a grate into an engine of the ordinary gauge can only be done by using a fire-box of uncommon length; for, taking the width of the grate at 3·3ft., it would have to be no less than 7ft. long. Grates very much longer and wider than this are used abroad, and grates over 7ft. long have been used in this country in the early days of coal-burning. Such furnaces can be fired readily enough, but their use involves a serious practical difficulty quite unconnected with firing. An engine with 19in. cylinders is pretty certain to have 7ft. wheels and to be coupled. It must be coupled either forward or backward; and no one in this country has, to our knowledge, run with a 7ft. leading wheel. We do not say that it ought not to be done; we are very far from saying anything of the kind. But we have to take things as they are, and most English locomotive superintendents will insist on coupling their driving and trailing wheels. With a 7ft. grate and inside cylinders, this would entail a coupling rod no less than 9ft. 6in. long at the very least; and this is more than any locomotive superintendent would care to risk. The only way out of the difficulty would lie in pitching the grate above the trailing axle; but this involves many objectionable features, and the result hitherto has been that the English locomotive, if coupled, is objectionably restricted in grate area. All difficulties of this kind can be got over at once by using single engines; and we are disposed to hold that an undue preference has been given to coupled engines for fast traffic. It is true that such engines do give trouble by slipping in bad weather; but this is not an insurmountable difficulty, and there are at this moment hundreds of single engines working very heavy and fast traffic with perfect success. We may cite Mr. Stirling's splendid outside cylinder engine, with 8ft. drivers, on the Great Northern, and Mr. Stroudley's engines on the Brighton line, to say nothing of the single engines on the Great Western and London and North-Western railways, to support our argument. One of the most recent examples of the single engine is the fine locomotive constructed by Messrs. Neilson, which we illustrate this week. In this engine it will be seen that sand is used for perhaps the first time in England on scientific principles to secure adhesion. Jets of clean sand are blown under the driving wheels by compressed air from the Westinghouse brake reservoir, and, we understand, that where this scheme has been tried the results are all that can be desired. The quantity used is only about 1 lb. per mile.

The great advantage of the single engine is that it leaves the designer quite untrammelled as to the proportions of his boiler. In a large number of engines cast iron foot-plates are used to equalise the weights on the wheels. It will be found far better to extend the grate backwards a few inches, and this can be done to any reasonable extent desired with the single engine. The essence of success in locomotive engineering is ample boiler power. Nothing will compensate for the absence of this essential; and that design which is most favourable to the boiler may be accounted as most favourable altogether. It may be urged that the proportions we have named above are often widely departed from. We are quite aware of the fact, but the circumstance does not prove that the proportions we have named are defective; practice demonstrates the contrary.

EXPRESS ATLANTIC STEAMERS.

The papers read by Mr. Parker, chief engineer surveyor to Lloyd's, and Mr. John, manager to the Barrow Shipbuilding Company, during the recent meeting of the Institute of Naval Architects, must be taken together. They are the complement each of the other. A very full abstract of Mr. Parker's paper appeared in our columns last week, an equally full abstract of Mr. John's paper will be found on page 124. To the latter we shall refer first. There was no reason, indeed, why it should not have been read first. Mr. John deals with ships, Mr. Parker with engines, and the ship comes before the machinery by which she is propelled. Mr. John sets forth succinctly the history of the Atlantic steamer, and sketches the manner in which the most remarkable engineering triumphs ever heard of have been brought about. There is really nothing in the world like the fleet of express steamers which now maintain communication between the old and new world; and the more carefully the ships, their engines, and their performances are examined, the more cause do we find for admiration and wonder. Familiarity does not in this case produce contempt, but it does evoke criticism, and splendid as the achievements of the engineer and the shipbuilder have been, both are agreed that they have not yet reached finality.

One of the first things to suggest itself about such ships as the Etruria or the Umbria is the vast cost at which their efficiency has been obtained; a cost which no one in his senses would have suggested a quarter of a century ago. We do not here refer so much to the outlay of capital on ships and engines, enormous as that is, as on the working expenses. Let us compare the performance of the Etruria with that of the Britannic. An interval of nearly ten years separates the construction of the two ships. The Britannic is still running. Her consumption is, we believe, about 90 tons of coal per day of twenty-four hours. Her passages average, Mr. John tells us, 8 days 9 hours outwards, and 8 days 2 hours homewards. Her consumption may, allowing for getting up steam, &c., be taken at 840 tons per voyage. The Etruria's fastest passage has been 6 days 5 hours 31 min. Her average we do not know, but we shall not be far wrong if we call it 6 days 12 hours. She burns 320 tons of coal per day of 24 hours, or, making allowance for getting up steam, &c., 2250 tons of coal on the trip. She makes the passage in a day and a-half less than the Britannic. To save this day and a-half the consumption of coal is augmented by no less that 1400 tons. That is to say, the consumption has been nearly doubled to save thirty-six hours in time. This is startling enough, but if we compare the fastest ship named by Mr. John with very fast ships, the figures are, in one sense, yet more remarkable. Let us take, for example, the Servia, and compare her with the Etruria. The best passage of the latter is, in round numbers, 6¼ days; the best passage of the former is, also in round numbers, 7 days. Using Mr. John's figures, and neglecting coal spent in getting up steam, &c., we have for the Etruria, $315 \times 6{\cdot}25 = 1968{\cdot}75$ tons; and for the Servia, $205 \times 7 = 1435$. That is to say, over 500 tons of coal are expended in shortening the passage by 18 hours. It may be urged that this is not all, and that the difference in the dimensions of the two vessels must be taken into account. But it so happens that the Servia is a larger ship than the Etruria, the displacement of the former vessel being 10,960 tons, and of the latter 9860 tons, or 1100 tons less. The indicated horse-power of the Servia is 10,300, and that of the Etruria 14,321. The latter ship has 1·45 indicated horse-power per ton of displacement; the former a little less than ·94 indicated horse-power per ton of displacement. The enormous increase in horse-power required to put on a knot, or a fraction of a knot, in speed, explains the difference in the coal consumption of the two ships. Nor does the additional expense end here. It will be seen that not only can the Servia make a trip with 500 tons less coal than the Etruria, but she has available for some purpose or another 1100 tons more displacement. Part of that can be devoted to cargo, part to passenger space, even after due allowance is made for the greater weight of the hull. But furthermore, the boilers and engines of the Etruria weigh a great deal more than do those of the Servia. The more carefully we investigate the construction and performances of the two ships the clearer does it become that the price paid for reducing the time of transit between Liverpool and New York seems to be out of all proportion to the result gained. If such a ship as the Etruria can be made to pay her way, then the profit earned by such a vessel as the Servia must be very large, while that earned by the Britannic ought to be colossal. We believe that the truth lies between the two statements, and that the fastest ships in the Atlantic trade are partly supported out of the earnings of their slower sisters. Mr. John has hinted that the express Atlantic steamer of the future will carry no cargo, and this, we think, is more than probable. If any ship is built to beat the Etruria it is clear that there will be no space left for cargo—engines, boilers, and coal demanding every ton of displacement available.

The members of the Institution of Naval Architects were favoured with an opportunity of seeing the Etruria, the Cunard Company sending a tender to take them on board the vessel as she lay in mid-stream, the day before starting for New York. It would be waste of space to attempt in a few words to give an adequate idea of what the Etruria is like; it will be enough to say that she is 500ft. long, 57ft. beam, and draws 22ft. 6in. Her engines have one high-pressure cylinder 71in., and two low-pressure 105in. diameter, with a stroke of 6ft. She has 72 furnaces, and the working pressure is 110 lb. Her engines make about 65 revolutions, or a piston speed of 780ft. per minute. It is impossible to look at these engines without remarking the enormous gap which separates them from the typical steam engine of books, and indeed of very many makers. The use of piston valves of huge dimensions seems to multiply the number of cylinders; and the great number of adjuncts serves to complicate the whole machine, until even a trained engineer stands bewildered before them. One thing is certain. No amount of college training, no amount of mathematical education, could have evolved such a machine. This kind of training can only teach principles, and the success of such engines as those of the Etruria and ships like her depends from beginning to end on detail, and a consummate knowledge of detail can only be acquired by prolonged experience. It would be quite impossible, we feel certain, to make our meaning quite clear to any one who has not seen such engines as those of which we are writing. There is not a member of the Institution of Naval Architects who visited the engine-room of the Etruria who will not at once understand what we intend to convey. It is this consummate knowledge of detail which places British marine engineers in advance of the marine engineers of every other nation under the sun. But when we have said so much in admiration of the Etruria's machinery we may proceed to criticise it, and to ask, could not equally admirable results be obtained by far simpler machinery? The abundance of detail, the multiplicity of parts, is in the Etruria overwhelming. It does not follow that they are necessary or desirable in the propulsion of a ship. Having visited the Etruria in the morning, we visited the steamship British Prince, the property of the British Shipowners' Company, lying in the Langton Branch Dock, in the evening. This ship has compound engines by Messrs. Harland and Woolf, of Belfast. She is a vessel of some 4000 tons, and makes over 12 knots, her engines indicating about 2700-horse power, steam being supplied at 90 lb. by three double-ended boilers with 18 furnaces. It was impossible not to contrast the excessive simplicity of these engines with the complexity of the Etruria's machinery; much of this simplicity being due, no doubt, to the ease with which the ordinary slide valve lends itself to the wishes of the designer, as compared with the piston-valve system, which doubles gear in a very objectionable fashion, besides largely augmenting the dimensions of an engine. The engines of the British Prince are remarkable for the great length of their connecting rods, which gives great smoothness of motion. If it is possible to build engines in this way, which will indicate nearly 3000-horse power, surely it might be possible to build engines of much greater power, without departing widely from the general features of the design.

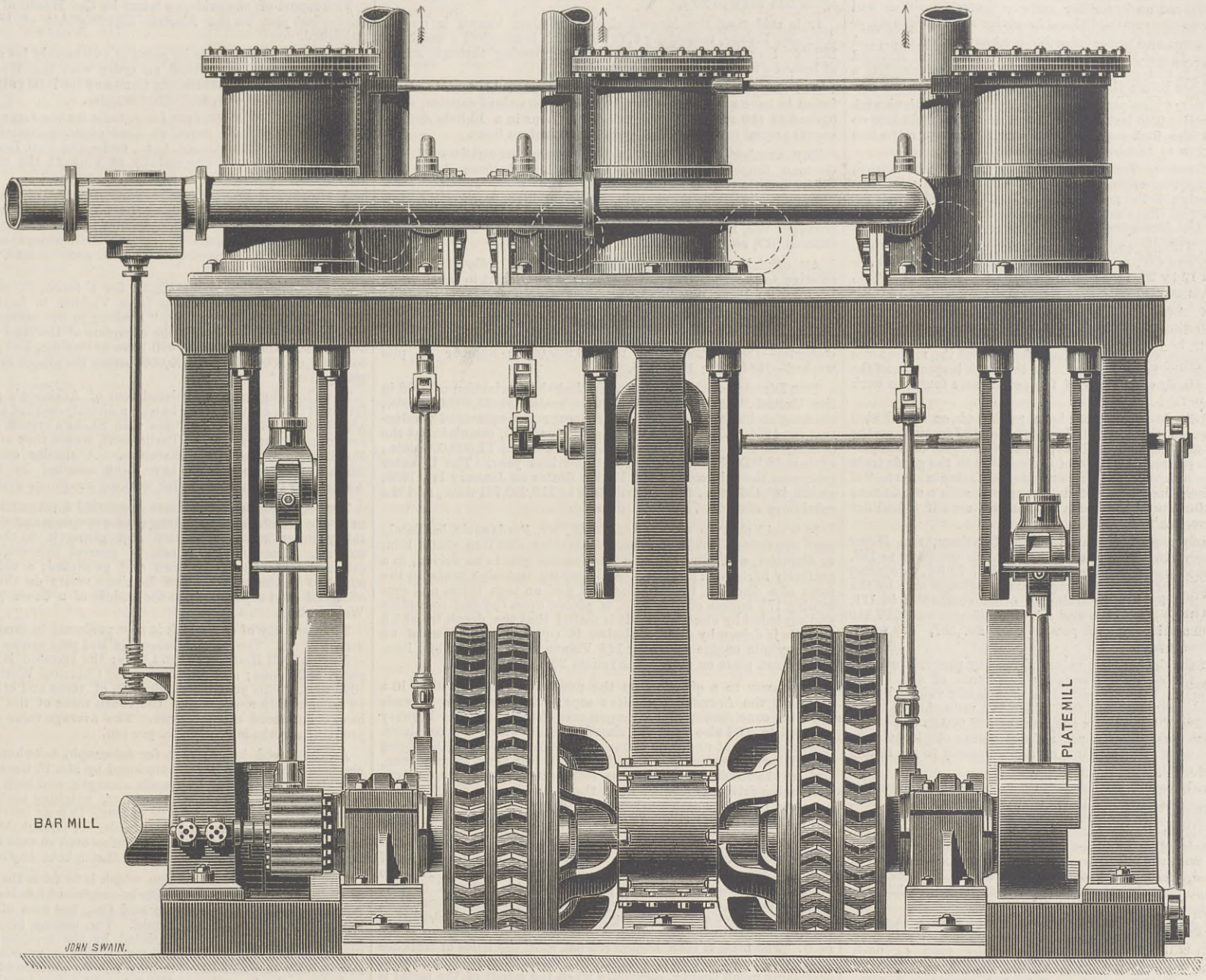
We have not left ourselves space to say much concerning Mr. Parker's paper, which contains a great deal that is highly suggestive. There is, however, no passage in it which deserves so much consideration as that in which he says—"In regard to the economical application of the work after it has been produced, to the propulsion of vessels, there is also room for great improvement, for according to the late Mr. Froude, the greatest authority on this subject, only about one-half of the total power exerted by the engines is effective in propelling the vessel, the remainder being expended in overcoming frictional and *other resistances*." The italics are ours. We have emphasised them because they indicate a weak place in engineering science. What are these "other resistances?" Is it too much to say that no one possesses any adequate information concerning their nature? The loss they represent is enormous. The gentlemen who believe in theory before all things have here a splendid chance open to them. If they will come forward and say how no less than 6000 indicated horse-power is wasted in the Etruria, they will do a good work. On what is this 6000-horse power expended? Let us assume that not less than 1000-horse power is absorbed by engine friction, where does the remaining 5000-horse power go? The quantity is no trifle. It ought to be possible to ascertain with some approach to accuracy on what it is expended. Not less remarkable than the loss is the fact that no one has ever even attempted to define with precision on what it goes. There are, of course, numbers of vague explanations floating about, but they all elude the grasp when we attempt to handle them; one, for example, is that the friction of screw blades in passing through the water is quite sufficient to account for most of the loss. But the loss is as great in the case of the paddle-wheel as with the screw, and it is quite certain that the waste by friction in this case must be as nothing when compared with that of the screw.

THE PATENT OFFICE.

Nearly nine months ago the President of the Board of Trade appointed a committee to inquire into the management of the Patent-office. Shortly afterwards a political accident removed one of the members to a different sphere and deprived another of his office under the Government, and it was thought to have put an end to the committee. Shortly afterwards, however, it emerged with the Lord Chancellor, Lord Herschell, as chairman, and strengthened by several new members, including Sir Richard Webster, Attorney-General. The committee held several meetings, and a good deal of evidence was taken; not indeed that much was wanted, as the radical defects of the Patent-office became apparent a few months after the new Act came into operation in 1884. These defects we have alluded to on more than one occasion. Time has not improved matters, and it is understood that the committee are now strongly convinced of the urgent necessity of taking some steps to bring about that unity of aim and harmony of view which are absolutely essential to the proper conduct of every large organisation. This want of accord manifested itself in a very remarkable way during the hearing of some recent appeals by the Law-officer. It appeared

ROLLING MILL ENGINES, WOODSIDE WORKS, COATBRIDGE.

MESSRS. DICK AND STEVENSON, AIRDRIE, ENGINEERS.



that a certain amendment of a specification had been, in the first instance, disallowed by the Comptroller, but subsequently allowed by the Deputy-comptroller, on an application slightly varied in form. The specification so amended afterwards formed the groundwork of some proceedings by way of opposition to the grant of certain patents. There were two cases, one being heard by the Comptroller, and the other by his deputy ; and although the facts were almost identical, these two officials were again found to be giving conflicting decisions. We believe that the whole matter will come before the courts in another way during the next term, when we may perhaps refer to it again. The Patent-office is in a thoroughly unsatisfactory condition, not only as regards the exercise of the higher judicial functions of the Comptroller, but also with respect to the conduct of the ordinary business of the department. It has always been a complaint against the present *régime* that the office never knew its own mind, and the public are harassed by incessant and vexatious changes of procedure. It is understood that the nature of the reform required has been intimated informally to the Board of Trade, who, of course, strongly oppose any interference with the present staff on the ground of the difficulty of disposing of the surplus assistance. The recent formation of a fishery department, may perhaps be found to offer a solution of the difficulty.

