GEOLOGICAL SOCIETY OF LONDON.

December 1, 1858.

The following communication was read :—

"On the Geological Structure of the North of Scotland and the Orkney and Shetland Islands." Part II. By Sir R. I. Murchison, F.R.S., V.P.G.S.

In a paper read during the last session (see "Abstracts," No. 10, the author described the general succession of rocks in the northern Highlands, as observed by Mr. Peach and himself, aided by the researches of some other geologists.

The rocks were described in their ascending order, as, first, a fundamental gneiss traversed by granite veins at Cape Wrath; secondly, a red or chocolate-coloured sandstone and conglomerate, of great thickness, and regarded by the author as of Cambrian age; thirdly, succeeding unconformably, is a series of quartzite, with intercalated limestone, both of them often highly crystalline; from the limestone Mr. C. Peach had succeeded in obtaining, "near Durness," several fossils, shown to be of lower Silurian age; fourthly, micaceous schists and flagstones occupying a wide extent of country to the east of Loch Eriboll, described as being of younger age than the foregoing, and older than the old red sandstone series which occupies the north-eastern Highlands, and a great portion of the eastern coast of Scotland; fifthly, the old red series, arranged by the author into three divisions, the middle being the Caithness flags.

In the past autumn Sir Roderick, feeling that several points required stricter examination, revisited the country already described, extending his researches both east and west, and to the most northerly point of the Shetlands.

In this tour he not only confirmed his views previously announced with regard to the succession of the older rocks, but examined the structure of the Orkneys and Shetlands, more clearly defining the relations and physical characters of the beds there composing the old red series.

The present memoir comprised the details of these later observations: and Sir Roderick acknowledged the aid he had derived from Mr. Peach (who accompanied him throughout the journey), Mr. John Miller, Rev. Mr. Gordon, and others; and he referred to the previous memoirs of Mr. Cunningham and Hugh Miller on Sutherland, &c., and Dr. Hibbert on the Shetland Islands.

The principal points dwelt upon in this paper were :—

1. The evidence obtained at various points, that the Lower Silurian limestone is intercalated in quartz-rock (east of Loch Eriboll, Assynt, &c.)

2. That the Durness limestone lies in a basin supported by quartz-rock on the east as well as on the west.

3. That certain igneous rocks, connected with the Durness trough, are protruded near Smo, which had not before been noticed.

4. On this occasion corroborative evidence was adduced of the conformable superposition of the micaceous schists or gneissose flag-stones to the quartzite series—the succession being visible at intervals in all the intermediate country between Loch Eriboll and Ledmore, and the passage upwards from the quartzite, and their associated limestones into the schists and micaceous flags being both clear and persistent, with some local interruptions only of igneous rocks.

5. That the protrusion of porphyry, hypersthene, greenstone, &c., is not peculiar to any one line, but occurs in the purple or Cambrian sandstone, in the overlying Silurian limestone of Durness, and again in the still higher micaceous flag-stones; and that the latter, when intruded upon by granite, much resemble the old gneiss.

6. With regard to the old red series of the east coast, Sir Roderick pointed out the extension of the middle set of deposits, namely, the Caithness flags, their great thickness in Caithness compared with their development in the south, and their range over the Orkneys into the Shetlands, where they also thin out, putting on a somewhat different lithological character, and where the old sed series is chiefly represented by sandstones, the upper part containing plants. He dwelt upon the great value of the Caithness flags as paving-stones, their extraordinary durability being due to a certain admixture of lime and bitumen (the latter derived from fossil fishes) with silica and alumina, whilst in some parts they contain bitumen enough to render them of economic value. The author next pointed out the passage of the Caithness flags upwards into light-coloured sandstones, which eventually form the great headlands of Dunnet and Hoy, where such overlying sandstones cannot be of less thickness than 1,200 ft. to 1,500 ft.

With regard to the micaceous rocks of the north-east of Scotland and the Shetland Isles, they are, according to the author, portions of the series which is younger than the fossiliferous lower Silurian rocks of the west of Sutherland—so-called gneiss of the Sutors of Cromarty belonging, in Sir Roderick's opinion, to the micaceous flag series of eastern Ross-shire; and the gneissic rock extending southwards to Flowerburn, Kinordy and Rosemarkie, near Fortrose, is regarded by him as a member of that series, altered by the intrusion of granitic and felspathic rocks.

The paper was illustrated by a large series of rocks and fossils collected during the author's last tour, and by geological maps and coloured views and sections.

Papers to be read at the next Evening Meeting, Dec. 15, 1858 :—

1. "On the Old Red Sandstone of Elgin and its neighbourhood." By Sir R. I. Murchison, V.P.G.S.

2. "On some Reptilian Remains from the Sandstone of Elgin." By Professor Huxley, F.G.S.