TRADE REVIVAL.

Sufficient attention has not yet been turned by iron and steel masters to the revival going on in the United States, as foreshadowing a return to prosperity in this country. The Government trade returns have for several months past indicated larger buying compared with a year ago, on account of American consumers of the products of British iron and steel works. Reports to hand from the manufacturing centres across the Atlantic all speak of a continuation and steady development of the larger demand which a few months ago began to appear at the iron and steel mills there. The works are gradually, and in some instances rapidly, filling up their order books with forward business. The expectation has established itself that railway building in the States will be very large in the next two years, than which nothing can give a greater stimulus to trade. It is estimated that the production of steel rails will this year be in advance of anything previously accomplished, namely, 1,500,000 tons. Heavy orders are being offered, and some of them placed in the English hematite pig iron districts for export to America. Good contracts are also being given out by the same buyers to our steelworks for open-hearth and Bessemer material in the form of blooms, billets, tin—or sheet—bars, wire rods, and other forms of partially manufactured steel. The most recent advices from the States speak of this class of business as certain to increase. Many of the American ironmasters are preferring to roll down imported steel rather than experiment for the present in steel-producing plants. The trade horizon is brightening in several directions, and we congratulate the iron and steel and engineering industry upon the improved autumn prospects.

A GOOD INVESTMENT.

At the recent half-yearly meeting of the North-Eastern Railway shareholders at York, the chairman—referring to the reduction in the amount paid as compensation for injuries to passengers—said, "Formerly upon some occasions, as you know—and as we know from unfortunate experience—the sums paid annually for personal injuries to passengers were very great. In two consecutive years—in 1870 and 1871—we paid £37,413 for that alone in the first-named year, and £59,006 in the second-named year. Of course there is something of far more importance underlying these figures than the mere pecuniary amount expressed by them. There is all the suffering, grief, loss of relatives and so forth, to be added to the account; but during the six years ending 1886 the average amount paid was only £15,300 a-year. I am glad to refer you to the half year just ended, where the sum paid is only £2356, or under £5000 a-year. Now, of course, all this has not been got without a considerable expenditure by the railway company, and it is owing to your generosity, your liberality, that we have been able to apply large sums of money in that direction. We have, as you know, now applied almost entirely over the whole line the block system, and in addition to that we have great command over the speed and motion of our trains by the very liberal use of the Westinghouse brake."

GERMAN COMPETITION IN THE EAST.

Our Sheffield correspondent sends two interesting statements in reference to Japan and China. The first disposes of the German boast that a firm of the Fatherland had succeeded in securing the monopoly of the Japanese rail trade for eight years. As a matter of fact a leading Sheffield firm has just taken an order for 10,000 tons of steel rails, which follows another order for a similar quantity for the land of the Mikado. China has also placed an order for steel rails with this Sheffield house, and hopes are entertained that the Celestials really mean business this time. This is the first order for steel rails since a syndicate laid down the line to Woosing. The Chinese had bargained for a horse-line. When the contractors used steam, the children of the sun were terribly offended, negotiated for the purchase of the railway, and then deliberately broke it up. It is satisfactory to know that both in China and Japan the Germans have failed in their masterful efforts to appropriate the railway business. The opening up of China and Burmah will do more to revive English trade than any other event, short of a world-wide "boom."

STEVENSON'S ROLLING MILL ENGINES AND REVERSING CLUTCHES.

The engravings which will be found at page 128 are three-coupled engines and two sets of ponderous frictional rolling mill reversing clutches and gearing, which have been erected at the Woodside Steel and Iron Company's Works, Coatbridge. The erection embraces several novel features. The improvements secured by this new arrangement may be gathered from a close inspection of the engravings, and those of some of its earlier forms, such as installed at Monkland and Blochairn, to be found in The Engineer of 1872 and 1874.

The system has been adopted, although its cost is much higher than that of reversing engines and other forms of this plant. Mr. Stevenson argues that "plates or bars rolled at uniform speed are superior in tensile strength to such as are rolled by the staggering motion of reversing engines, and that many of the plate failures of which so much had been heard, such as that in one of the boilers of the Russian s.s. Livadia, are due to defective processes of rolling more than the differences in the quality of the metal of which they are composed." His theory is that "the molecules of iron put in motion when attacked by the rolls in passes of the piece through them require time as well as pressure to adjust and settle themselves in their respective relations and dispositions with the effect of obtaining the maximum tensile strength corresponding to the quality of the metal. The alternating quick and slow travel of the rolls results in spasmodic seizures of the metal's molecules upon each other, which is destructive of strength of hold and incompatible with homogeneous masses throughout individual plates—a fact which is obvious on microscopic inspection." These views will not perhaps meet with general assent, especially as Mr. Stevenson mentions the possible improvement under this head as analogous to that referred to by Dr. Percy in connection with the strength of wire; but that the varying speeds have some effect will no doubt be admitted. The Woodside clutches are based on the lines of those at Gelshenkirchen, and were adopted for Woodside after inspection of their productions and an investigation of their behaviour in continuous working since 1873 by the engineers of that company.

The three engines shown have each 36in. cylinders with 42in. strokes. The two outside engines are coupled to two crank shafts, which they drive continuously in opposite directions. These shafts are each connected at their inner ends to the centre engine, which, by means of two connecting-rods working in opposite directions to each other, couple the shafts to the effect combining the power of all the engines against resistance presented to either of the mill wheels. The appearance of the whole system when in full action presents to the eye strange and mixed movements. Four engine connecting-rods rise and fall unevenly, yet all beat time like the legs of a trotting quadruped, whilst the clutch pieces and rolls seem now to spin round right and left, now to stop or start, or now to join chase in one direction in obedience to the finger touches on small hydraulic controlling valves. These may be seen in the plan, page 128. Engines and gearing are embraced in one united and compact bed frame, and are bound to it on the level face of a solid square foundation, so that unequal wearing of the machinery or uneven setting of the foundations, through pressures and strains long directed on particular points, is prevented. The main castings of the structure are of selected tough iron, and its main malleable parts of mild steel. The cranks are forged solid with the shafts, and have crank pins 10·5in. diameter. The crank shafts have necks 14·5in., and those carrying the mill wheels and clutches have necks 16·5in. diameter. The spur wheels are 26·25in. wide on the face, and are 8ft. 10·5in. diameter. The weight of each set of wheels, with clutches and sliding boxes, is nearly 25 tons, and with the hydraulic reversing cylinders, central spindles, crabs, and their relative appurtenances, make up a total weight to be carried by each mill shaft of about 30 tons. The teeth of the wheels, as will be seen from the illustration, are formed on Stevenson's zig-zag or quadruple helical design, with a central web between the two sets of teeth; the pitch is 7in. These teeth are claimed to be 30 per cent. stronger than those of the ordinary double helical form, because they present an arch throughout half the total breadth of teeth towards the driving pressure in whichever direction the wheels and pinions drive. Second, the zig-zag lines give greater sectional area of metal by virtue of their double apex. The whole has been worked out by careful reference to past experience, and the results will no doubt be looked for by rolling mill engineers and owners with interest.

RAILWAY MATTERS.

Experiments are to be made in the States in the use of compressed natural gas in locomotives instead of coal.

It is reported that the Anderston Foundry Company, of Port Clarence, has secured an order for railway materials which will afford employment to several additional hands for some time to come.

Several engineers and upper subordinates have been transferred on loan from the Jhansi-Manickpur Railway to the Indian Midland Railway Company, and every effort is being made to complete a length of 186 miles before the end of next year.

South Australia now possesses through communications with Melbourne by rail. The last spike was driven in the main line on June 24th, and the first engine with a carriage ran over the line from Border Town to Dimboola on June 25th.

The North-London Tramway Company is, we understand, running Merryweather engines with 2 lb. less fuel per mile than hitherto, averaging 7 lb. per mile only. This speaks well for these engines, which have now been working the first steam tramway in London for close upon eighteen months.

The London, Tilbury, and Southend engines built by Messrs. Sharp, Stewart, and Co., are ten wheeled side tanks, outside horizontal cylinders 17 by 26, four coupled wheels 6ft. 1in. in diameter, the leading end is carried on a four wheeled bogie, while the trailing end is carried on a pair of wheels fitted with a radial motion.

The Committee appointed to inquire into the cause of the recent railway accident at Portsmouth Dockyard, when several Indian and Colonial visitors were injured, have found that the mishap was due to the points not being blocked. A thorough inspection of the line has taken place, and many of the points were found to work badly.

A Board of Trade report has been published on a collision which took place on the 12th of June, at Yeovil Junction, on the London and South-Western Railway, when the engine of the passenger train left the rails and two of the vehicles in the goods train were upset. In concluding the report, Major Marindin says:—"If the passenger train had been fitted throughout with a continuous brake the collision would have been less violent, even if it had not been entirely averted."

The half-yearly report of the London, Chatham, and Dover Railway Company gives the miles owned by the company as 192, and miles worked by company's engines as 196m. 72·5c., as against 192m. 5·5c. last year. The passenger train mileage was by the company's trains 1,484,516, by trains of other companies 56,111, a total of 1,540,627. The goods and mineral mileages were 258,110 and 89,777. The locomotive power cost £67,557, of which £22,420 17s. was for fuel.

Some idea of the depreciated value of railway property may be gathered from the steadily lessened assessments of the Crewe Locomotive Works. This property has been lately valued by the company for assessment at £68,000, which is a reduction of £7000 on their valuation of three years ago, and of £27,000 on the valuation, at the same period, of a professional valuer employed by a union. The company attributes this reduction mainly to the falling off in the traffic receipts of the railway.

The half-yearly report of the Belfast and Northern Counties Railway gives the total cost of locomotive power as £13,551 18s., of which £5216 10s. was for coal. The lines owned by the company are as follows:—Miles authorised, 161½; miles constructed, 156½; miles constructing or to be constructed, 5; miles worked by engines, 156½; lines worked by company, 61 miles; being a total of 222½ authorised, 217½ made, 5 in course, and 217½ worked by engines. The mileage statement gives—passenger trains, 329,851; goods and mineral trains, 147,360; total, 477,211.

The Society of German Engineers has thirty branch societies, with a total of nearly 5600 members. It will hold its twenty-seventh annual convention in Coblenz August 23rd to 25th. Among subjects for discussion at this convention are—"Steam Boiler Inspection," "Preparatory School Instruction for the Higher Scientific Callings," "Experiments on the Resistance of Steam Boiler Tubes to Pressure from Without," "The Protection of Secrets in Manufacturing," "Introduction of a Metrical System of Screw Threads," "Formation of Technical Courts of Arbitration and Establishment of Technical Chambers of National Courts."

The Lancashire and Yorkshire Railway Company introduced in 1879-80 a type of tank engines which are doing good service; they are eight wheeled—six coupled, and a pair of wheels under the trailing end—which, as in the case of the Tilbury engines, is extended—and have Webb's radial axle box. There are two classes, the goods, with 4ft. 6in. coupled wheels, and the passengers, 5ft. 1in.; in each case cylinders 17½ by 26, inside bearings, and side tanks. The first of these were built for the Lancashire and Yorkshire Company from light goods engines with 4ft. 10in. wheels, cylinders 16 and 16½ in diameter, while Kitson and Co., 1881, and Dubs and Co., 1882, built about fifty of them with 5ft. 1in. wheels.

The Canadian Pacific Railway Company, with a view to develope commercial traffic on their line, have issued new regulations, which will shortly come into force. A circular has been sent to all the merchants and manufacturers of the Dominion on the subject of the development of trade. Numerous merchants having expressed a desire that a special commercial train should be run to canvass the trade of British Columbia and the North-West, the company proposes if a sufficient number of subscribers can be secured to justify the running of such a train, to fit out a special train of new box cars of the largest size provided with steps and windows, and with the necessary shelving and tables for the display of samples of goods, and to provide in the train one or more first-class sleeping cars and a dining car.

"Where ignorance is bliss. A few days ago we witnessed a model car coupler having its photograph taken for the first time. Although it neither screamed nor struggled, the author of its being had some little difficulty in getting it into a proper pose for the operation; its little mouth had to be adjusted, and though a fine healthy tongue was displayed, it was found impossible to get a smile upon the lips. When the camera had been adjusted for the last time and the solemn silence might be broken, the photographer approached and whispered, "If I am not intruding on a private grief, might I ask what that thing is? I and a friend in the dark room have talked it over and concluded it was an improved tap for drawing beer." In the innocence of his guileless nitrate of silver and collodion heart, he had imagined the rear end of the patent automatic safety car coupler that is to lick all creation and make the eagle bird — mine or any other man's — scream again was intended to screw into a lager beer keg. Fancy the solemn thought, how one's mind fills with envy; these men had never heard of a car coupler and didn't know one by sight."

All the American railways are doing better than they have been. The net earnings of the Newport News and Mississippi Valley Railway for June last amounted to 131,622 dols., showing an increase of 21,785 dols. compared with the same month of last year. The net earnings for the half-year ending June 30th amounted to 856,321 dols., showing an increase of 201,834 dols. compared with the same period of 1885. The net earnings of the Marquette, Houghton, and Ontonagon Railway for July amounted to 139,534 dols., an increase of 18,558 dols. The net earnings from January to July 1st were 514,751 dols., an increase of 109,204 dols. The earnings of the New York, Ontario, and Western Railway for July amounted to 144,711 dols., an increase of 8637 dols. The earnings from January to July were 717,478 dols., an increase of 36,249 dols. The earnings of the Gulf of Colorado and Santa Fé Railway for July were 192,000 dols., an increase of 52,700 dols. From January to July the earnings amounted to 1,103,386 dols., an increase of 364,652 dols. The net earnings of the Memphis and Charleston Railway for the year ending June 30th amounted to 386,314 dols., being an increase of 118,052 dols. compared with the previous twelve months.

NOTES AND MEMORANDA.

In London 2336 births and 1620 deaths were registered last week. The annual death-rate per 1000 from all causes, which had increased in the seven preceding weeks from 14·9 to 22·0, declined again last week to 20·4.

It is said that the longest clock pendulum known is one in Avignon, France, measuring 67ft., to which is attached a weight of 132 lb. Its movement is necessarily slow, passing through an arc of between 9ft. and 10ft. in 4½ seconds.

Air charged with 735 grains of gasoline per cubic foot has been found to have an illuminating power of 16½ standard candles, when burned at the rate of 3½ cubic feet per hour in a 15-hole Argand burner; equal to 23·7 candles per 5 cubic feet an hour.

The number of students in the twenty universities of the German Empire amounts now to 28,021. Of these Berlin has 4434, Leipsic 3069, Munich 3035, Halle 1518, Breslau 1425, Tübingen 1403, Würzburg 1369, Freiburg 1319, Bonn 1293, Göttingen 1076, Heidelberg 1036, Greifswalde 1018, Marburg 939, Erlangen 909, Königsberg 871, Strasburg 856, Jena 650, Kiel 542, Giessen 513, and Rostock 313.

An official return just published gives the following figures relative to the Belgian collieries for 1884:—Output in tons—1884, 18,000,000; 1885, 17,000,000; number of colliers—1884, 105,182; 1885, 103,095: average annual pay—1884, 914f.; 1885, 813f.; cost of extraction per ton—1884, 9f. 18c.; 1885, 8f. 67c.; produce of sale the 1000 kilos.—1884, 9f. 53c.; 1885, 8f. 87c.; profits of all the collieries—1884, 6,250,110f.: 1885, 6,929,055f.; number of pits worked—1884, 289; 1885, 285.

The Director of the Mint reports that the production of gold in the United States during 1885 is estimated at 31,800,000 dols., showing an increase of 1,000,000 dols. over the estimated production for 1884. The production of silver for 1885, calculated at the coining rate in silver dollars, is estimated at 51,600,000 dols., against 48,800,000 dols. during the previous year. The Director estimates the gold coin in the United States on January 1st, 1886, at 533,485,453 dols., the silver dollars at 218,259,761 dols., and the subsidiary silver at 75,034,111 dols.

It is said that an engineer of Pesth, Mr. Pradanovic, has lately used dynamite for driving piles. A circular cast iron plate, 15in. in diameter, and 3¾in. thick, is fixed on the pile to be driven, in a perfectly horizontal position. A dynamite cartridge made in the form of a disc, 6in. in diameter, and ¾ of an inch thick, and containing 17½ ounces of dynamite, is placed upon the cast iron plate and exploded by electricity. It is stated that the depth to which the pile is driven by each explosion is equal to five blows of an ordinary pile engine weighing 14¾ Vienna cwts., falling 9ft. 10in. A cast iron plate on an average resists 25 explosions.

In answer to a question on the number of men required in a brewery, the *Brewers' Guardian* says:—So very much depends upon the construction and arrangements of the particular brewery referred to, and also upon the class of trade which is done there. We consider that under no circumstances can a 20-qr. plant, doing 20,000 barrels annually, be worked with less than twenty men, and we should distribute them as follows:—Two copper side men, one engine driver, one boiler man, three cellar men, one fermenting-room man, two cask washers, four draymen, one horse keeper, one odd man, one cooper, one carpenter, one smith, and one yeast pressman and to assist generally.

The flow of metals is illustrated very curiously in one phase of Japanese art metal work, of which, however, it is quite difficult to obtain native examples. In its preparation thin layers of copper, precious metals, and various alloys, are soldered in superposition, like the leaves of a book; through these layers holes are drilled to varying depths in the thickness of the metal, or trenches are cut in it. The mass is then hammered flat until the holes or trenches disappear, and the result is contorted bands of some complexity, possessing much beauty, especially when the colour of the metal is developed by suitable chemical treatment and polishing. A similar effect may be produced by beating up the metal from one side and filing the other flat.

In 1869, H. St. Claire Deville, being instructed by the French Government to conduct a series of experiments with the object of ascertaining the value of liquid fuel, determined the calorific effect of various samples of crude petroleum from the United States and other countries. In the case of a sample from Oil Creek, United States, he found the total calorific power to be 9963 Centigrade units, equal to an evaporation of 16·17 lb. of water per 1 lb. of oil; but his actually obtained yield of steam was 14·05 lb. per 1 lb.; 1252 heat units out of the 9963, by exact measurement, being lost in operating the chimney to produce draught, and 76 units by radiation. A sample from Franklin, United States, of higher density, gave 10,672 units; and a third sample of Ohio oil, dense and black, 10,399.

The quantity of matter ejected by the New Zealand volcanoes lately is probably very great. The *Melbourne Argus* of June 29th writes:—"Latest accounts as to the New Zealand volcanic convulsions state that an area of 2000 square miles is said to be covered with 3in. and more of dust. About 20 miles square is covered, mostly to the depth of 3ft. and more. For 400 square miles at the outside the country is totally destroyed, and 1600 square miles is much damaged, the result depending on the problem of the fertilising qualities of the deposit." Although 20 miles square is here mentioned, 20 square miles is probably more nearly the area covered 3ft. in depth with this ejecta. Even that quantity represents about 1400 millions of cubic feet, which will allow a good deal of contraction of the earth to take place; but the estimate is probably too much, but in any case the amount extruded here and by Krakatoa must make room for a good deal of secular cooling and contraction.

The experiments of Regnault, Mendeléeff, and others, have shown that Boyle's law is not rigidly exact for air pressures much below that of one atmosphere, although, on the other hand, Amagat's results indicate that the variations at low pressures are too small and irregular to be of any account (Abstr., 1882, 1269). In a paper by C. Bohr (*Ann. Phys. Chem.*) a series of experiments with oxygen are described under pressures varying from 15 mm. to 0·01 mm. at temperatures 11—14 deg.; the possible sources of experimental errors are discussed in full, and shown to be inadequate to explain the observed variations from the law, even when all are in the same direction. The results of the experiments seem to indicate that under these conditions the law is not expressible by the simple formula $pv = k$, but rather by a formula $(p + \alpha)v = k$, in which α is a constant within certain limits of pressure. Thus at pressures above 0·70 mm. value for α is 0·109, whilst below 0·7, this value is 0·07. Thus oxygen seems to undergo a change of aggregation at that limit.

From a paper on "Secondary Electrolysis," by E. Semmola (*Compt. Rend.*) it appears that if a small ribbon of platinum is immersed in a voltameter containing acidulated water, in such a way that its ends are opposite the electrodes of the voltameter, and a powerful current is passed through the latter, hydrogen and oxygen are evolved not only from the electrodes but also from the ribbon. This secondary electrolysis varies greatly with different conditions, and ceases altogether when the current is not strong, but if oxidisable metals are used instead of platinum it becomes much more energetic. The phenomena are well seen with amalgamated zinc, which is not attacked by acidulated water except when the current passes. When the circuit containing the voltameter is closed, hydrogen is given off from one half only—the negative half—of the zinc, whilst oxygen is absorbed by the other half. If several pieces of zinc are immersed in the water in the voltameter, hydrogen is given off from each of them. This secondary electrolysis is due to a current derived from the immersed zinc.

MISCELLANEA.

The Metropolitan Board of Works has determined upon a plan for making a tunnel under the Thames from Greenwich to Blackwall.

The report of the evidence taken by the House of Lords Committee last year on the Electric Lighting Act of 1882 has been published.

The Admiralty seem to be going in extensively for electric lighting. They have just placed an order with the Woodhouse and Rawson Electric Manufacturing Company for 7000 switches, besides fusible plugs, brackets, and other articles.

The pump hopper dredger Lucy, built for the Cape Government by Messrs. J. and K. Smit, of Kinderdjik, in Holland, as recommended by Sir John Coode, C.E., arrived at East London early in June last, and is now successfully at work at the mouth of the Buffalo River.

A project is on foot in the northern part of Aurora county, Ill., for the purpose of draining the large swamps at the head of the Kishwaukee creek, which is drained by Rock River. By digging a ditch seven miles long, 8ft. deep and 40ft. wide, at an expense of 15,000 dols., it is expected to drain 5000 acres of land which is now utterly useless.

It is proposed to spend £8000 for a fence, 90 miles long, to prevent the inroad of rabbits from Victoria to South Australia. The *Colonies and India* says, "Looking to the ravages committed by the rabbits, it is clear, if the occupiers of the land are not to be starved out, that this work will have to be done, and possibly at a cost, not of £8000, but of £20,000, before the plague can be properly stamped out."

The Government have ordered four of Atkinson's patent "Differential" gas engines, each having a directly-worked air compressor attached, to work in connection with Shone's system of pneumatic sewerage at the Houses of Parliament, where they are to work in the basement under the chambers. A similar construction of engines and compressors have been adopted by the sanitary authorities of Beaumarais, for working the Shone system there.

The Kensington vestry have appointed a committee to inquire as to the practicability of taking road-sweepings and dustbin refuse thirty miles into the country and giving it to the farmers as manure. The inquiry is one of general interest, and as the evidence is to be taken down and published, a valuable report ought to be the result. The Lambeth vestry do the dirty filthy offal and dust separations in the middle of a dense population in Walworth.

The quantity of salt which is now produced in South Durham is considerable. The official figures for last year are as follows, viz.:—Messrs. Bell Brothers, 51,871 tons; the Hamton Hill Salt Company, 1026 tons; and the Newcastle Chemical Works Company, 1040 tons. This year the production of these and other firms will be considerably more, whilst the south shore of the Tees will also have commenced to contribute. The average value of the salt at producer's works is nearly 10s. per ton.

An improved bronze wire for telegraph, telephone, and other electrical purposes is being introduced by Mr. F. Geere Howard, of Cleveland-street, W. Its tensile strength and high conductivity permit the substitution of this wire, weighing about 36 lb. per mile, instead of 380 lb. per mile of iron. It is an inoxidisable wire, and can be used on spans of 400 yards. A remarkable property or quality of the wire is that it is manufactured so that it has exactly the same conductivity and strength throughout any length.

The head of the colossal lion which is to form the chief feature of the memorial to the 66th—Berks—regiment has been cast in the foundry of Messrs. H. Young and Co., five tons of metal being barely sufficient to fill the mould. The casting proved perfectly successful, and has been inspected by the sculptor, Mr. George Simonds. As all the other parts of this monument have been successfully cast and fitted it may now be considered as complete, and the work of erection at Reading will proceed without delay.

A national conference of miners delegates was held in Glasgow, on Monday, when delegates were present who reported that they represented upwards of 36,000 men. Some of the delegates reported in favour of a national strike, but this opinion was far from general. After a long discussion it was found that the districts were so variously circumstanced that it would be impossible, in the meantime, to adopt any general course of action that would be applicable to all. The outcome of the conference was a recommendation that each district adopt some principle of restriction suited to its special circumstances.

The Cleveland ironmasters' returns, showing the make and disposal of pig iron for the month of July, were issued on the 4th inst. There were 63 blast furnaces at work on Cleveland iron, and 30 on hematite, spiegel, and basic iron, whilst 63 furnaces were idle. The total make of pig iron of all kinds in the district was 206,176 tons, being an increase of 4045 tons as compared with June. The stocks on July 31st amounted to 706,736 tons, being an increase for the month of 17,551 tons. The increase for the year now amounts to 189,248 tons. Two years ago, when No. 3 g.m.b. was about 36s. 9d. per ton, the stock of pig iron in the Cleveland district was only 277,519 tons.

Steel rails were exported last month from Sheffield to the value of £318,842, a great increase on July, 1885, when the figures showed £268,878. The United States, which was *nil* in the corresponding month of 1885, took last month a value of £24,503; British North America increased from £44,676 to £103,578; British East Indies, from £76,080 to £81,362; Argentine Republic, from £5910 to £15,090; Egypt, from *nil* to £7310; Spain and Canaries, from £1450 to £5102. Heavy decreases are shown by Russia from £14,360 to £140; Sweden and Norway, from £17,786 to £2915; Italy, from £14,320 to £7126; Brazil, from £7409 to £3296; Peru, from £4516 to *nil*; British Possessions in South Africa, from £7458 to £1236; Australasia, from £62,766 to £48,692. Railroad material of all sorts has increased from £347,382 in July of 1885 to £409,536. Hoops, sheets, and plates have fallen from £270,211 to £259,802.

A number of the Colonial representatives, have visited the works of Messrs. Shand, Mason, and Co., their object being to witness a trial of two new pattern steam fire engines made for the Insurance Companies Fire Brigade, Melbourne, Australia. After inspecting the machines, steam was raised in three minutes forty seconds, the total time occupied in raising 100 lb. being eight minutes. The water was projected far over the shaft in the works to a height of about 160ft. An improved London Brigade manual fire engine was also tested. All present, amongst whom were Sir Graham Berry, Agent-General for Victoria, Mr. Bosisto, Mr. Thompson, President and Secretary of the Victorian Commission, and the Hon. U. Wilson, of Melbourne, Victoria, expressed great satisfaction at the results obtained, and inspected, three new steam fire engines for the Metropolitan London Fire Brigade, and one for the Midland Railway Company.

At the Yorkshire Agricultural Show, Sheffield, Mr. Thomas Andrews, F.R.S.E., Wortley Ironworks, near Sheffield—established before the year A.D. 1660—exhibited an interesting variety of articles, consisting of samples and tests of Wortley bar iron; huge best best chains, made at Wortley and used in moving; 81-ton guns, and other heavy ordnance; photographs showing the appearance of fractures of Wortley fagotted railway axles; illustrations of extensive research, in which Mr. Andrews has been engaged, "On Effects of Temperature on the Strength of Railway Axles," the results of which are communicated to the Institution of Civil Engineers, and for which the Council awarded him a Telford Premium during the recent session of 1886. He also exhibited some ancient cannon balls made at these old ironworks 200 years ago, and a photograph of an old hammer erected at Wortley Ironworks A.D. 1713, one of the first forge hammers erected in Yorkshire.

square millimetre. The second girder tore, without previous damage, when the calculated strain amounted to 37·5 tons per square inch—59 kilogs. per square millimetre. It is remarkable that the top flange plate showed a rent of $\frac{5}{16}$in.—8 millimetres—wide, while in the web plate only a small fissure could be found near one of the rivet holes. In these three girders no motion of the rivets or cutting into the plates whatever took place. The third girder withstood a tension of 43·2 tons per square inch—68 kilogs. per square millimetre; the experiment had then to be stopped owing to signs of warping. Strips taken from these three hard steel girders gave a resistance against tension of from 51·4 tons to 54·6 tons per square inch—81 kilogs. to 86 kilogs. per square millimetre—an elongation before fracture of from 9 to 15 per cent., a contraction of from 24 to 36 per cent. It must be borne in mind that the steel in these girders was made purposely for the experiment, that great trouble was experienced in the manufacture before the material satisfied the different requirements, and that, therefore, it cannot be considered as a fair trading specimen, nor does it compare favourbaly with wrought iron. When the wrought iron girders were loaded till the strain in the extreme lamina amounted to 86 per cent. of the ultimate strength, or to 80 per cent. of the tensional resistance, deformation, indicating the approach of the limit of endurance, began to show, and the failure did not occur suddenly, but by gradual yielding. In the steel girders, fracture occurred suddenly, when the strains reached 73 per cent. of the ultimate strength and 66 per cent. of the extreme resistances to tension. The power of resistance beyond this point was of small value.

"The deflection of the iron and the hard steel girders was equal until a strain of 16·5 tons per square inch—26 kilog. per square millimetre—was reached. Above this limit the deflection in the iron girders was the greater. On the experiments on three soft steel girders the following remarks may be made. The girders show deflections uniformly increasing with the load, until a strain of 12·7 tons per square inch—20 kilogs. per square millimetre—was reached. After unloading, the permanent set was very slight—from 0·66 millimetre to 0·76 millimetre. After 14 tons per square inch—22 kilogs. per square millimetre—the observed deflections exceeded those calculated, and these differences increased rapidly with the load. With a strain of 17·8 tons to 18·4 tons per square inch—28 and 29 kilogs. per square millimetre—local bulges and deformations began to show, and some displacement of rivet-heads was noticed. A considerable deformation of the bottom flanges and bulges in the web plates followed shortly after. When a calculated strain of 22·2 tons per square inch—35 kilogs. per square millimetre—had been reached, the girders were considerably deformed, and the readings of the hydraulic gauge indicated the collapse of the girders. Test samples showed a resistance to tensional strain of from 26·7 tons to 31·1 tons per square inch—42 kilogs. to 49 kilogs. per square millimetre—an elongation of from 12 to 24 per cent., and a contraction on the sectional area of from 42 to 50 per cent. Though these results are not unfavourable, they are not so good as those obtained from iron girders. The deflections of the steel girders were greater, the deformations and bulgings originated at an earlier period and were more irregular. The material for these girders was also manufactured specially for these experiments."

[*Note.*—It cannot fail to strike the reader of the above abstract that the quality of steel used in the experiments was very irregular, and quite different from steel used for structural purposes at the present time in this and other countries.—W. A.]

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

(*From our own Correspondent.*)

THERE is more business doing this week than last, since the interference with regularity of operations caused by the holidays of last week is at an end. There has not been much accumulation of orders during the slack time, for consumers are still chary of giving out large orders, but most makers had enough in hand to allow of the works being generally started on Tuesday. The slightly improved outlook of a week or a fortnight ago is maintained. Enquiries are decidedly better than a while back, and there is less tendency on the part of purchasers to demand a reduction upon the prices which regulated earlier contracts.

More immediate promise of a revival comes from the export than from the home trade, though the indications are not yet very striking in either department. Ironmasters of much experience here are urging that a distinctly encouraging feature is the progress of the improvement in America. Opinion is stronger this week than last that larger orders will by-and-bye be coming from the West. The hematite market is already strengthening by reason of the considerable American orders, with the promise of others to follow. Steel ingots, blooms, billets, and tin—or sheet—bars are also, consumers in this district are informed by sellers, in increasing demand for the same market from the steel-making centres. The continued improvement of the Colonial and South American markets is also a feature full of promise for South Staffordshire ironmasters and other heavy metal manufacturers. Trade with the Indian Empire is still disadvantaged by the state of the currency, yet to the Northern provinces good shipments of some heavy descriptions of work continue to be made.

Prices have a tendency to strengthen this week for early deliveries. Sheet makers again lead the market in the matter of activity. Sheets of 20 w.g. are quoted £5 15s. to £6, though buyers are placing some contracts at £5 10s. 24 w.g. are quoted: £6 2s. 6d. to £6 5s.; and 27 g., £7 per ton to £1 5s. per ton additional. Some makers are satisfied with a 15s. difference between 24 and 27 g., but these are exceptional firms. Galvanised corrugated sheets are an average of £10 per ton, f.o.b. Liverpool for 24 g.

Tin-plates and best—thin—sheets for working-up and stamping purposes are in good demand from the chief South Staffordshire and East Worcestershire works. Good prices, as times go, are being realised alike from the country and continental and colonial and American buyers. £10 to £10 10s. is quoted as the basis for working-up sheets.

Marked bars are without much change. Messrs. Noah Hingley and Sons quote rounds and squares $\frac{1}{2}$in. to 3$\frac{1}{2}$in., and flat bars 1in. to 6in.—Netherton Crown best and Netherton Crown best horseshoe—£7; best rivet iron, £7 10s.; double best plating and double best Crown bars, £8; and treble best Crown, £9; Netherton Crown best angles are £7 10s., and tees £8. None of the marked bar makers are better employed at the present time than this firm, and very few so well. Whilst other works whose proprietors have manifested less disposition to meet customers' views as to prices have been running barely half-time, Messrs. Hingley have been running full.