December 15, 1858.

The Rev. J. H. Austen, Ensbury, Dorset; the Rev. Alexander Maclennan, M.A., Rectory, Newington Butts, Surrey; John Sharp, Esq., of the Inner Temple, Barrister-at-Law, Tunbridge Wells; Henry Christy, Esq., 103, Victoria-street, Westminster; and Joseph Paull, Esq., Moor-master, Aldstone, Cumberland, were elected Fellows.

The following communications were read :—

1. "On the Succession of Rocks in the Northern Highlands." By John Miller, Esq. Communicated by Sir R. I. Murchison, V.P.G.S.

Mr. Miller in this communication explained the history of our knowledge of the geology of this district; and, having given in detail an examination that he made of the coast last autumn, he drew particular attention to the faithful and comprehensive descriptions of the old red district by Sedgwick and Murchison in former years, and showed that his own observations quite coincide with the results of Sir Roderick Murchison's late correlation of the Gneissic, Cambrian, Silurian, and old red strata of the coasts of Sutherland, Ross-shire, and Caithness.

In conclusion, Mr. Miller pointed out that the Durness Limestone and the fossiliferous beds of Caithness were still open fields for careful and energetic explorers.

2. "On the Geological Structure of the North of Scotland, Part III. The Sandstones of Morayshire, containing Reptilian remains, shown to belong to the Uppermost Division of the Old Red Sandstone." By Sir Roderick I. Murchison, F.R.S., D.C.L., V.P.G.S., &c.

Referring to his previous memoir for an account of the triple division of the old red sandstone of Caithness and the Orkney Islands, the author showed how the chief member of the group in those tracts diminished in its range southwards into Ross-shire, and how, when traceable through Inverness and Nairn, it was scarcely to be recognised in Morayshire, but reappeared with its characteristic ichthyolites in Banffshire (Dipple, Tynet, and Gamrie).

He then prefaced his description of the ascending order of the strata belonging to this group in Morayshire by a sketch of the successive labours of geologists in that district; pointing out how in 1828 the sandstones and cornstones of this tract had been shown by Professor Sedgwick and himself to constitute, together with the inferior red sandstone and conglomerate, one natural geological assemblage; that in 1839 the late Dr. Malcomeson made the important additional discovery of fossil fishes, in conjunction with Lady Gordon Cumming, and also read a valuable memoir on the structure of the tract, before the Geological Society, of which, to his, the author's regret, an abstract only had been published. (Proc. Geol. Soc. vol. iii. p. 141.)

Sir Roderick revisited the district in the autumn of 1840, and made sections in the environs of Forres and Elgin. Subsequently Mr. P. Duff, of Elgin, published a "Sketch of the Geology of Moray," with illustrative plates of fossil fishes, sections, and a geological map by Mr. John Martin; and afterwards Mr. Alexander Robertson threw much light upon the structure of the district, particularly as regarded deposits younger than those under consideration.

All these writers, as well as Sedgwick and himself, had grouped the yellow and whitish yellow sandstones of Elgin with the old red sandstone; but the discovery in them of the curious small reptile, the *Telerpeton Elginense*, described by Mantell in 1851, from a specimen in Mr. P. Duff's collection, first occasioned doubts to raise respecting the age of the deposit. Still the sections by Captain Brickenden, who sent that reptile up to London, proved that it had been found in a sandstone which dipped under "Cornstone," and which passed downwards into the old red series. Captain Brickenden also sent to London natural impressions of the foot-prints of an apparently reptilian animal in a slab of similar sandstone, from the coast-ridge extending from Burgh Head to Lossiemouth (Cummingstone).

Although adhering to his original view respecting the age of the sandstones, Sir R. Murchison could not avoid having misgivings and doubts, in common with many geologists, on account of the high grade of reptile to which the *Telerpeton* belonged; and hence he revisited the tract, examining the critical points, in company with his friend the Rev. G. Gordon, to whose zealous labours he owned himself to be greatly indebted.

In looking through the collections in the public museum of Elgin, and of Mr. P. Duff, he was much struck with the appearance of several undescribed fossils, apparently belonging to reptiles, which, by the liberality of their possessors, were, at his request, sent up for inspection to the Museum of Practical Geology. He was also much astonished at the state of preservation of a large bone (*ischium*), apparently belonging to a reptile, found by Mr. Martin in the same sandstone quarries of Lossiemouth, in which the scales or scutes of the *Stagonolepis*, described as belonging to a fish by Agassiz, had been found. On visiting these quarries, Mr. G. Gordon and himself fortunately discovered other bones of the same animal; and these, having been compared with the remains in the Elgin collections, have enabled Professor Huxley to decide that, with the exception of the *Telerpeton*, all these casts, scales, and bones, belong to the reptile *Stagonolepis Robertsoni*.