There is little that is encouraging to be said of the plate trade, in which the demand keeps very limited. Local mills, indeed, are still cut out by works in other centres where cheaper production is possible. Prices are easy at £6 15s. to £8 and on to £9. Hoops remain at £5 5s. to £5 10s. for common, and bars at £4 15s. to £5. Occasionally £4 12s. 6d. is accepted for hurdle qualities.

"Marrying" contracts in the pig trade is still the order of the day. Consumers who bought at prices considerably above those now ruling, and who have not yet taken all the iron, are getting sellers to double the quantities that have yet to be delivered at present low prices and then to strike a mean average. By conducting business in this manner, sellers are managing to book somewhat heavy lots. A few, indeed, have lately made sales so considerable in amount that they are this week being prohibited by principals from booking further lots. The classes of pigs that are mainly selling continue to be Northampton, Derbyshire, Nottingham, and Leicestershire makes. Open market quotations are again named this week at 33s. for Northamptons, delivered to railway stations hereabouts, and 34s. and 35s. for Derbyshires. Business of a speculative sort, the pigs to be delivered at once, and the cheque in payment of the same to be ready directly it may be asked for, is being done at well within the figures named.

Native pig makers are making very little money out of current business. This is their one settled complaining. Certain Shropshire furnace owners are naming 5s. per ton under best Staffordshire makers. While 50s. to 52s. 6d. is the quotation of the former, 55s. to 57s. 6d. is the nominal figure of the latter. Common Staffordshire pigs are 27s. 6d. to 31s. 3d. for cinder sorts.

The North Staffordshire ironmasters continue at only part production. Orders show scarcely any increase. Messrs. Robert Heath and Sons, of the Biddulph Valley Works, quote f.o.b. Liverpool: Ordinary bars, £5 10s.; best, for shoe and turning purposes, £6; double best, £7; angles and tees, £6; best angles, £6 10s.; while best tee iron is £6 10s. Ravensdale hoops are £6 10s. to £6 15s.; best half-round and convex bars, £6; bridge or tank plates, £6 10s.; best boiler plates, £7 to £7 5s.; double best, £8 5s.; and treble best, £10 5s.

Messrs. Kinnersley and Co., Clough Hall Ironworks, Kidsgrove, quote, delivered Mersey, bars, £5 2s. 6d.; best, £5 12s. 6d.; and double best, £6 12s. 6d.; angles, £5 7s. 6d.: best, £5 17s. 6d.; and double best, £7 2s. 6d. Bridge and tram rails they quote £5 7s. 6d.; half-round, convex, and oval bars, £5 12s. 6d.; and triangular iron, £6 2s. 6d.

The South Staffordshire ironmasters are watching with much interest for the terms upon which the Shropshire ironworkers' strike may finally be settled. It is a matter of much importance to them that the Shropshire makers should not be able to secure their labour for much if any less money than they themselves have to pay. In times of competition like the present every little advantage obtained by one district over another counts, and is jealously watched. South Staffordshire ironworkers' wages would have to come down if a distinct reduction were established in Shropshire, since whatever course Shropshire might take would be quickly followed by the ironmasters in North Staffordshire, who are keen competitors of the South Staffordshire firms.

The Patent Shaft and Axletree Company, Wednesbury, is quietly going on with the laying down of its new steel works. The firm is not hurrying itself in the matter, but intends to do the thing well. Orders are being filled in good numbers for railway engineering work, particularly wheels and axles of first-class design and manufacture, for home, and Indian, and Colonial, together with South American and other foreign railway lines. The directors of the company are understood to have a good deal of confidence in the beneficial effect upon this district of the United States' revival.

The Imperial Tube Works, Wolverhampton, Mr. John Brotherton, proprietor, is being formed into a joint-stock concern, with Mr. O. Altendof—Altendof and Wright, Birmingham—as chairman, and Mr. Brotherton as manager.

Speaking at the annual meeting of the Birmingham and Aston Tramways Company, Mr. E. Pritchard, C.E., said that there had been a large increase from the steam department, and a slight loss from the branches upon which horse propulsion was employed. It was decided to pay a dividend of 10 per cent. upon the year's working. At the extraordinary meeting it was resolved to increase the capital of the company to £100,000, by the addition of another series of 10,000 shares of £5 each.

The Waterworks Committee of the Wolverhampton Town Council, in their yearly report, express gratification at the efficient state of the property of the Corporation. An increased demand for water has been met by the erection of a new pumping engine at Tettenhall, which is now working satisfactorily. The plant at all the stations is being maintained in good working order with the exception of one engine, which is undergoing extensive repairs, after having been in regular work for twenty-seven years. The continued low prices of fuel have again enabled the committee to realise a profit upon the year's business amounting to £1679 7s. 6d.

An explosion of a boiler, which has given rise to much speculation as to its cause, took place on Friday at Bloxwich. The boiler, whose dimensions were 30ft. by 5ft., was one of a battery of five horizontal boilers, comprising the new Fishley plant of Messrs. G. and R. Thomas, and was used for winding and pumping purposes. No tenable theory concerning the origin of the explosion can at present be ascribed, as the boiler was known to be thoroughly efficient, and on the previous night, when it was emptied, cleaned, and overhauled, no signs whatever of weakness or defect were detected.

The question of the responsibility of workmen following what was denominated "erroneous" instructions was considered at a recent meeting of the Birmingham Trades Council. It was alleged that the practice existed in some trades of making the workman bear the cost of articles which had been rendered useless by "wrong instructions which had been given by the employer, having been carefully followed." A case in point was mentioned, and it was stated that the matter was about to be decided by law.

At a meeting of chainmakers held at Cradley Heath yesterday, a list of prices at which the men were prepared to resume work was formulated. These prices ranged from the 3s. list for common hammered chains, to the 4s. list for best dollied chains, and other work in proportion. This means an average all round of 3s. 6d., which was declared to be 6d. beneath the lowest list yet recognised.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—There is still no really traceable improvement in the condition of the iron trade of this district, but in a vague kind of fashion a better feeling seems to prevail, which may mean something or may mean nothing. It is probably due to the encouraging reports received of late with regard to the revival of trade in America, and although it can scarcely be said that an improvement of American trade must necessarily be followed by an improvement in trade here, indirectly it exercises an influence in promoting a more hopeful tone. Then, in addition, there is the growing conviction, to which I have referred in previous "Notes," that prices have at last really got to the bottom; and this receives some justification from the fact that the very low sellers of pig iron in this market, although they do not actually quote any higher prices, are showing a decided indifference about booking further orders at the minimum rates. If there is any improvement in trade it is in hematites, and if the revival of activity in America is to be felt directly in this country it will certainly first be in the demand for material for the manufacture of steel rails, beyond this the means of production in the United Sates are so large that it will scarcely be necessary to come upon English ironmasters for supplies. Hematites certainly do show a tendency towards firmness, but still of no very decisive character, and certainly not indicative of any anticipations of large American orders coming to hand. The finished iron trade remains in a very depressed condition; the shipping season has brought forward very little extra demand, and the inland trade has shown no improvement except in some increase of requirements for constructive work which is usually carried out during the summer months. Altogether the outlook for the iron trade of this district, notwithstanding the somewhat better feeling to which I have referred, continues very discouraging.

The Manchester iron market on Tuesday presented no specially new feature as compared with the previous slow, dull markets which have been held for some time past. There are no orders of any weight stirring in the market, for the very sufficient reason that there are really no large requirements which consumers have to cover, but in small odd parcels there is a moderate business doing; and where buyers have orders to give out it may, perhaps, be said that there is less hesitation in placing them at current rates. No better prices are, however, obtainable, and the full list rates which some of the pig iron makers have been holding out for are still out of the market; there is, however, business to be done at prices which did not tempt buyers a short time back. Lancashire makers have been able to book a few moderate orders on the basis of about 35s. 6d., less 2$\frac{1}{2}$, delivered equal to Manchester; this, of course, represents a considerable concession upon the full list rates they have been quoting, but these have been so purely nominal that they could not be considered at all as market prices. In district brands prices for Lincolnshire iron are still cut very low, but at the minimum quoted rates of 33s. 6d. and 34s. 6d., less 2$\frac{1}{2}$, delivered here, makers who have been willing sellers at these figures are showing a disinclination to book further orders except to special customers, whilst for other Lincolnshire brands makers still quote 1s. to 2s. per ton above these figures, and rather than come down further in price the blowing out of several furnaces has now been practically decided upon. For outside brands prices are steady at late rates, but the demand for either Scotch or Middlesbrough iron in this market is at present extremely small.

There has been rather more business doing in hematites, and although low prices are still being taken to secure orders, there is a decided tendency towards a firmer tone.

Manufactured iron makers report a few more orders stirring, but in most instances they are still very short of work, and trade shows no real improvement. For bars delivered into the Manchester district £4 17s. 6d. still remains the full average price; hoops can be got at £5 5s. to £5 7s. 6d., and sheets at about £6 10s. per ton.

Several of the large engineering firms in this district are fairly busy, and amongst machine tool makers there seems to be rather more orders stirring, which is giving a somewhat more hopeful tone; but generally trade continues very slack, and the large locomotive building concerns are so badly off for orders that, simply to keep their shops running, work is in some instances being taken at prices which scarcely more than cover the bare cost of labour and materials.

The mention of aerated water machinery would scarcely at first suggest anything very striking in the way of mechanical engineering; but there are appliances connected with this branch of industry which are very clever mechanical arrangements, and the other day I had introduced to my notice an American novelty of this class, which has just been secured by Messrs. Bratby and Hinchcliffe, of Manchester, who have acquired the sole right for its manufacture in this country. This is a machine for wiring on the corks of aerated water and other bottles, and it is certainly a very clever piece of mechanism. The machine is carried on a small iron stand; at one end are spools containing the wire, four separate strands of which are passed through a hollow shaft to the opposite end of the machine, where the operation of wiring is effected. Two of these wires are passed in a half circle, one on each side, in such a position so that when the bottle is placed in the machine they enclose the neck. The two other wires are passed in parallel lines, only slightly apart, over the centre of the cork, and the four wires, having been previously twisted, are firmly gripped in a pair of jaws; the cork of the bottle is pressed against the two parallel wires, and the bottle forced upwards by hand until it is in the required position; by means of a foot-treadle a revolving motion is given to the shaft, and the four wires immediately passing out of the shaft on to the bottle are firmly twisted on and cut off, leaving a portion of the twist to be carried forward by the machine to the pair of jaws already referred to, when the machine is again ready for work. With the exception of applying the bottle-neck and cork to the machine by hand, the operation is automatic throughout, and is performed with marvellous rapidity and precision, the machine being capable of wiring 1300 bottles per hour.

The proposal to hold next year in Manchester a national Exhibition of arts, science, and industry, to commemorate the Jubilee year of her Majesty's reign, has now taken complete and definite shape. The project has been so heartily taken up that the required guarantee fund has been obtained without difficulty, and the preliminary details for the Exhibition have already been arranged. A very convenient and readily accessible site near the Botanical Gardens, Old Trafford, has been selected, and a scheme has been arranged for dividing the Exhibition into seven sections. These sections include industrial design, as shown in textile fabrics, pottery, and metal work; industrial processes, such as textile machinery, engineering and general plant, and machinery in motion; chemical and collateral industries; handicrafts; fine arts and a botanical section. There is also to be a representation of Old Manchester and Salford, in which various handicraft work will be carried on, and a model of the Manchester Ship Canal, showing the proposed docks, locks, waterways, &c.

In the coal trade an extremely quiet tone still prevails generally; house fire coals perhaps move off a little better, but all other descriptions of fuel for ironmaking, steam, and general manufacturing purposes, meet with no improved demand whatever. Pits, except where they are putting into stock, are not working more than an average of three to four days a week, and prices remain without quotable change—from about 8s. to 8s. 6d. for best coals, 6s. 6d. to 7s. seconds, 4s. 9d. to 5s. 3d. common, 4s. 3d. to 4s. 9d. burgy, 3s. 9d. to 4s. best slack, and 2s. 6d. to 3s. for common sorts at the pit mouth.

For shipment there is a moderate business doing, and good qualities of steam coal are firm at about 7s. per ton delivered at the high level, Liverpool, or the Garston Docks, but common sorts are still to be got at 6s. 6d. per ton.

Barrow.—There is a lull to report in the demand for hematite qualities of pig iron, and sales show somewhat a falling off, for both Bessemer and ordinary forge descriptions. The cause of the lull is difficult to explain, but it is not believed to be of more than a passing character. The makers in the district, generally speaking, are fairly sold forward considering the output of their furnaces and the number of the latter they have in blast, and the fact of this business being in hand to some extent deters the transaction of further business also for forward delivery, except in instances where cheaper prices are offered in order to effect sales. These instances, however, are only those on which holders of large parcels of pig iron are anxious to dispose of them, because, although there are indications of a continuance of steady trade without a prospect of improvement, there is nothing to lead holders of pig iron to believe that better prices will be realised at an early date. Therefore, at the moment, stocks of iron are being reduced, and makers are not increasing their engagements; 42s. is still the quoted price for parcels of mixed Bessemer iron, net at maker's works, prompt delivery; and it is noteworthy that this price has now been maintained something like nine months, without any appreciable variation either in an upward or a downward direction. The steel trade is in a fairly active condition, so far as rails are concerned. There is a good demand for the latter, and buyers are anxious to place large contracts; but the prices at which these are offered are low and unremunerative, and makers are careful not to enter largely into contracts with their present responsibilities until nearer the time when deliveries will be required. In the tin-bar trade a falling off is reported, and in ship and other descriptions of steel the demand is quiet and lifeless. Engineers have secured one or two good marine orders, but outside of this there is no new feature in this trade. Full time is being worked night and day at the Barrow Shipbuilding Company's engineering works. In a few weeks the Pacific steamer Orizaba will be ready for sea. She will probably be placed in the Orient service. Shipbuilders have booked no new orders. Iron ore is in fuller demand, at from 8s. to 9s. per ton net at mines. The coal and coke trades are steady, but quiet. Shipping is busier than it has been.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

THE Board of Trade returns for July are somewhat disappointing, as not maintaining the expectations raised by the figures for the first half of the year; but they disclose more gratifying results in regard to iron and steel than to the general trade of the country. The exports of iron and steel last month were of the value of £1,894,384, against £1,880,691 and £2,286,333 for the corresponding months of 1885 and 1884. For the seven months of the present

year the total value was £12,812,989, against £12,750,200 for the first seven months of 1885, and £14,750,223 for a similar period in 1884. In comparison with last year, the exports of iron and steel show an increase of £3693 for July, and an increase of £62,789 for the seven months.

In hardware and cutlery the value exported last month was £236,537, as compared with £243,779 for July, 1885, and £268,938 for July, 1884. The increasing markets are France, from £9694 to £12,050; foreign West Indies, from £3304 to £5248; Brazil, from £10,188 to £12,249; Argentine Republic, from £7853 to £13,720. The decreasing markets are Russia, from £4572 to £3260; Germany, from £12,544 to £11,020; Holland, from £6775 to £5899; Spain and Canaries, from £6170 to £6042; the United States, from £31,397 to £26,409; British North America, from £9674 to £8219; British Possessions in South Africa, from £5533 to £4627; British East Indies, from £21,306 to £20,768; Australasia, from £55,203 to £48,104; other countries, from £59,586 to £58,922.

Pig iron has increased from £169,622 in July, 1885, to £223,067 last month, the principal increase being to the United States, which took a value of £20,593 in July, 1885, and £93,543 last July. Russia has also increased from £13,537 to £33,724; France, from £9902 to £11,566; and British North America, from £13,719 to £14,337. Germany, on the other hand, has fallen from £30,640 to £22,069; Holland, from £31,620 to £14,284; Belgium, from £6113 to £2008; Italy, from £12,754 to £11,186; and other countries, from £30,734 to £20,350. Bar, angle, and bolt iron has decreased from £131,454 in July, 1885, to £119,187. Italy, Turkey, and the United States show slight increases. All the other markets have decreased.

Steel, unwrought, was exported last month to the value of £99,561, against £81,344 for July last year. France has increased from £7215 to £8416, the United States from £20,689 to £36,181, and other countries from £53,440 to £54,964.

Ninety-eight of the fillers employed at the Denaby Main Colliery were summoned at Rotherham on Monday for absenting themselves from work on the 29th July. According to the statement for the prosecution, the fillers congregated on the top and objected to go down and join the colliers on the afternoon shift. The manager remonstrated with them, and they went to their work; but the following day they went out on strike. Later on the manager again saw them, and ascertained that their grievance was not with the company, but with the colliers by whom they were paid. He told them that if they were disatisfied with the wages which the colliers gave them, their proper course was to give notice, and this they eventually agreed to do. The secretary of the colliery submitted a statement of the loss sustained in consequence of the pit being idle on July 29th. In the estimate he had not taken into account rents or wear and tear, simply the actual amount of wages paid, which was £100 15s. 5d., and stores, £43 19s. 9d., which, with fixed charges, £17 7s. 5d., made up a total of £162 2s. 3d. The wages were paid to datallers for packing and putting the roads in repair, and did not include the loss sustained by the colliers, which was £69 14s. 3d., amounting to over 15s. for each defendant, and the company only claimed 5s. each. In the shaft 150 tons of coal were raised, while under ordinary circumstances the quantity brought to bank ought to have been 830 tons. One test case was taken for the rest, and the Bench, remarking that the men had probably committed through ignorance, stupidity, or obstinacy, imposed a fine of 5s. damages and 5s. costs.

I have good authority for stating that there is nothing in the report so industriously circulated in English and continental newspapers to the effect that a German house, through the personal intervention of Prince Bismarck, had succeeded in persuading the Government of Japan to sign a treaty with it, by which the German house secured a monopoly of the supply of steel rails to the Japanese for the next eight years. It was added that by this operation the German house would make £200,000, in addition to having the satisfaction of cutting out England, which had hitherto had possession of the trade of Japan in rails. The Japanese authorities have no intention of entering into any arrangement of the kind, and as an evidence of it I am enabled to state that within the past few weeks Messrs. Charles Cammell and Co., of the Cyclops Works, have taken an order for 10,000 tons of rails. This order follows an order for another 10,000 tons, making 20,000 tons in all to be sent by this Sheffield firm to Japan. The same firm have also secured an order for rails, including steel sleepers, for China. This is the first order which has been given by the Chinese for the transport of passengers and goods, with the exception of an experimental line laid some years ago by a syndicate of contractors at Woosing. The Chinese at that time had not familiarised themselves with steam, and intended the Woosing line for horse traffic, and when the contractors introduced steam, the Celestials were offended, successfully negotiated for the purchase of the line, and then tore up the rails. The opening of China would be of immense importance to this country, and give the much-needed impetus to the iron and steel trades.

The colonial visitors are to reach Sheffield on the 23rd inst., and be received by the Mayor and Master-Cutler. They will have the opportunity of seeing some of our leading cutlery, silver-plating, steel, and iron establishments. They leave for Scotland in the afternoon of the 24th inst.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

The tone of the Cleveland pig iron trade has been certainly steadier during the past week. At the market held at Middlesbrough on Tuesday there was some inquiry for the Continent, and although the amount of business done was not large, prices were decidedly firmer. For small lots of No. 3 g.m.b. for prompt delivery 29s. 4½d. per ton was paid. The price usually asked by merchants was, however, 29s. 3d., and most of the business done was at that figure. There is no change in the quotations for forge iron, and it is in but moderate demand. The current price is 28s. per ton. Since the July returns were issued, showing an increase in stocks of 17,551 tons, rumours have been rife as to an attempt at restriction, and it is generally believed that something definite will be done shortly.

There are no inquiries for warrants, and the price still remains at 29s. 6d. per ton.

The stock of Cleveland pig iron in Messrs. Connal and Co.'s Middlesbrough store continues to increase at a rapid rate. The quantity held on Monday last was 278,610 tons, being an increase of over 5000 tons for the week.

Shipments have lately been slightly larger than they were last month, but they are still below the average for the time of the year. From the 1st to the 9th of August, inclusive, 18,960 tons of pig iron were sent away, as against 15,878 tons during the corresponding portion of July, and 22,428 tons during that of August, 1885.

There is no change to report in the finished iron trade. The demand does not improve, nothwithstanding the extremely low prices now quoted; and it is a difficult matter for makers to get specifications enough to keep going.

One would have thought that the Durham colliers, who pride themselves on their intelligence and hard-headedness, would have known that the present was not exactly the time for a successful strike, and indeed that no sane man would engage in anything of the kind. Such, however, does not appear to be the case. The whole of the boys—and not only the boys, but the men—the grown-up, experienced, thoughtful men, employed at the Castle Eden Colliery struck work on the 5th inst. They did not strike because their work was intolerable, nor against a threatened reduction of wages; but they actually struck to obtain an advance, and that without giving any notice whatever. Neither was it a few who did this foolish thing, for no less than 1000 hands, all told, broke their contracts. Bad as the times are, and long as they have so continued, it would seem that they must be even worse and continue so even longer, before the Castle Eden collier will learn to conduct his relations with his employers in a decent and sensible way. The general public, who are daily importuned to contribute to the support of the so-called victims of bad trade, ought surely to raise their voices in no uncertain way against such unpardonable folly as this.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

The pig iron warrant market has been comparatively steady this week, and this has been due mainly to the action of the miners, which has at length become somewhat effectual in restricting the output of coals. The past week's shipments of pigs were 9212 as compared with 7510 in the preceding week, and 7051 tons in the corresponding week of 1885. As the shipments are limited, and there being no reduction in the amount of the output of pigs, the deliveries into store are again rather larger, the addition to the stock in Messrs. Connal and Co.'s stores being upwards of 4000 tons for the week. This is exclusive of what may be added to the private stock of makers. Connal's stock now exceeds 800,000 tons, by far the largest on record, and close on 200,000 tons more than at this date last year.

Business was done in the warrant market at 39s. cash. Monday's market was steady at a little more money. On Tuesday forenoon, on a report of possible rail orders from China, transactions took place at 39s. 0½d. to 39s. 1½d. cash, the afternoon prices being 39s. 2d. to 39s. 1d. cash. On Wednesday the quotations were 39s. 0½d. to 39s. 3d. and 39s. 1½d. cash. To-day—Thursday—there are reports that there is to be a restriction in Cleveland. The cash price of pigs advanced to 39s. 7d.

The values of makers' iron do not exhibit much alteration. Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 43s.; No. 3, 40s. 6d.; Coltness, 46s. and 42s. 6d.; Langloan, 43s. and 41s.; Summerlee, 45s. and 41s.; Calder, 45s. and 40s. 6d.; Carnbroe, 40s. 6d. and 39s.; Clyde, 42s. 6d. and 39s. 6d.; Monkland, 40s. and 36s.; Govan, at Broomielaw, 40s. and 36s.; Shotts, at Leith, 43s. 6d. and 43s.; Carron, at Grangemouth, 46s. 6d. and 43s. 6d.; Glengarnock, at Ardrossan, 41s. 6d. and 39s. 6d.; Eglinton, 39s. 6d. and 36s.; Dalmellington, 40s. and 37s. 6d.

The week's arrivals of Cleveland pigs have been 5730 tons, against 6510 in the same week of last year.

The malleable iron trade is reported very quiet, most of the works being short of orders, and all working at very low rates.

During the last three weeks the iron and steel manufactured goods shipped from Glasgow, exclusive of pig iron, embraced locomotive engines and tenders to the value of £50,000, nearly all for India; machinery, worth £20,710; a steam barge shipped to Rangoon, £2500; sewing machines, £4800; steel goods, £31,620; and general iron manufactures, £48,640.

The action of the miners in restricting the output of coals, together with the holidays in the mining districts, is telling materially on the amount of the coal shipments, which have been comparatively small in the past week. From Glasgow 18,231 tons were despatched; Greenock, 1740; Ayr, 10,603; Irvine, 1602; Troon, 4617; Leith, 7280; Grangemouth, 14,761; and Bo'ness, 5999 tons. The scarcity of coals to meet the more pressing wants has enabled some coalmasters to obtain slightly higher rates, but this advantage is generally believed to be more than counterbalanced by the smaller quantities disposed of, and the extra cost of production at the collieries, the latter being a natural consequence of the restricted output. This state of matters does not exist in the Fife coal trade, where the colliers have been working full time. As the wages of the Fife miners were reduced in March last, the masters have not on this occasion taken action with those in the rest of the mining districts, so that both employers and workmen are presently reaping some advantage from the circumstances in which they find themselves placed. The stocks at the collieries are said to have accumulated to the extent of about 200,000 tons, and there is now a chance of these being reduced.

The movement against the reduction of wages, and in some places in favour of a positive advance, has now spread nearly throughout the whole of the district with the exception of Fife. The colliers are holding frequent idle days, working short hours and adopting all possible means to influence their employers on the wages question, but hitherto without any appreciable effect.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

I should be sorry to arouse expectations unless tolerably good ground for the same existed, but it does appear as if we had reached the lowest depths of coal depression, and that the step that will follow will be an ascending one. The times endured, in Cardiff particularly, have been of the severest kind; coalowners and shippers have had an ordeal of the most trying description. Steamers laid up, collieries entailing a certain loss daily, men working a turn or two weekly, exports down to nearly one-half, such has been the state of things; and it will be well if it is coming to an end, as I venture to suggest.

Last week trade was better at the leading ports; Newport, Cardiff, and Swansea, and Cardiff in particular, came near to its old averages. Whether a prosperous condition will be regained is a problem. I am afraid not. Prices are weak—coal can be had almost at the starting price of the article half a century ago, namely, 5s. Excellent coal is being sold at 6s., which means 8s. at Cardiff; but some of the leading owners refuse to sell their best 4ft. at this price, and they are to be commended for not giving it away.

House coal is more active, prices a little firmer. The coke trade shows signs of improvement. The advance of science in connection with this industry is marked, and the prospects of a future are assured, especially if the steel trade continues to progress.

What with Indian rails, of which a large quantity went to Madras on Saturday, steel bars, bar iron, and steel sleepers, there is a fair amount of business being done at the principal works. I note that in the manufacture of sleepers most of the works are engaged; some, however, are simply for collieries in connection with their own works. To construct the elaborate machinery for railway sleepers few works would incur the outlay, for a good deal of time and money is necessitated. The fact that certain works, in addition to those now working sleepers, are incurring this, points to fair prospects ahead. It is currently rumoured in the district that several of the large railways are making arrangements for quantities. This branch is the only thing that will improve trade. Capacity of make is now so great that a large order for rails is turned out in a week or two.

The pipes for the Cardiff Waterworks come to hand in large numbers. They are turned out by a Scotch firm, and appear excellent. The order was a substantial one, as the length is thirty miles.

Patent fuel is slack both at Cardiff and Swansea; iron ore at Newport and Cardiff is dull. At the latter place, a foreigner dealing in iron ore committed suicide on Saturday. The trade is very depressed, only a shade above 9s. per ton for best Spanish. Welsh ironmasters are fairly stocked, as may be understood from the fact that at Cyfarthfa Works large mounds can be seen with a good thick vegetation growing thereon.

A reduction of the capital on the Swansea and Mumbles Railway has been made to the extent of £5000. Many visitors to Swansea are surprised at the want of speculation on the part of railway authorities in not having a distinct connection with the Mumbles. What the Taff Vale has done for Penrith surely could be done by, say, the London and North-Western for Mumbles.

There is a little lull in the tin-plate trade, and disturbing rumours have been in circulation around Swansea that strenuous efforts are to be made in the United States to compete in the manufacture, and as the cargoes despatched were very slight last week it was feared by some imaginative people that the competition had begun. I do not think that there is much fear at present quotations. Labour here is too low to fear rivalry of any account.

A leading ironmaster from Middlesbrough was in the district some time ago, and, inquiring about the wages, exclaimed: "I would rather enlist for a soldier." Still, it is only by these wages and the greatest economy that Wales holds its own.

Shipments of tin-plate from Swansea during July were double those of July, 1885. Coke and Bessemer steels maintain their quotations at 13s. 6d., but business is being done by certain makers for 13s. 4½d.; some at 13s. 3d.

Stocks this week are a little heavier owing to a small export. Masters are selling freely from 12s. 3d. to 12s. 6d.

NOTES FROM GERMANY.

(*From our own Correspondent.*)

In Silesia the tone of the market becomes weaker and weaker, and as a last resort the State Railways are negotiating with the Russian to lower their freights on iron going there against an equivalent reduction on petroleum and cereals coming into this country. Many foundries are full of work. Still this does not favourably affect the prices of pig iron, because there are large stocks on hand, and the puddling works only require limited quantities. Foundry pig costs 50 to 51 up to 53 marks for the best sorts. The rolling mills have work to go on running slowly till October, but the prices leave no profit. These are 92·50 to 95 for merchant bars; fancy sections, 105 to 115; sheets, 135 to 140; boiler plates, 150 to 155 marks p.t. at works. The Rhenish-Westphalian iron market has become worse than it was when last reported, in spite of the restriction of output, and it has become apparent that excessive competition lowers prices even more than a superabundant production. Out of 460 iron mines in the Lenne district—Westph.—453 are standing idle and only seven at work. A similar state of things, though not quite so bad, is reported from the Siegenland and Nassau. The Spanish ores are now so cheap and freights lower than they were, so that they can be delivered on the Rhine, at Bochum and Dortmund, as cheap as those from Nassau or Siegen. The prices are 7·20 up to 10·50 marks p.t. for raw and roasted ores on trucks at R. W. St. Pig iron is still in excess of demand, but stocks have not much increased lately. There is really no great demand for either forge, foundry, Bessemer, or basic pigs at the moment, and prices are in consequence very weak, nominally 45 to 46·50 for spiegel down to 29·60 marks for Luxemburg forge p.t. on trucks at work. Although there is a current sale for rolled iron, yet the prices are ever declining. Bars cost 93 to 98, less 1 to 2 m., for weighty orders. Angles, 100 to 105; girders, 93 to 98; hoops, 102 to 105. In Bessemer metal the price varies from 105 to 115, according to brand. Best boiler plates, 139 to 142, occasionally 144; common heavy plates, 130 to 132; thin sheets, 123 to 125, in Bessemer m. higher according to quality. Iron wire rods 102 to 106; in steel, 105 to 110, with little export trade doing. Wire nails, 115 and higher; steel rails, 120 to 125; sleepers, 122 to 130 marks, p.t. at works; wheels and axles complete, 315 to 320; steel tires, 220 to 225 m. per set; mine rails, M. 90 to 95 p.t. The machine and wagon works and foundries, with few exceptions, are all in want of orders, and prices miserable. Seventy-three passenger coaches are to be tendered for at Bromberg shortly, and doubtless a hot struggle to obtain the order will ensue. The brass foundries have been well employed last month, and prices have remained nearly the same as last reported.

Raw fine costs at Breslau, 270; refined, 280 marks p.t., and the market is firm.

The coal market is very dull. Contracts can be made at this moment at very low prices, whilst other coalmasters prefer to let the pits lie idle one or two days a week rather than sell at the prices. Cokes are dull of sale. The prices quoted on 'Change are:—Gas coal, 6·50 to 7·80; good slack, 5·50 to 6·20; lumps, 8 to 10·50; nuts, 9·50 to 11; fine slack, 2·10 to 3; cokes, patent, 8·50 to 9·50; ordinary sorts, 6·60 to 8·40; smalls, 6·50 to 7·50, all p.t. on trucks at mines.

The iron market in Belgium is firm, but prices are unsatisfactory. The machine factories, nevertheless, complain of not being able to compete with foreign houses at the present prices, though there is no pig iron combination there at the moment to keep prices up. The French market is very firm for rolled iron, and it is looked upon as an achievement having got girders and bar iron up to the same price, which masters expect will rise this summer up to 150f. p.t.

It is stated here that on closing the accounts of the late international rail combination, the English party had to pay the Germans M. 500,000. But beyond this there are M. 300,000 which should come to them on 60,000 tons which they did not deliver as their share, according to agreement, as they ought to have done, the indemnification being 10s. per ton. It is further stated that, as after the denunciation of the convention the price of rails went down at once from M. 95 to 68 or 70, the English party must have profited M. 900,000 on the 60,000 tons. To make up the M. 800,000 there remain M. 200,000, which are accounted for by German sales made below the stipulated price.

Krupp carried off the late order for 1410 tons of steel tramway rails at Middelburg against other German and Belgian houses at the price of 48fl. 83c. delivered at Breskens, which would be equal to M. 78 p.t. at Essen. The Dutch conditions are severe, which accounts for the comparatively high price.

The visit of Marquis Tseng to this country is stated to be in connection with orders for war vessels from the Vulcan Company at Stettin for the Chinese Government.

It appears that not only the Cockerill Company, but Krupp as well is contemplating the establishment of steel works in the South of Russia. This is not greeted in a friendly spirit by the Russian press, which fears that the native works now existing there may be crushed out by the superior forces brought to bear upon them, as both companies have large capitals and enjoy the special favour of the Government Departments. The Italian Minister Gemala, with other officials, has just inspected the new steel rail mills of the ironworks at Terni, which, it is said, will be able to make nearly all the rails which the Government will require yearly.

There has been a slight explosion in a coal mine in Westphalia, whereby seven men were killed and two wounded, but the working of the mine has not been stopped.

The following announcement has just been published:—"To prove what advance the German marine industry has made, the twin-screw aviso Greif, 5400-horse power, which was recently launched, will have a speed of nineteen knots an hour, and will be the fastest vessel in the world" (*sic*). The tonnage is not stated, and she will not be the fastest vessel in the world.