Sir Roderick, having visited the quarries in the coast-ridge, from which slabs with impressions of reptilian footmarks had long been obtained, induced Mr. G. Gordon to transmit a variety of these, which are now in the Museum of Practical Geology; and of which some were exhibited at the meeting.

After reviewing the whole succession of strata from the edge of the crystalline rocks in the interior to the bold cliffs on the sea coast, the author has satisfied himself that the reptile-bearing sandstones must be considered to form the uppermost portion of the old red sandstone, or Devonian group,—the following being among the chief reasons for his adherence to this view :—

1st. That these sandstones have everywhere the same strike and dip as the inferior red sandstones containing *Holoptychii* and other old red ichthyolites, there being a perfect conformity between the two rocks, and a gradual passage from the one into the other. 2ndly. That the yellow and light colours of the upper band are seen in natural sections to occur and alternate with red and green sandstones, marls, and conglomerates low down in the ichthyolitic series. 3rdly. That, whilst the concretionary limestones called "Cornstones" are seen amidst some of the lowest red and green conglomerates, they reappear in a younger and broader zone at Elgin, and reoccur above the Telerpeton sandstone of Spynie Hill, and above the Stagonolepis sandstone of Lossiemouth; thus binding the whole into one natural physical group. 4thly. That, whilst the small patches of so-called "Wealden" or oolitic strata, described by Mr. Robertson and others as occurring in this district, are wholly unconformable to, and rest upon, the eroded surfaces of all the rocks under consideration, so it was shown that none of the oolitic or liassic rocks of the opposite side of the Moray Frith, or those of Brora, Dunrobin, Ethie, &c., which are charged with oolitic and liassic remains, resemble the reptiliferous sandstones and "Cornstones" of Elgin, or their repetitions in the coast-ridge, that extend from Burgh Head to Lossiemouth.

Fully aware of the great difficulty of determining the exact boundary-line between the uppermost Devonian and lowest carboniferous strata, and knowing that they pass into each other in many countries, the author stated that no one could dogmatically assert that the reptile-bearing sandstones might not, by future researches, be proved to form the commencement of the younger era.

Sir Roderick concluded by stating that the conversion of the *Stagonolepis* into a reptile of high organisation, though of nondescript characters, did not interfere with this long-cherished opinion—founded on acknowledged facts—as to the progressive succession of great classes of animals, and that, inasmuch as the earliest trilobite of the invertebrate lower Silurian era was as wonderfully organised as any living crustacean, so it did not unsettle his belief to find that the earliest reptiles yet recognised, the *Stagonolepis* and *Terlepeton*, pertained to a high order of that class.

[The memoir was illustrated by geologically-coloured charts of the Admiralty's Hydrographic Survey of the Coast extending from the Orkney Islands to Banffshire (which, in the want of any accurate maps, fortunately gives the outlines of the coast and a few miles inland), and by transverse sections showing the succession and relations of the strata; also by numerous organic remains from the collections of Mr. P. Duff, Mr. Gordon, the Elgin Museum, the Museum of Practical Geology, and the Geological Society's Museum.]

3. "On the *Stagonolepis Robertsoni* of the Elgin sandstones; and on the Foot-marks in the Sandstones of Cummingstone." By Thomas H. Huxley, F.R.S,, F.G.S., Professor of Nat. Hist., Government School of Mines.

The unquestionable remains of *Stagonolepis Robertsoni* which have hitherto been obtained consist partly of bones and dermal scutes, and partly of the natural casts of such parts. The former have been obtained only at Lossiemouth, and are comparatively few in number; the numerous natural casts, on the other hand, have all been procured at the Findrassie Quarry, in which no bones or scutes, in their original condition, have been discovered.

The considerable series of remains exhibited to the society did not embrace all those which had been subjected to examination, but contained only a selection of those more characteristic parts upon which the conclusions of the author of the paper, respecting the structure and affinities of *Stagonolepis*, are based.

They were—1. Dermal scutes; 2. Vertebræ; 3. Ribs; 4. Bones of the extremities; 5. Bones of the pectoral arch; and 6. A natural cast of a mandible with teeth. The dermal scutes are all characterised by an anterior smooth facet, overlapped by the preceding scute, and by the peculiar sculpture of their outer surface, which exhibits deep, distinct, round or oval pits, so arranged as to appear to radiate from a common centre. Of these scutes there are two kinds, the flat and the angulated. By a careful comparison with the dermal armour of ancient and modern crocodilian reptiles, it was shown that every peculiarity of the scutes of *Stagonolepis* could find its parallel in those of *Crocodilus* or *Teleosaurus*,—the flat scutes resembling the ventral armour of the latter, the angulated scutes the dorsal armour of the former genus.