Naval Engineer Appointments.—The following appointments have been made at the Admiralty:—David J. Gyles, chief engineer, to the Pylades; and Samuel E. Lark, to the Royal Adelaide.

Steam Diggers.—We are informed that Mr. F. Proctor has made arrangements with Messrs. Burrell and Co., of Thetford, for the manufacture of his light steam digger, which has given very considerable satisfaction where used abroad.

The "Northern of Europe Railway."—The article on the Northern of Europe Railway which we published in our last impression should have given the name of the railway as the "Swedish and Norwegian Railway." We are informed that a considerable length of the line has been completed, that the constructing staff has been at work uninterruptedly through the past two years, that orders for about 10,000 tons of rails have been placed in England for the line, several thousand tons of which have been delivered, and that some difficulties referred to in our article are not met with. We shall probably refer to the line and to these matters in a future impression.

AMERICAN NOTES.

(From our own Correspondent.)

New York, July 31st.

The general merchandise movements from the metropolis have increased largely during the past week. Reports from various railroad companies show an increase in the volume of traffic, and some improvement in earnings. The Trunk lines have thus far maintained harmony in the East, and in the West the possibility of a rupture has been avoided by the establishment of rates satisfactory to all parties concerned. A great deal of railroad stock of one kind or another is being bought. Pennsylvania seems to be leading. Reading affairs are still unsettled. The Baltimore and Ohio extensions are being pushed, both on the Atlantic coast and in the interior. The Norfolk and Western interests are pushing the construction of short lines through the Virginias and other sections. Railroad matters generally are in a very encouraging condition, and investments are increasing. There is, however, more capital offering than can be absorbed promptly. A large amount is going into industrial enterprises.

The iron mills throughout the country have nearly all resumed work with a fair volume of business on hand. The rail mills have contracts for 600,000 tons either on hand or assured. The bridge iron makers have contracts for 50,000 tons of material in sight. The pipe iron makers have contracts which will aggregate a large amount, and take three months for their completion. There are over 100,000 acres of natural gas territory leased and under development, and from four to five hundred miles of piping have been contracted for, and will be laid during the present autumn and winter. The iron trade generally is in excellent condition; while prices are firm there is no tendency to a boom. The producing capacity has been so largely increased as to make us entirely safe against a recurrence of such a disaster. The production of pig iron is at the rate of 125,000 tons per week; steel rail production, 30,000 tons. Merchant steel of all kinds is taking the place of iron, and prices are firm. Nails have advanced to 2·10 dols. in car load lots, and all the factories are sold out.

Advices from the Far West show improving industrial activity. A vast amount of lumber is being contracted for against the possibility of a further advance. Quotations for Bessemer pig iron are from 19 dols. to 20 dols.; Scotch pig, 18 dols. to 20 dols.; blooms, 30 dols. to 32 dols.; steel rails, 34·50 dols. to 36 dols.; bridge iron, 2 dols. to 3 dols. The coal trade is active, and buyers from the North-east are in the market for liberal supplies.

NEW COMPANIES.

The following companies have just been registered:—

Dennis Patent Continuous Wire Netting Company, Limited.

This company proposes to purchase various patents belonging to Messrs. W. F. Dennis and Arthur Dennis, of 101, Leadenhall-street, for improvements in the manufacture of wire netting, and the benefit of various pending applications for further patents for the same invention. It was registered on the 30th ult. with a capital of £50,000, in £10 shares. The subscribers are:—

	Shares.
C. P. Ogilvie, Leiston, Suffolk	100
G. R. le Doux, 4, Cullum-street, merchant	10
E. Bower, Ashley-road, Crouch-hill, N., merchant	10
A. Homann, 4, Cullum-street, merchant	
A. S. Williams, 31, Lombard-street, steamship manager	25
J. H. Clements, 49, Muschamp-road, East Dulwich, clerk	1
F. J. Rotheroe, Tiernay-road, Streatham-hill, draughtsman	1

The number of directors is not to be less than three nor more than seven; qualification, ten shares. The remuneration of the board will be £50 for the first year and subsequently £150 per annum, with £50 additional when £7 per cent. dividend is paid, and a further £50 for each £5 per cent. dividend up to £32 per cent., but £450 per annum is to be the maximum of such remuneration.

Cyprus Copper Company, Limited.

This company was registered on the 31st ult. with a capital of £15,000, in £50 shares, to carry out an agreement of the 28th ult. (unregistered) between Messrs. Knowles and Foster and John Rowland, for the purchase of mines of copper and other minerals, situate in the Island of Cyprus. The subscribers are:—

	Shares.
R. Foster, 48, Moorgate-street, merchant	1
W. Knowles, 48, Moorgate-street, merchant	1
J. F. Knowles, 48, Moorgate-street, merchant	1
J. Rowland, 13, Camden-road, Lewisham	1
W. L. Chutham, 22, Kelmore-grove, East Dulwich	1
R. Webster, Derby-road, Woodford	1
W. Green, 25, Aberdeen Park-road, N.	1

The subscribers are to appoint the first directors. Most of the regulations of Table A of the Companies' Act, 1862, apply to the company.

Butterworth Brothers, Limited.

This is the conversion to a company of the business of glass manufacturers carried on by the firm of Butterworth Brothers at Newton Heath, Manchester, and elsewhere. It was registered on the 4th inst. with a capital of £7000, in £10 shares, with the following as first subscribers:—

	Shares.
*F. Butterworth, Blackley, near Manchester, joiner	1
*William Butterworth, Crumpsall, Manchester, manufacturer	1
*J. Whittaker, Newton Heath, Manchester, manager	1
Mrs. Alice Butterworth, Castleton, Manchester	1
T. Butterworth, Newton Heath, Manchester, glass manufacturer	1
*Walter Butterworth, Moss-side, Manchester, clerk	1
H. S. Slatter, Crumpsall, Manchester, assistant master	1

The number of directors is not to be less than three nor more than seven; the first are the subscribers denoted by an asterisk; qualification, 10 shares; the company in general meeting will determine the remuneration of those directors who are not otherwise paid out of the funds of the company. Mr. Wm. Butterworth is appointed managing director.

John Brotherton, Limited.

This company was registered on the 29th ult. with a capital of £100,000, in £10 shares, to carry on business as manufacturers of, and dealers in, iron, steel, and other tubes and fittings, and also to carry on the business of mechanical engineers, iron and other founders, and metal workers. The subscribers are:—

	Shares.
Alfred Conder, Crown-court, Old Broad-street, accountant	1
J. Y. Clark, 46, Devonshire-road, Hackney, clerk	1
R. White, C.E., 43, Belsize-square, N.W.	1
J. W. Lord, 4, Fairfield-road, Bow, engineer	1
H. Woods, Ashford	1
G. Marnti, 10, Curzon-street, Mayfair	1
J. Barker, Devonshire Villa, Grove Park	1

The number of directors is not to be less than three nor more than seven; qualification, fifty shares. The subscribers are to nominate the first; remuneration, £500 per annum and 5 per cent. upon the amount of dividend paid. Mr. John Brotherton is appointed managing director for five years at a salary of £500 a year, and will also be entitled to a commission of 5 per cent. on the annual net profits divided amongst the shareholders.

Automatic Railways Company, Limited.

This company proposes to make roller coasters, or roller coaster apparatus, upon the principle of the letters patent, No. 4454 of 1884, and No. 10,453 of 1884, the former being granted for improvements in railways, and the latter for improvements in gravity railways. It was registered on the 30th ult. with a capital of £50,000, in £1 shares. The subscribers are:—

	Shares.
W. Lemmis, 45, Doddington-grove, Kennington, accountant	1
F. Wilks, Mildmay Park, N., African merchant	1
W. R. Little, 66, Kyverdale-road, Stamford-hill, clerk	1
T. W. Cook, 2, Bedford-place, New North-street, W., clerk	1
R. Trench, 5, Walbrook, chemist	1
J. Harmer, 89, Sewardstone-road, Victoria Park, book-keeper	1
G. W. Dancy, 110, Cannon-street, journalist	1

The number of directors is not to be less than two nor more than five; qualification, 250 shares; the first are Colonel Francis Cornwallis Maude, V.C., C.B., J. Stewart Craig, Edwin Day, M.A., F. P. Matthews, and C. C. Sykes. The remuneration of the ordinary directors will be £50 per annum each, and 10 per cent. of the net profits after payment of 20 per cent. per annum dividend.

Moldacot (Colonial and Foreign) Pocket Sewing Machine Company, Limited.

This company proposes to enter into an agreement with John Charles Cottam and Albert Douglas Moll for the purchase of the colonial and foreign patent rights granted in respect of the Moldacot Pocket Sewing Machine. It was registered on the 4th inst. with a capital of £100,000, in £1 shares. The subscribers are:—

	Shares.
*Hon. Howard Spensley, 12, Earl's-court-square, barrister	1
*Saul Isaac, J.P., 9, Hyde Park-mansions	1
*J. G. Bellamy, 12, Addison-road, W., merchant	1
A. B. Isaac, 8, Garlinge-road, West Hampstead, secretary to a company	1
*W. S. Lockhart, C.E., Fenchurch-street	1
J. C. Berry, 31, Stansfield-road, Stockwell, clerk	1
F. Clark, 12, Warner-road, Camberwell, clerk	1

The number of directors is not to be less than two nor more than seven; qualification, 100 shares; the first are the subscribers denoted by an asterisk; remuneration, £150 per annum each, with an additional £100 per annum for the chairman, and in any year in which 20 per cent. dividend is paid a further sum equal to 5 per cent. upon the net profits.

Backes and Strauss, Limited.

This is the conversion to a company of the business of wholesale and manufacturing goldsmiths, silversmiths, and jewellers, carried on by Messrs. Backes and Strauss, and also the business for the sale of rings and other jewellery carried on by Siegfried Strauss, under his own name, in London, Paris, and at Hanau, in Germany. It was registered on the 29th ult. with a capital of £100,000, in £5 shares. The subscribers are:—

	Shares.
*Robert Milburn, of Cintra, Beckenham, engineer	1
*W. P. Morgan, 1, Queen Victoria-street, merchant	1
*M. Strauss, 64, Holborn Viaduct, jeweller	1
*S. Strauss, 64, Holborn Viaduct, jeweller	1
W. B. Styer, 2, Threadneedle-street, solicitor	1
J. H. Davidson, 40 and 42, Queen Victoria-street, solicitor	1
J. H. Charles, 22, Stonefield-street, Lonsdale-square, Islington, clerk	1

The number of directors is not to be less than three nor more than seven; the first are the subscribers denoted by an asterisk, and Mr. W. Neale, of Warstone-lane, Birmingham; qualification, £250 in shares or stock; remuneration, £750 per annum.

Anglo-Montana Mining Company, Limited.

This company proposes to acquire upon terms of an agreement of the 19th ult. between Elisha Waller, Edward Pleasance, and William Thomas Huxley, certain mines in Montana, U.S.A. It was registered on the 31st ult. with a capital of £120,000, in £1 shares. The subscribers are:—

	Shares.
G. V. Stewart, 34, Leadenhall-street, merchant	1
W. T. Huxley, 47, Stockwell Park-road, North Brixton	1
E. Schuberth, 139, Cannon-street, auditor and accountant	1
W. Drank, 6, Denman-street, W.	1
G. Stewart, The Spring, Coventry	1
W. G. White, 118, Queen's-road, Peckham, merchant	1
T. W. Eyton, J.P., Mold, North Wales, mine-owner	1

The number of directors is not to be less than three nor more than seven; qualification, £200 in shares; the subscribers are to appoint the first and act *ad interim*; remuneration, £150 per annum each until 10 per cent. dividend is paid, and £200 per annum each when 20 per cent. is paid, and also 5 per cent. of the realised or divisable profits above what will pay 10 per cent. upon the paid-up amount of all shares.

Gillman and Spencer, Limited.

This company was registered on the 4th inst. with a capital of £150,000, in £5 shares, for the manufacture of gelatinised malt and other patent manufactured malts from various cereals, also torrified barley and maize, germless maize, isinglass, and every description of finings, and generally to manufacture every kind of material or liquid appertaining to brewing; also to manufacture, purchase, or hire machines for ærating or bottling beer, &c., and such other machinery as may be useful in the brewing trade. The subscribers are:—

	Shares.
*A. W. Gillman, Castle Brewery, St. George's-road, S.E., brewer and analytical chemist	1
*S. Spencer, Castle Brewery, St. George's-road, S.E., brewer and analytical chemist	1
*E. S. Spencer, Castle Brewery, St. George's-road, S.E., brewer and analytical chemist	1
H. Pearson, The Manor House, Penge	1
C. Napier Wallace, Isleworth, secretary	1
J. C. Barnard, 47, Lincoln's-inn-fields, solicitor	1
A. M. Gillman, 3, Southampton-street, High Holborn, solicitor	1

The number of directors is not to be less than three nor more than seven; qualification, £500, in shares or stock; the first three subscribers are appointed directors. Mr. E. S. Spencer is appointed manager at a salary of £300 per annum, with £100 per annum additional for each £1 per cent. dividend in excess of £5 per cent. Messrs. A. W. Gillman and S. Spencer are appointed managing directors for five years, and their remuneration will be payable out of the surplus profits at the rates following, viz.:—£1½ per cent. if a dividend of £9 per cent., £2 per cent. if a dividend of £10 per cent., £3 per cent. if a dividend of £12 per cent., £4 per cent. if a dividend of £15 per cent., and £5 per cent. if a dividend of £20 per cent. or more. The company will purchase the business of manufacturers and analytical chemists, patent maltsters, and manufacturers of patent finings, carried on by Messrs. A. W. Gillman and Samuel Spencer at the Castle Brewery, St. George's-road, and at Gordon's Wharf, Rotherhithe. The purchase consideration is £40,000 in fully-paid shares and £40,000 in cash. The stock-in-trade of the vendors will be purchased by the company at the cost price thereof.

Sanitary Institute of Great Britain.—The ninth autumn congress will be held at York from September 21st to September 25th, 1886. The Council invite papers on subjects relating to health and sanitary science. The acceptance of papers, and the days on which they are to be read, are determined by the Council before the beginning of the meeting. The Council reserve the right of refusing any papers sent in; and in the case of those accepted, the reading of them must depend upon the time at the disposal of the meeting. No previously published paper can be read. Papers read at the congress cannot be published by the authors unless by permission of the Council. The Council reserve to themselves the privilege of printing any paper read at the congress, either wholly or in part, or of refraining from the publication thereof, if they see fit. Papers are limited to twenty minutes in reading. A short abstract should accompany every paper, both for the convenience of the press at the congress and for insertion, subject to the approval of the Council, in the volume of "Transactions" should it not be deemed desirable to publish the paper *in extenso*. The addresses and papers, or abstracts thereof, are usually printed by the Institute in London before the meeting of the congress, and may be purchased from the secretary of the Institute during the congress. Authors should forward the original manuscript by book post on or before August 26th, addressed to the Secretary, Sanitary Institute of Great Britain, 74A, Margaret-street, W. Authors whose papers have been received and accepted will be furnished with printed copies before the commencement of the congress.

Liverpool Engineering Society.—On the 30th ult. the members of the above society visited the Forth and Tay Bridge, on the kind invitation of the engineers and contractors of the respective undertakings. On arrival at Queen's Ferry South, the party was met by Mr. Cooper, the resident engineer of the Forth Bridge, who drew attention to the novel features of the special appliances for constructing this gigantic bridge. Having examined the various details connected with the south shore end of the work, the party embarked in the steam launch kindly placed at their disposal for the occasion, and proceeded to the north shore. Here the "skew backs" which are now in position were examined with much interest. The mode of erecting the vertical members of the piers, and the skilful arrangement for raising temporary staging by hydraulic pressure, was explained by Mr. Cooper. The party were much struck with the progress made in all parts of the work since their visit last year, the whole of the foundation being now completed. The precautions taken against accident were also noted with satisfaction. Riveters and others engaged on the elevated part of the work exposed to heavy winds, &c., being protected by a wire caging which also prevents tools and materials falling on the men below. The facility with which the rivetting *in situ* is effected by means of the specially designed apparatus was thoroughly appreciated. A visit was paid to the Exhibition by the party on their return to Edinburgh, with which they were much pleased. Proceeding to Dundee the party made an inspection of the Tay Bridge, on Monday, under the guidance of Mr. Seabright, one of the assistant engineers. Here again a steam launch conveyed members to the various points of interest. One of the large bowstring girders in course of construction was seen, and the method of floating it into position in mid stream was explained. The opportunity afforded of comparing the design and execution of the old and new bridges was by no means the least instructive feature of the excursion. The party broke up at Dundee, well satisfied with what they had seen, and greatly pleased with the courtesy shown to them.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

Applications for Letters Patent.

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

3rd August, 1886.