An unexpected verification of the justice of this determination was furnished by a natural cast of a considerable portion of the caudal region of *Stagonolepis*, consisting of no less than seven vertebræ, enclosed within the corresponding series of dermal scutes. Of these, the dorsal set were angulated; the ventral, flat.

It would appear that the anterior dorsal scutes attained a very considerable thickness, while the posterior scutes were widest, attaining more than five inches in breadth in some instances. The vertebræ described were all studied from natural casts, and belonged to the caudal, sacral, and anterior-dorsal series. These vertebræ are, in their leading features, similar to those of Teleosurians—the obliquity of the articular faces of the centra, so characteristic of the vertebræ of *Stagonolepis*, being, as the author of the paper pointed out, a very common character of Teleosaurian, and even of modern crocodilian, vertebræ. Of the sacral vertebræ, only a natural cast of the posterior face of the second had been obtained; but it was sufficient to demonstrate the wholly crocodilian characters of this region in *Stagonolepis*.

The dorsal vertebræ present a remarkable peculiarity in the strong upward, outward, and backward inclination of the transverse processes, and in the size of the facet for the head of the rib. The vertebra thus acquires a Dinosaurian character; but no great weight was attached to this circumstance, as the amount of upward inclination of the transverse processes of the anterior dorsal vertebræ varies greatly in both *Crocodilia* and *Enaliosauria*.

The ribs have well-marked and distinct capitula and tubercula; and the scapula is extremely like that of a crocodile. The femur, though somewhat thick in proportion to its length, and, though its articular extremities present such a peculiarly eroded appearance as to lead to the belief that they were covered with thick cartilaginous epiphyses, is also completely crocodilian in its characters.

The natural cast of the mandible is remarkable for the great length and subcylindrical contour of the teeth, the apices of which are slightly recurved. The surface of the tooth is marked by numerous close-set longitudinal grooves, which all terminate at a short distance from the smooth apex. It would appear that the teeth contained large pulp-cavities, and that each was set in a deep and distinct alveolus. Notwithstanding their special peculiarities, these teeth might in many respects be compared with those of the *Teleosauria*.

A metatarsal or metacarpal bone reproduced from a natural cast was shown to be similar to that of a crocodile, but so much shorter in proportion to its thickness as to indicate an altogether shorter and broader foot. The cast of an ungual phalanx, on the other hand, proves that *Stagonolepis* had long and taper claws.

Thus far the resemblances with the *Crocodilia* are, on the whole very close; but the characters of a coracoid obtained from Lossiemouth separate *Stagnolepis* from all known recent and fossil *Crocodilia*. It is, in fact, a lacertian coracoid, very similar to that of *Hylæosaurus*.

In summing up the evidence thus brought forward as to the affinities of *Stagonolepis*, the author, after comparing it with the oldest known *Reptilia*, expressed his opinion that the peculiar characters of this ancient reptile separate it as widely from the mesozoic *Reptilia* hitherto discovered, as these are separated from the cainozoic members of the same group—in fact, it widely diverges from all known recent and fossil forms, and throws no clear light on the age of the deposit in which it occurs.

The footsteps from the Cummingstone quarries were next described. The largest yet seen by the author are eight or nine inches long, but the majority are much smaller. Prof. Huxley expressed his opinion that all the tracks which he had seen were referable to variously-sized individuals of one and the same species of reptile; and he described at length the only perfect impressions he had observed, the one of a fore, the other of a hind foot. The impression of the fore foot presented a broad, oval palmar depression, ending in five digits, of which the innermost, representing the thumb, was very broad and short. Each of the outer digits was terminated by a long and tapering claw; and there were clear traces of a web-like membrane uniting these digits as far forwards as the bases of the ungual phalanges. The innermost digit or thumb is directed inwards as well as forwards, and appears to have been provided with a thick, short, and much curved nail.

The impression of the hind foot is smaller than that of the fore foot, to which, however, it has a general resemblance. It exhibits only four digits, all terminating in taper claws and united by a web. There are indications of a rudimentary outer toe. In one track, where the impression of the fore-foot measured three inches, the stride was twelve inches.

The impressions might very well have been made by such an animal as *Stagonolepis*, with the ungual phalanges of which, indeed, the claw-marks of the footsteps present a close resemblance, while the shortness and breadth of the palmar and plantar impressions harmonise very well with the proportions of the metatarsal or metacarpal bone.

In the course of his remarks, the author took occasion to express his great obligations to Mr. Patrick Duff and the Rev. George Gordon for their zealous and most efficient aid, without which it would have been quite impossible for him to lay so complete a case before the society.

[This paper was illustrated by original sketches, and by a fine series of tracks from Cummingstone, and of natural and artificial casts and models of the remains of the *Stagnolepis* (including the specimen originally figured), from the collections of Mr. P. Duff, the Rev. G. Gordon, the Museum of Practical Geology, &c.]

4. "On Fossil Foot-prints in the Old Red Sandstone, at Cummingstone." By S. H. Beckles, Esq. F.G S.

Mr. Beckles, during a late tour through the Highlands, examined the sandstone quarries at Covesea, near Elgin; and, having exposed and removed several square yards of the sandstone slabs bearing fossil foot-prints at this place, has sent a large collection of them to London, but has not yet had the opportunity of studying them

in detail. Mr. Beckles says that he has secured several varieties of footsteps, differing in size and form, and in the number of the claws, which vary apparently from two to five. One foot-print, of a circular shape, measured 15 in. in breadth. Some of the smaller foot-prints are evidently formed by young individuals of the same species that made some of the larger marks. Some of the prints have been left, in the author's opinion, by web footed animals.

Most of the surface-planes of the rock, at different levels, bear foot-marks. The majority of the tracks, Mr. Beckles says, are uniserial, the double (or quadrupedal) series being exceptional.

Mr. Beckles noticed also impressions of rain-prints, well-marked on some of the surface-planes, and indicating the direction of the wind blowing at the time of the rain-fall.

ROYAL GEOGRAPHICAL SOCIETY.

A very full meeting of this society was held on Monday evening, at Burlington-house, Sir Roderick I. Murchison, president, in the chair.

The papers read were :—1. "Notes on the Zambesi Expedition, from the journal of Mr. Thomas Baines, F.R.G.S.," communicated by Dr. Livingstone, F.R.G.S. Prior to the reading of Mr. Baines' journal, the President introduced the subject with extracts from a letter addressed to him by Dr. Livingstone, describing his enthusiastic reception by the natives, the companions of his former journey, whose numbers had been reduced by sickness. and mentioning the general condition of the people and their treatment by the Portuguese authorities. The existing relations between the natives and the Portuguese were represented as being still unsatisfactory; the English name, however, won a passport with the natives. The Doctor states that good coal was met with, some of which was taken on board, and answered well; in the absence of this coal lignum vitæ and other valuable hard woods were consumed as fuel. The Doctor concludes by expressing his satisfaction with the conduct of the members of the expedition. Portions of Mr. Baines' journal, which minutely details the proceedings of the exploring party from the commencement, were then read. He alludes to the difficulties encountered in navigating the river from the rocks and want of water, and he mentions the various astronomical and meteorological observations which had been made, the character of the country passed through. its climate, physical features, and other information. The paper gave rise to an animated discussion. Mr. Mac gregor Laird, having been called upon, explained the reason of the slow rate of speed of the steam launch, which had been referred to, attributing it entirely to the fact of so light a vessel being too heavily laden, and remarked that, as she was only intended to draw six inches of water, if the weight she had to carry doubled or trebled that, her speed would naturally be diminished in proportion. He then, as well as Mr. Lyons M'Leod, who has recently returned from Mozambique, where he served as British consul, spoke strongly in favour of the vegetable products of the country in the vicinity of the Zambesi. Mr. Crawfurd dissented from Mr. M'Leod in these views, which were confirmed by Mr. Macqueen and Colonel Sykes, who expressed a hope that Dr. Livingstone's expedition would prove successful, and said that he had no doubt that the accounts given of the fertility of the country were quite correct.

2. "Account of the Lake Yojoa, or Taulebé, in Honduras, Central America," by Mr. E. G. Squier, of the United States. After commenting upon the lakes of Central America generally, and their peculiar physical features, the author remarked that, although twenty-five miles in length and eight in breadth, with an average depth of between eighteen and twenty feet, Lake Yojoa was not marked in any of the maps of Central America before that of Baily, published in 1850, and in this it is represented as having five outlets, all open, instead of ten, with only one open, the others being subterranean. It is distant, in a direct line, about forty miles from the coast, being situated about midway across the Isthmus, between mountains averaging 5,000 ft. and 6,000 ft. elevation above the ocean, and 3,000 ft. above the waters of the lake itself, which is closely shut in by them. It occupies the centre of one of those singular terrestrial basins, of which Honduras offers many examples, which are formed by the contortions of the mountain system of the country, the ranges of which frequently bend back in themselves, sometimes describing almost circles, and enclosing plains of varied extent and height. Into these the waters are collected, often forming considerable rivers, which wind away to the sea through the narrow valleys. A map of Honduras, exhibiting the mountain chain as broken up in various directions, through which chasms the line for the Interoceanic Railway was traced, was suspended. The summit level would be 2,900 ft., but it would be a continuous ascent to that point, and the gradients would not be steeper than 60 ft. in a mile, which is much less than many of the most important railways in the United States. The chairman, the author, Mr. Hamilton, and Mr. Moore, spoke with reference to the physical features of the lake, and the advantages presented by the line of route indicated for a railway; and the meeting adjourned to the 24th of January, when the paper on Mexico, by Mr. Sevin, will be read.