9904. Hair-pin, W. Hewett, London.
9905. Planing Machines, W. Chattaway, Darlaston.
9906. Cloth for Cleaning, &c., Metals and Glass, C. E. Davies, Walton.
9907. Fastening the Hoops of Butter, &c., Casks, W McDonnell, Corbally.
9908. Machines for Breaking, &c., Fibres, T. Adair and J. O. Wallace, Belfast.
9909. Razor, J. Poyser, Mansfield.
9910. Construction of Tank Covers, W. Swindlehurst, Lancaster.
9911. Belts and Ropes for Machinery, W. W. Oldfield and G. H. Smith, Glasgow.
9912. Pumps for Drawing Beer, &c., J. Morley, Birmingham.
9913. Taking-up Motion of the Self-acting Mule, R. Wood, Ashton-under-Lyne.
9914. Bottle Stoppers, A. C. Farrington, Shelfanger,
9915. Hollow Cones of Winding Frames, T. Wilkinson and J. Horsfall, London.
9916. Apparatus for Ruling Parallel Lines, C. Wiggins, Birmingham.
9917. Kettle Spouts, E. Fisher and H. W. Ludlow, Birmingham.
9918. Sleeve Protectors, C. Wiggins, Birmingham.
9919. Treatment of Ores containing Sulphide of Antimony, E. W. Parnell and J. Simpson, Liverpool.
9920. Machine for Opening Bottles, &c , S. Skerritt, Sheffield.
9921. Mattress Frames, I. Chorlton and G. L. Scott, Manchester.
9922. Ventilating Window Blinds, W. Harte, London derry.
9923. Small Commode intended for Travelling, A. M. Alston, Streatham.
9924. Retorts for Distilling Shale, &c., J. Jones, Glasgow.
9925. Imitation Tallipot Palm Leaf, G. Hudson, London.
9926. Hydraulic Lead Presses, H. J. Allison.—(*J. Robertson and J. Hardie, United States.*)
9927. Scissors, E. M. Corbett, London.
9928. Buttons, F. A. Fox, London.
9929. Centre Seconds Watch, A. Welter, London.
9930. Cradle-like Crushing Machine, W. Schranz, Berlin.
9931. Damping Gummed Labels, W. Leggot, Bradford.
9932. Jacquard Card Repeating Machines, T. Nuttall, Ramsbottom.
9933. Sections of Iron or Steel, J. H. Bell and W. Rockliffe, Monkwearmouth.
9934. Automatic Cord Stop for Venetian, &c., Blinds, R. Whitehead, Heeley.
9935. Fire-grates, &c., J. H. Annandale, Glasgow.
9936. Sketching Protractor, H. L. Mackenzie, Glasgow.
9937. Draughtsman, C. W. Clark, Birmingham.
9938. Manufacture of Chessmen, C. W. Clark, Birmingham.
9939. Manufacture of Pipes, &c., R. Mannesmann, and M. Mannesmann, London.
9940. Suspenders, H. C. Whitmarsh, London.
9941. Working Furnaces by Compressed Air, C. Otto, London.
9942. Artificial Fuel and Fire-lighters, A. Gutensohn, London.
9943. Spinning, &c., Filamentous Materials, J. C. Mewburn.—(*A. Delannoy, France.*)
9944. Cleansing Bottles, G. Burges, sen., and G. Burges, jun., London.
9945. Self-locking Shackle, A. Martin, London.
9946. Handles for Knives and Forks, J. Ockermüller, London.
9947. Safety Hooks, H. Cherry and G. Tangye, London.
9948. Coupling for Pipes, F. Henry and L. Lecellier, London.
9949. Internally-heated Sad Irons, C. Gardener, London.
9950. Hat Leather or Sweat Band, G. F. Redfern.—(*J. Burthoul, Belgium.*)
9951. Spirally-formed Metal Pipes, J. B. Root, London.
9952. Spirally-formed Welded Pipe, J. B. Root, London.
9953. Recording Apparatus for Making Notes, &c., A. B. Ibbotson.—(*K. Walter, Italy.*)
9954. Welding Metal Plates, J. B. Root, London.
9955. Compound Locomotive Engines, R. C. Parsons, London.
9956. Pocket Sewing Machines, J. C. Cottam and A. D. Moll, London.
9957. Jury Rudder and Drogue, S. P. Wilding.—(*H. Schoening, Belgium.*)
9958. Circulating Malt when producing Malt Liquors, F. Faulkner and W. Adlam, London.
9959. Electrical Firing Keys or Contact Makers, C. A. McEvoy, London.
9960. Railway Buffers, D. N. Arnold, London.
9961. Rotary Engines, H. Knebel, London.
9962. Velocipedes, L. Krause, London.
9963. Fabric, H. Wickel, London.
9964. Stitching Sheets of Paper for Binding Books, J. Y. Johnson.—(*W. von Pittler, Germany.*)
9965. Rotary Pump, S. Mellor, London.
9966. Steam Boiler, J. Richardson, London.
9967. Chairs, &c., O. Dietrich, London.
9968. Packing for Bottles, H. H. Lake.—(*R. H. Thompson and H. D. Norris, United States.*)
9969. Preserving the Soles and Heels of Boots, W. G. Jones, London.

4th August, 1886.

9970. Holding Adjustable Stems of Music Stools, &c., S. Marsden, Hunslet.
9971. Removing the Seed of Flax, &c., T. Adair and J. O. Wallace, Belfast.
9972. Ruled Slates and Blackboards for Drawing, H. Marle, Birmingham.
9973. Forming Bath with Flushing Rim, C. F. Moxon, Westgate-on-Sea.
9974. Steam Boiler Furnaces, J. Proctor, Manchester.
9975. Fire-extinguishing Apparatus, R. Hargraves, Bolton.
9976. Sustaining Sliding Doors and Windows, J. H. Goodwin, Sheffield.
9977. Oil Cans, J. McHardy, Dollar, N.B.
9978. Spinning Tops, J. Stead, Manchester.
9979. Stirrup, J. A. de Macedo, Thorner.
9980. Bench Machines for Loading, &c., Cartridge Cases, J. Fletcher, jun., Upperthorpe.
9981. Preparing Clay for Brick-making, J. Davies, Manchester.
9982. Rack Pulleys, T. Hughes, Lozells.
9983. Means of Giving Greater Power by Piston-rods, J. A. Walker, London.—22*nd April*, 1886.
9984. Springs for Locomotives, R. Woodward and A. E. Wells, Sheffield.
9985. Mules and Twiners, J. Moorhouse and J. Ashton, London.
9986. Clock Synchronising Apparatus, A. Ramel and W. W. Dean, London.
9987. Pile Driving Machines, T. Whitaker, Liverpool
9988. Brakes for Vehicles for Common Roads, E. Power, London.
9989. Supplying Fresh Water to Marine Boilers, J. Gilmour, Glasgow.
9990. Ventilating Ships, J. Gilmour, Glasgow.
9991. Electric Batteries, H. Aron, Glasgow.
9992. Ulilisation of Lime, A. G. Wass, London.

9993. Screw Tapping W. A. Pearn, London.
9994. Using Steam for the Production of Motive Power, M. P. W. Boulton, Tew Park.
9995. Velocipedes, &c., J. F. Haskins.—(*G. D. Davies, United States.*)
9996. Fastening with Metal Clamps, O. Pekrun and E. Heynen, London.
9997. Cooking Ranges, H. J. Macklin, London.
9998. Motive Power, J. Thompson, London.
9999. Storing, &c, Compressed Air, T. Archer and J. Fairley, London.
10,000. Sulphites, A. W. Gillman and S. Spencer, London.
10,001. Governing the Speed of Marine Steam Engines, F. H. Eijdman, London.
10,002. Dyeing Hair or Restoring its Colour, Henri de la Place, London.
10,003. Pump, G. Castanon, R. Menendez, and S. Gil, London.
10,004. Indicating Apparatus, F. W. Reeves and A. Slatter, London.
10,005. Breech-loading Fire-arms, J. G. Howard, London.
10,006. Electro-motors, A. Schanschieff, London.
10,007. Stiffeners for Boots and Shoes, S. H. Hodges, London.
10,008. Obtaining Solutions of Iron, J. S. Kipping and F. Scudder, Manchester.
10,009. Chlorine Gas, H. H. Lake.—(*Count R. de Montgelas, United States.*)
10,010. Composition for Cleaning Metals, J. V. Toll, London.
10,011. Chloride of Aluminium, H. H. Lake.—(*Count R. de Montgelas, United States.*)
10,012. Ornamental Woodwork, H. H. Lake.—(*F. Mankey, United States.*)
10,013. Chloride of Aluminium, H. H. Lake.—(*Count R. de Montgelas, United States.*)

5th August, 1886.

10,014. Devices for Refrigerating, P. W. Peckham, Leicester.
10,015. Stuffing-boxes for Engines, E. R. Vaughan, Belfast.
10,016. Syruping Beverages, J. McEwen, London.
10,017. Cuff Adjuster, T. W. Taylor and J. S. Whitten, Birmingham.
10,018. Mattresses, F. R. Müller.—(*F. Maussner, Germany.*)
10,019. Folding Cabinet Beds, G. Neilson, Glasgow.
10,020. Mounting the Rollers and Gearing of Wringing and Mangling Machines, H. L. Wilson and J. Clegg, Halifax.
10,021. Drill Hoeing and Cultivating Land, W. A. Murray, London.
10,022. Distilling, &c., Liquid and Gaseous Substances, J. Whitley, Leeds.
10,023. Shanked Buttons, T. W. Taylor and J. S. Whitten, Birmingham.
10,024. Securing Scarf Pins, &c., W. Johnson, Liverpool.
10,025. Axle Bearings, T. Davies, Liverpool.
10,026. Spindles of Spinning Machinery, G. H. Wrigley, Manchester.
10,027. Tricycles, &c., B. English, Newcastle-on-Tyne.
10,028. Seamless Bobbin for Traverse Warp Machine, G. Owen, Derby.
10,029. Metallic Curtain Band for Windows, &c., H. Wilkinson, London.
10,030. Magneto Meters, A. Millar, Glasgow.
10,031. Wood and Leather Golosh or Shoe, S. S. Bromhead.—(*J. Petit, France.*)
10,032. Capstan for Fishing Vessels, T. P. Hamling, Hull.
10,033. Tapping Cock for Liquids, J. Richardson, Sheffield.
10,034. Hot-air Engines, J. C. R. Okes, London.
10,035. Utilising Plants, Shrubs, &c., for Textile and Woven Fabrics, A. Wilkinson, London.
10,036. Distilling Ammoniacal Liquor, A. A. Croll, London.
10,037. Absorbing Gases by Liquids or Solids, E. Edwards.—(*G. Lunge, Switzerland, and L. Rohrmann, Germany.*)
10,038. Letters and Figures for Attachment to Glass, &c., W. N. Sears, London.
10,039. Cigar Cutter or Piercer, H. Allday, London.
10,040. Window-frames, &c., E. Goddard, London.
10,041. Boilers, W. Whiteley, Halifax.
10,042. Metallic Sleepers for Railways, F. J. Brougham.—(*P. Hanrez, Belgium.*)
10,043. Metal Fencing, W. Bayliss, London.
10,044. Securing Railway Chairs to Metallic Sleepers, J. H. and W. Tozer, London.
10,045. Lock-up Stands for Spirit, &c., Bottles, A. Barker, London.
10,046. Automatic Cut-off Pendulum Governor, T. F. Veasey.—(*J. H. Lancaster, New York.*)
10,047. Solidifying Sewage Sludge, W. Asthrop, London.
10,048. Vinegar, E. Vandenhoff, London.
10,049. Rolling Plate Glass, &c., E. Walsh, jun., London.
10,050. Incandescent Electric Lamps, P. M. Justice.—(*A. Cruto, Italy.*)
10,051. Combing Machines, D Denby, Hull.
10,052. Dental Chair, G. C., W., W. H., H. C., C. J., and A. E. Ash, London.—(*D. O. Finnigan, Germany.*)
10,053. Treating Textile Materials with Liquids, W. Mather, London.
10,054. Bolts, S. de la G. Williams, London.
10,055. Window Fasteners, A. S. Andrews, London.
10,056. Springless Lock, E. Wright, Sheffield.
10,057. Velocipedes, H. H. Lake.—(*D. H. Rice, United States.*)
10,058. Cutting Meat, H. H. Lake.—(*C. F. Leopold, United States.*)

6th August, 1886.

10,059. Silent Protector for Boots, A. C. Farrington, Shelfanger.
10,060. Shuttle Pikes, W. Deighton, Bradford.
10,061. Rebounding Locks for Fire-arms, A. J. Boult.—(*E. Richoux, France.*)
10,062. Working Metals in a Cold State, W. P. Thompson.—(*W. H. Wright, United States.*)
10,063. Cisterns for Water-closets, &c., B. and W. Weale, Ludlow.
10,064. Exhausting, &c., Fluids, H. S. Stewart, London.
10,065. Ornamenting Surfaces in High Relief, C. Meason, Birmingham.
10,066. Iron and Steel Ships, N. Arthur, Leith, and J. Johnson, Monkwearmouth.
10,067. Pneumatic Inflating Apparatus, J. Hebblewaite, Manchester.
10,068. Sector Measuring Gauge, W. H. and T. Laidler, London.
10,069. Heating the Interior of Greenhouses, E. C. Pitt, London.
10,070. Washing Machines, W. Fieldhouse, Grimsby.
10,071. Chimney Top, J. Harnett, Halifax.
10,072. Stoppering Bottles, &c., W. Hazlehurst, Rochdale.
10,073. Raising or Lowering Book, &c., Shelves, J. G. Winder, Birmingham.
10,074. Utilising the Ordinary Water Supply of Dwelling Houses, &c., T. W. Newman, London.
10,075. Ripple Glass, A. D. Brogan, Glasgow.
10,076. Making the Bones of Fishes, Eatable, A. Dutour, Manchester.
10,077. Alarm Whistles, J. S. Hawkins, London.
10,078. Railway Buffers, S. F. Ibbotson, London.
10,079. Coupling Railway Wagons, T. Wood, London.
10,080. Bobbin Frames of Warping Machines, F. Reynolds, London.
10,081. Hoes for Gardening Purposes, W. Marsh, London.
10,082. Constructing Screw Propellers, A. T. Zeise, London.
10,083. Bicycles, E. Redman, London.
10,084. Accordians, L. Augustin, London.
10,085. Cupels and Tests, F. M. Lyte, London.
10,086. Cupels and Tests, F. M. Lyte, London.
10,087. Door Mat and Scraper Combined, J. S. Willway, London.
10,088. Illuminating Lighthouses, &c., J. R. Wigham, Dublin.
10,089. Coating Sheets of Iron and Steel, R. Heathfield, London.
10,090. Indicating to Passengers Travelling the Name of the Next Station, S. Ashby, London.
10,091. Dabbing Brushes, J. Lister and T. Brown, London.
10,092. Adjustable Mechanical Electrical Indicator, F. A. Stevens, London.
10,093. Drawing Off Water or other Liquid, W. Rice, London.
10,094. Ventilating India-rubber Boots, T. G. Douglas, London.
10,095. Furniture Castor, G. H. Reynolds, London.
10,096. Connecting Shafts, &c, W. H. Beck.—(*A. Fayol, France.*)
10,097. Electrical Signalling Apparatus, H. H. Lake.—(*L. Clémandot, France*)

7th August, 1886.

10,098. Machines for Producing Cold Air, &c., J. Atkinson, London.
10,099. Boot and Shoe Finishing Machines, G. Hurdle, London.
10,100 Manufacture of Doll or Puppet Heads, W. Brierly.—(*J. Schon, Germany.*)
10,101. Prawn Server, H. de Salis, Earl's Court.
10,102. Sewing Machines, J. J. Miller, London.
10,103. Cramping a Tennis Racquet, H. de Salis, Earl's Court.
10,104. Lessening the Waste arising from the Breakage of Yarns in Spinning, &c., A. H. Dixon and W. J. Gradwell, Manchester.
10,105. Securing Tool Blades in Handles, G. J. Williams, Birmingham.
10,106. Turbines, G. Gilkes, Liverpool.
10,107. Manufacture of Shrouds, W. Smith, Birmingham.
10,108. Slow Combustion Boilers, D. Horrocks, London.
10,109. Prevention of Traps in Looms, P. Holland, Cheetham.
10,110. Making-up Wreath Cases, &c., J. H. Kruse, London.
10,111. Dressing and Travelling Bags, W. F. Williams, London.
10,112. Sewing Machines, F. Dowling and C. J. Croft, Stevenage.
10,113. Reels and Bobbins, A. G. Waas, London.
10,114. Lubricator, M. Falk, London.
10,115. Glass Pigeon Rings, W. Robinson, London.
10,116. Canisters, J. C. Morrell, Ealing.
10,117. Portable Rails, G. M. Buckley, London.
10,118. Gas Motor Engines, F. W. Crossley, London.
10,119. Top Notches of Umbrellas, E. B. Podmore, London.
10,120. Flexible Girder Wire Tramway, C. J. Ball, London.
10,121. False Cuffs, M. E. Wilson, London.
10,122. Metal Bedsteads, E. Peyton, London.
10,123. Sewing Machines, J. C. Cottam and A. D. Moll, London.
10,124. Sewing Machines, J. C. Cottam and A. D. Moll, London.
10,125. Sewing Machines, J. C. Cottam and A. D. Moll, London.
10,126. Straw for Packing Bottles, &c., S. Edwards, London.
10,127. Giving a Non-oxidising Coating to Wood, E. Schröder and H. Perner, London.
10,128. Kilns for Burning Lime and Ores, J. Daglish, London.
10,129. Garter, H. H. Lake.—(*F. Armstrong, United States.*)
10,130. Sewing Sacks, L. Bollman, London.