The friends of Captains Burton and Speke, of the expedition to East Africa, will be glad to hear that those gallant officers have succeeded, after the most trying efforts, in reaching and surveying the great lake of the interior, and are on their return to Zanzibar.

The Electric Telegraph in the United States.—On the 1st of January there will be, for all practical business purposes, a complete union of interests between the telegraph companies which, with their connecting side lines, embrace all the wires in the Atlantic States and British provinces, excepting the south, or union line, namely:—The New York, Newfoundland, and London; the Atlantic; the New Brunswick; the Maine; the American; the Magnetic Washington, and New Orleans; the House Washington; the New York, Albany, and Buffalo; the Montreal or Canadian Lines; the Western Union; the Atlantic and Ohio; the National, or New York and New Orleans; the Illinois and Missouri lines.

Foreign Notes.—A telegraphic wire has been laid down between Bagdad and Constantinople.—The Central Society of Agriculture at Brussels has resolved on holding an international meeting for the trial of reaping machines next year. The date has not yet been fixed. A sum of 3,000 francs has been voted by the society for distribution in one or two prizes, and to defray the expenses connected with the carriage of the machines. [The sum seems very meagre.] English implement makers have been invited to compete.—It is stated that the continental railway system is becoming so complete, that the journey between Vienna and London will soon be accomplished in three days.—A new line of railway is being executed in Switzerland from Berne to Tuerne, and is expected to be completed by the summer months—a noteworthy circumstance to visitors to the district.—The United States navy is composed of seventy-eight vessels, carrying 2,225 guns. Only twenty-five are steamers, and of these three carry no guns.—The electric wire is now being carried along the line of the fortifications of Paris. On the eastern ramparts the posts are fixed for no less than twenty-one wires.—A land slip of 20,000 cubic metres has completely buried the Luxembourg Railway at a point between Grupon and Arlon. It was estimated that a month would be occupied in clearing the road.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

December 28, 1858.

W. Fairbairn, Esq., F.R.S., &c., President, in the Chair.

At the commencement of the business of the meeting the President stated that it was his painful duty to announce a loss which the society had sustained in the sudden and unexpected death of their friend and colleague, the late Rev. Henry Halford Jones, M.A., F.R.A.S., &c. This lamentable occurrence took place on the morning of the 21st inst., and in Mr. Jones's death the society has lost an intelligent and efficient member. For upwards of twenty years he took an active part in the business of the society. He served the office of honorary secretary from two to three years, in conjunction with Dr. Angus Smith; and on every occasion Mr. Jones, as an ardent lover of science, faithfully and honestly discharged the duties of that office. His scientific attainments, and varied knowledge in literature, enabled him to take an active part in the discussions; and on all occasions he was found able and willing to assist in any pursuit, having for its object the advancement and prosperity of the institution to which he belonged.

In astronomy Mr. Jones was no pretender; on the contrary, he was an accurate observer; and his knowledge of mathematics, united to a mind possessing powers of generalisation, rendered him an instructive and, at the same time, an agreeable associate and companion.

As a member of the society he was always alive and always attentive to its proceedings; and his love of science, strict integrity of character, and other acquirements, rendered him a powerful advocate in every department of mental progress.

It was moved by the President, seconded by Mr. Buchan, and unanimously resolved, "That this society has heard with deep regret of the sudden death of the Rev. H. H. Jones, F.R.A.S., and desires to record its high appreciation of his services as one of the honorary secretaries and as a member of the council of the society for many years; and that this expression of condolence on their sudden and painful bereavement be conveyed to Mr. Jones's widow and family."

Mr. Binney brought before the society some lithographs of brooches and ornaments.

"Mr. F. M. Jennings, M.R.I.A., F.G.S., some time since travelled in Morocco. Whilst there he collected a series of brooches and ornaments in common use in that country. These are very similar in form to specimens of ancient Irish brooches and ornaments now in the Museum of the Royal Irish Academy, and are, in the opinion of the author, another evidence of the trade anciently existing between the Phœnicians, their colonies, and Ireland. The drawings exhibited show the African and Irish ornaments. On showing these drawings to Mr. Charles James Julote, a Manchester gentleman, who has resided in Morocco, he says the brooches seen by Mr. Jennings in Morocco, and ornaments with similar designs, are not uncommon in Algeria and Morocco; they are made by Moorish and Jewish workmen. All the designs I have seen in those countries, which are acknowledged as Moorish, have reference to some geometrical figure. Then, in the designs which may be considered Christian, some have waving lines with branches, others have reference to the cross, like Fig. 1 of Mr. Jennings' drawings. These designs may be traced to Christian workmen (Spaniards, Portuguese, Italians, and Maltese) who have, from time immemorial, occasionally resided in these countries; indeed, many of them have adopted the manners and religion.

"The people of Susa consider themselves a distinct nation, have a distinct language, which I have heard somewhat resembles the Irish. They used to keep up an intimate relation with the Canary Islands. They say their religion is more Christian than Mahomedan. This statement should be received with doubt. When the Portuguese were driven from the coast many who had married remained in the country and professed Islamism.

"The above people, of which very little can be learned, owing to the jealousy of the Moors, are an active, intelligent class, sometimes employed by European settlers as trusty servants, and very seldom abuse the confidence placed in their fidelity. They are the celebrated snake charmers, vaulters, skull and choppers, of whom we read; and they are the carriers to Wednoor Mogador. I believe if we could induce the Emperor to allow us to trade to Agadeer, a large and valuable trade from that place to Senegal and Timbuctoo might be carried on. At present it is not safe to enter the country."

Mr. T. T. Wilkinson, F.R.A.S., laid before the meeting a selection of Geometrical Investigations, from the papers of the late Mr. Henry Buckley, of Wood House, Delph. He stated that Mr. Buckley was a pupil of the late Mr. John Butterworth, of Haggate, near Oldham, and was peculiarly distinguished for his knowledge of the Ancient Geometrical Analysis. Amongst the investigations laid before the meeting were several relating to the properties of bisectant axes, and their application to the solution of problems. Others related to porisms, loci, tangencies, sections of ratio, &c., all of which had important bearings upon the principal subjects of interest amongst the ancient geometricians. Mr. Buckley died in July, 1856, and might almost be considered as the last of the Oldham group of self-taught mathematicians. He corresponded to the *Diary*, the *York Courant*, and the *Educational Times*, both in his own name and under several assumed signatures. Since his death, Mrs. Buckley had consigned the MSS. to the care of Mr. Wilkinson, for publication or otherwise; and, on the suggestion of the President, he promised to make a selection of the most interesting of these geometrical speculations, and offer them to the notice of the society at no distant period.

A paper by Mr. Morris was read, entitled, "On the Practicability of Counteracting a Portion of the Resistance at the Head of a Ship, by employing a Revolving Conical Bow to work a Stern Propeller."—Communicated by David Chadwick, F.S.S., A.I.C.E.

"The proposed improvement consists in substituting for the lower or submerged part of the bow of a vessel, a cone fixed upon a moveable shaft. The cone is surrounded by spiral flanges, so disposed that the water (when the ship is set in motion by sails or steam-power) may impinge upon the flanges, and cause the cone to revolve. The force thus obtained is transmitted through proper shafting and gear to assist the engine, if a steamer, or to work a stern screw, if a sailing ship.

"Now, as this may, at first sight, look very much like an attempt to obtain something out of nothing, or to produce an effect without a cause, I must solicit your candid attention to the few arguments I shall advance. I would first remark, that in the examination of this plan, it is necessary to bear in mind that it does not profess to be a motive power—the motion must first come from engine or sails; and, secondly, that no more power can be derived from it as assistance at the stern than is first encountered as retardation at the head of the vessel. Whence, then, it may be asked, arises the advantage? In this way—the resistance in front has to be encountered, whatever the form of the ship's head, and whether any use be made of it or not; consequently, if a revolving bow be adopted, which gives no material increase of resistance, then the power derived from its revolution, when set either to assist the engine, or to work an independent screw at the stern, must be so much gain. The question, it will be observed, is not one of displacement, but the mode of displacement.

"It has been objected that, 'as the front apparatus is set in motion by the resistance to the vessel's progress, the stern screw can have no propelling power whatever.' Now this, you will perceive, assumes entirely the point in dispute, instead of attempting to prove it. It is indisputable that the action of the water upon the conical screw would cause a large amount of force to be given out by the propeller, and the only way which this can be rendered nugatory is to suppose that there would be as much additional resistance generated by the flanges of the revolving bow (which is in reality to suppose that the mode of displacement is equal to displacement itself) as would be given out by the stern screw. I think the experiments I am now prepared to make, in an artificial stream, will show that no such increase takes place. The water in front is pressed very little more forcibly by the flanges of the cone than it would be by the cone itself, if the flanges were removed, but the water at the stern is pushed with considerable force by the screw, and by a force which increases with the ship's velocity. In one of the small models now exhibited, the revolving bow, in a moderate stream, gives ninety-two revolutions per minute to the propeller.