9th August, 1886.

10,131. Studs, &c., H. Dalgety, Kent.
10,132. Winding Governor Motion for Self-acting Mules, B. A. Dobson, Manchester.
10,133. Bottles, W. McDonnell, Limerick.
10,134. Blue Dye-stuffs, Messrs. Dahl and Co.—(*E. Elsaesser, Prussia*)
10,135. Automatic Couplings for Railway Wagons, R. Hill, Liverpool.
10,136. Driving the Tubes on Spinning Frames, J. W. A. Black and H. Eade, Bradford.
10,137. Erecting Telegraph Wires, G. A. Grindle, London.
10,138. Castors for Furniture, S. Bott and C. Homer, Birmingham.
10,139. Window Sash Fastener, C. H. M. Wharton, Manchester.
10,140. Fixing Wires to Standards, W. A. Murray, London.
10,141. Hot-air Ovens, E. R. Morphet and J. Hardy, Yorkshire.
10,142. Nipple Protector, H. Taylor, Blackburn.
10,143. Steam Boilers, W. Lewin, Douglas,
10,144. Fastening Leather Football Belts, &c., J. Glossop, Leeds.
10,145. Wire-stitching Machines, W. E. Harper, Manchester.
10,146. Umbrella Cases, F. R. Stevens, Sheffield.
10,147. Safety Spirit Lamp for Tea-kettles &c., R. W. Boyd, London.
10,148. Manufacture of Mattresses &c., J. Alderman, London.
10,149. Combined Gas Globe Supports and Burner Tubes, W. Priestley, Sheffield.
10,150. Preventing Down Draught in Chimneys, J. de Baere, Sheffield.
10,151. Venetian, &c., Blinds H. J. Spooner, London.
10,152. Car Coupling, D. McKinnon, London.
10,153. Everybody's Filter, J. Lewthwaite, London.
10,154. Bedsteads for Stowage of Bed-cloths, G. M. S. Ball, London.
10,155. Planing Laths for Venetian Blinds, R. W. Hamilton, London.
10,156. Cranks for Velocipedes, &c, J. Colson, London.
10,157. Compressing Scraps of Metal, R. Evans, London.
10,158. Vehicle Hubs and Axles, J. N. Harris, London.
10,159 Forming Apparatus for Wood-turning Lathes, J. W. Dulston, Rochdale.
10,160. Safety of Travelling by Railway, C. Garrood, London.
10,161. Utilising the Heat in Chimneys, G. F. Redfern.—(*J. J. Imbs and MM. Toisoul and Fradet, fils, France.*)

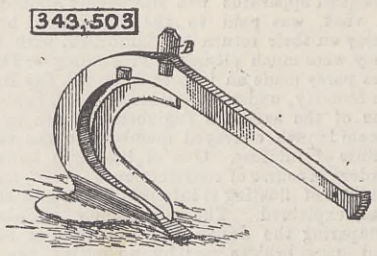
SELECTED AMERICAN PATENTS.

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

343,503. Plough Coulter, *George Stevens, Vassar, Mich.—Filed December 31st*, 1885.

Claim.—A curved coulter having tongue B and dove-

343,503

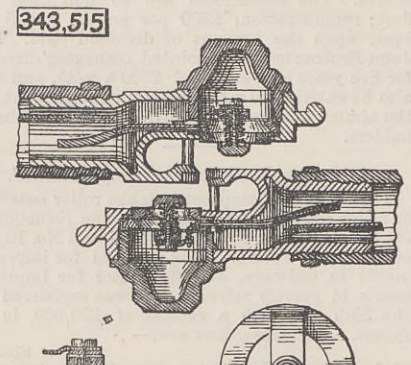


tail piece C, in combination with the share provided on its land side with a dovetail recess for the reception of the piece C, and means, substantially as described, for securing the tongue B to the beam, substantially as described, and for the purposes set forth.

343,515. Electrical Coupler, *George D. Burton, New Ipswich, N.H.—Filed February 16th*, 1886.

Claim.—(1) The combination, with the couplings, of the non-conducting annuli, one within either coupling and held in place by the coupling cap, and provided each with a yielding contact button, and electrical conductors contained within the couplings and electrically connected with the buttons. (2) The combination, with the couplings and electrical conductors in electrical connection therewith, of other electrical conductors insulated therefrom, and non-conducting annuli secured to the couplings and carrying yielding contact buttons, with which the last-named electrical conductors are electrically connected. (3) The combination, with a coupling and its cap, of an annulus of non-conducting material having a metallic frame on one side against which the cap fits, and resting on the other side against a non-conducting washer, and provided with a yielding contact button. (4) The combination, with a coupling having a screw cap and a non-conducting washer, of a non-conducting annulus fitted between said cap and washer, and having a metallic frame adjacent to the cap, and provided with a projecting bar and a spring interposed between the bar and button head, and an arm adapted to connect with the electrical conductor. (5) The combination, with a coupling, of a non-con-

343,515

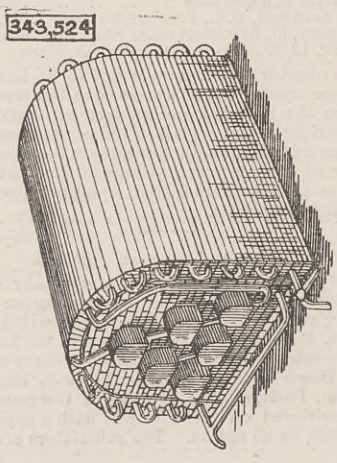


ducting annulus having a bridge bar, a contact button fitted to said bar, and a spring interposed between the bar and button head. (6) The combination, with a coupling of a non-conducting annulus having a bridge bar, a contact button whose shank is fitted to said bar, an arm insulated from the frame, and a screw for connecting it with the button, and a spring interposed between the bar and button. (7) The combination, with a coupling and a bushing of insulating material, of a screw fitted to said bushing and an electrical conductor passing through the screw. (8) The combination, with a coupling, of a non-conducting annulus, a yielding contact button carried by the annulus, and an arm carried by the button, an electrical conductor, and a spring connecting said conductor with said arm. (9) The combination, with a coupling, of an annulus, a yielding contact button, and an electrical conductor connected with said button through the medium of a spring, whereby contact between the button and the conductor is maintained notwithstanding the movement of the button.

343,524. Method of Manufacturing Heating and Illuminating Gas, *William F. M. McCarty, Philadelphia, Pa.—Filed November 25th*, 1885.

Claim.—(1) The process herein described of producing a permanent gas, the same consisting in heating natural gas and expanding it to its greatest tension in conjunction with water gas, and passing the mixed gases over scrap iron, whereby the carbonic acid is decomposed and acetylene substituted therefor, substantially as specified. (2) The process herein de-

343,524

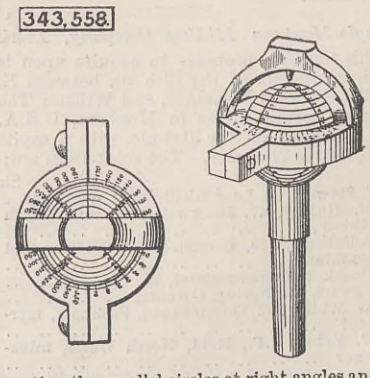


scribed of producing an illuminating gas of a high illuminating standard, the same consisting in heating natural gas in conjunction with water gas, passing the mixed gases through intensely-heated and finely-divided iron, and finally combining with the mixed and purified gases a suitable hydrocarbon in the form of vapour, and fixing the whole to a form a permanent gas, substantially as specified.

343,558. Graduated Ball-and-socket Joint for Surveyors' Instruments, *W. Abram Wright, Chipley, Ga.—Filed December 16th*, 1885.

Claim.—(1) In a ball-and-socket joint, the combination of a ball having a shank and having a number of parallel equidistant circles, and a number of circles

343,558

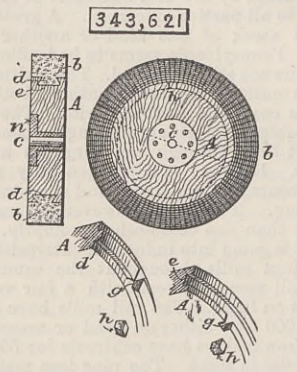


intersecting the parallel circles at right angles and intersecting each other at the same points, with a socket formed by two semicircular arms having their inner edges graduated and having their middles connected by a yoke and their ends formed into perforated ears having screws uniting them, as and for the purpose shown and set forth.

343,621. Polishing Wheel, *Walter Baker, Ilion, N.Y., —Filed February 24th*, 1886.

Claim.—(1) The herein described polishing wheel, consisting of the wooden disc A, with the pieces *b* of leather secured thereto by an interlocking joint and cement, substantially as described. (2) A polishing-wheel composed of the wooden disc A, having its periphery covered with pieces of leather set on edge, and secured to the disc by an interlocking joint and by being cemented to the disc and to each other,

343,621

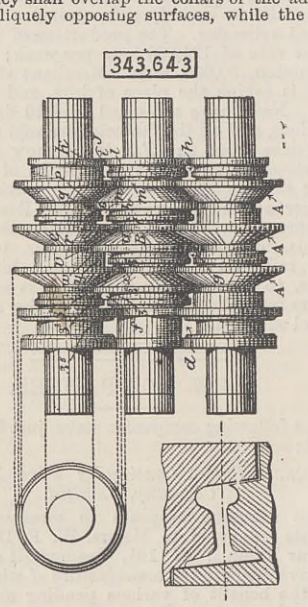


substantially as described. (3) The disc A, provided with the circumferential groove *e*, and lateral notch or opening *g*, in combination with the pieces *b* of leather, and the block *h*, or the equivalents thereof, substantially as herein shown and described.

343,643. Rolling Mill, *John G. Laurie, South Chicago, Ill.—Filed December 10th*, 1885.

Claim.—In three-high-roll mills for rolling rails, girders, and the like, constructing the collars of one so that they shall overlap the collars of the adjacent roll by obliquely opposing surfaces, while the broad

343,643

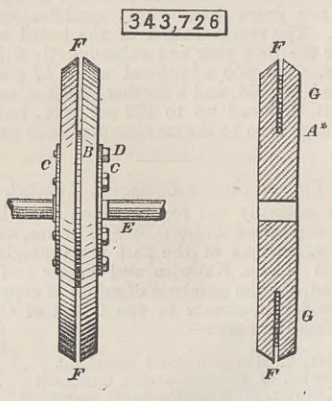


vertical surfaces of the collars on their opposite sides shall constitute severally lateral walls of the passes, and which lateral walls of the passes shall be on opposite rolls at each pass.

343,726. Device for Sharpening Mowing Machine Knives, *Charles G. Poulson, Linwood, Pa.—Filed March 8th*, 1886.

Claim.—(1) The herein described grindstone for grinding mowing or reaping machine knives, consisting of a circular disc having its edges bevelled off and a groove or slot in its face, all substantially as and for the purposes set forth. (2) The combination, in a grindstone, of the circular discs A A^1 having their

343,726

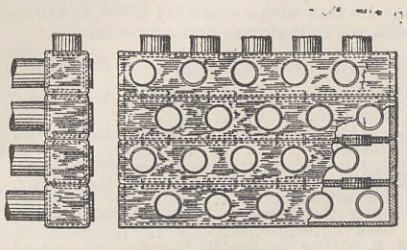


edges bevelled off, as shown, and the plate B, of smaller diameter than said stones, said plate separating said stones and forming a space F, between them substantially as and for the purposes set forth. (3) The combination, in a grindstone, of the stones A A^1, having bevelled edges, plate B, of smaller diameter and separating said stones, and rope G, partly filling the slot F between said stones, all substantially as and for the purposes set forth.

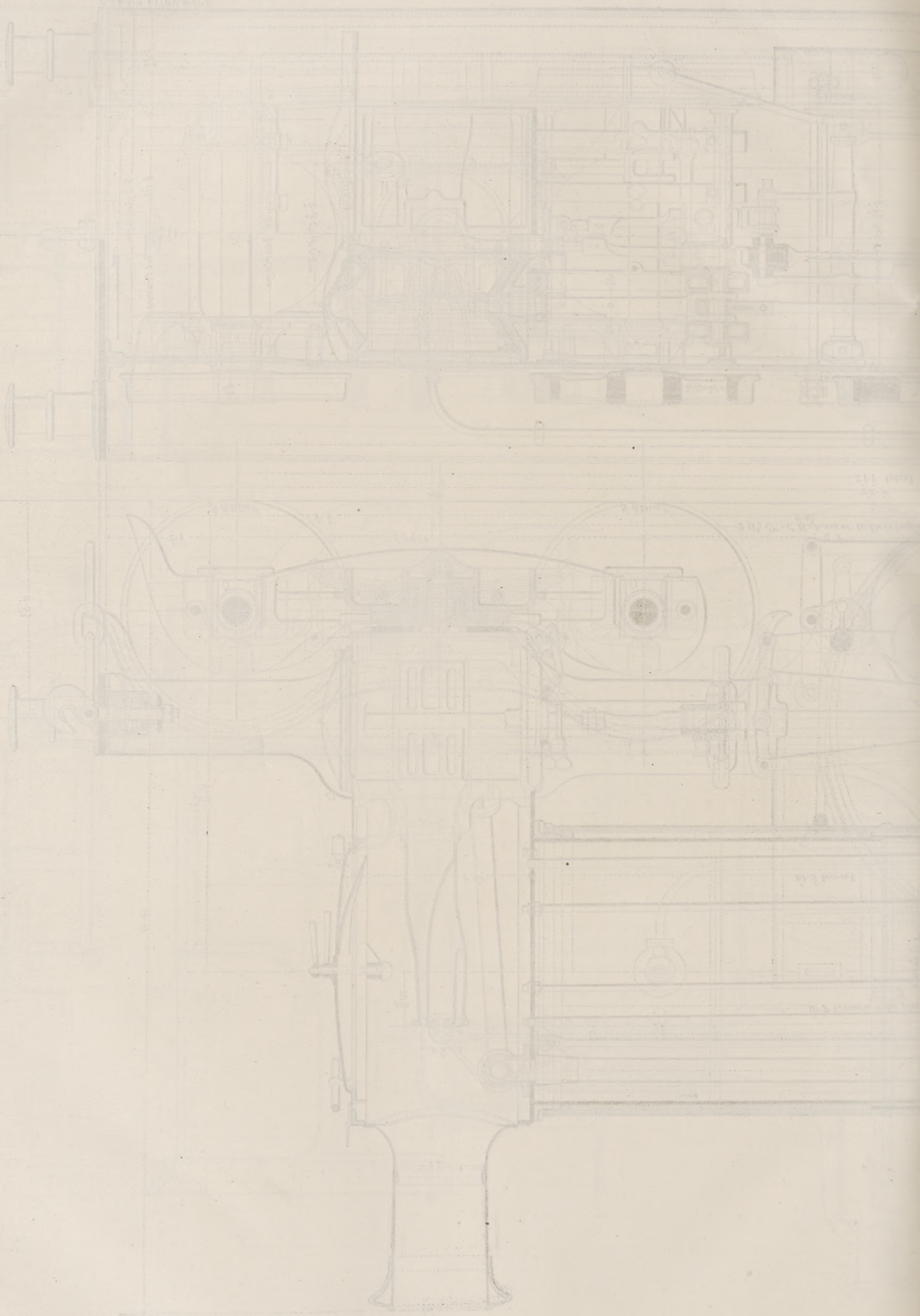
343,727. Manifold for Sectional Boilers, *Nat. W. Pratt, Brooklyn, N.Y.—Filed January 12th*, 1886.

Claim.—(1) A manifold or header composed of a

343,727



seamless tube of wrought iron or other ductile material, constructed in polygonal form in cross section. (2) A manifold or header composed of a seamless serpentine tube of wrought iron or other ductile material, constructed in polygonal form in cross section.



BOGIE EXPRESS ENGINE, CALEDONIAN RAILWAY.

CONSTRUCTED BY MESSRS. NEILSON AND CO. HYDE PARK LOCOMOTIVE WORKS, GLASGOW.