"No one, at this day, will imagine that any power can be created; but a great deal is lost, and perhaps some may be saved. The ordinary head of a vessel may be regarded as a wedge employed to split open a channel for her. In her voyage, the water is at every moment making an effort to press the two sides of the wedge together, and yet no attempt has been made to economise this constantly sustained pressure. Now, a cone is a wedge in every direction—a circular wedge—and by surrounding it with spirals, it will become a revolving wedge, the flanges themselves constituting an active part of it. I submit that by driving through the water an immoveable wedge, a large portion of the motive power is wasted: but by employing a revolving bow, that wasted portion may be economised. I believe that the result may be thus stated:—Resistance of plain conical-bow 100 + 10 for resistance of flanges + 5 for friction=115. Available power, one-half of 100 = 50 — 15 = 35 clear gain. This is upon the supposition that the revolving-cone is only checked to the extent of half the speed due to the resisting water."

Several experiments were then tried.

A laden model was balanced in the stream by a weight, and then attached to the shaft of the propeller, which revolved six times the speed of the bow. The string was fastened ahead, and the model wound itself forward. A second model was placed in the stream without a balance-weight, and it pulled itself ahead by a string fastened to the cone-shaft. A craft was then produced (merely as an illustration) with a paddle both at the head and stern, with gearing to increase the speed of the hind-paddle. When this is balanced in the stream, the fore-paddle causes the hind-paddle to revolve, and in doing so it pushes the boat forward by its action against the water at the stern.

In the discussion which followed the reading of the paper, the President said it was impossible to take power from the water without decreasing the speed of the ship to the extent of the power gained. Mr. Morris replied that no doubt that was so; but in this instance the water treated was not that which passed the sides of the vessel, but the very water which she would have to displace by her motive power before she could pass through it. Dr. Joule thought that the effect of the revolving-bow might in some cases be to make a bad bow better; but denied the possibility of its producing any but a retarding effect, if applied to a ship possessing good lines.

Shipping at Liverpool.—During 1858, 16,726 vessels passed inwards through the Victoria and other northern channels to and from Liverpool. This makes a total intercourse of 34,402 vessels as compared with 39,139 vessels in 1857.

Return of Wrecks in Liverpool Bay during 1858.—From a return presented yesterday to the Mersey Dock Board, it appears that during the past year twenty-five vessels were wrecked. Of these twelve were totally lost, and the remainder, with four exceptions, either raised or removed.

Punjab Railway.—The section between Lahore and Umritsir was commenced on the 25th of October last, and the portion between Lahore and Mooltan will be soon commenced. In addition to the engineering staff in India, thirty-five engineers, surveyors, and inspectors, are on the eve of departure, and the permanent way has been for some time in course of shipment.

Suez Canal.—A deposit of £2 per share having been paid, a call of £6 per share will be made payable at different periods during the present year, after which no call is to be made until 1861. A meeting of the Council of Administration is to be held in Paris on the 15th inst., to take into consideration the propositions submitted for the execution of the work.

French Railways.—The works of the branch line from Lisons to St. Lo, on the line from Caen to Cherbourg are being rapidly carried forward. There are about 400 men employed on the work. The directors of the Northern Railway have prepared the plan of the new station which is to be built next spring at St. Quentin. It is said that it will be a grand monument, three times larger than the Strasburg Railway terminus. The works of the railway which is to connect St. Quentin with Rouen, through Amiens, have been commenced. The railway from Paris to Nevers is likewise in progress of execution. The works are considerably advanced at the two extremities, Nevers and Fontainebleau.

Explorations in Australia.—From a recent report of Mr Gregory, in command of an expedition from South Australia, it seems probable that a low-lying belt of sandy desert extends from the great Australian bight, west of Spencer's Gulf, towards the Gulf of Carpentaria, uniting into one great insular continent what was once two islands, the more fertile portion lying to the eastward of this sandy belt. A patriotic inhabitant of Victoria, who conceals his name, offers £1,000 towards further explorations, and a subscription is now in course of collection for the purpose. It will, no doubt, be supplemented by the Assembly, and it is now thought quite practicable to traverse the continent from the Murray to the northern coasts. For this and other purposes this Government is about to introduce camels as an experiment. Those who are acquainted with the habits of the camel affirm that they will thrive and breed freely in the Australian climate.

The Late Mr. Thomas Belshaw.—Our attention has been called to the bereaved condition of the widow and five children of the late Mr. Belshaw, who for some months before his death had suffered very great privations, and who are now left entirely desolate. Mr. Thomas Belshaw it was who originated and practically carried out exhibitions of arts and manufactures, first at Manchester, then at Liverpool, Derby, Sheffield, Macclesfield, Devenport, Hull, and other places. It was he who so successfully organised the first Great Industrial Exhibition at Bingley House, Birmingham, and if he did not first suggest the idea of the Exhibition of 1851, Mr. Belshaw's admirable arrangements in placing the goods, &c., were largely instrumental to its brilliant results. His energy and talent also greatly contributed to the success of the Exhibitions of Cork and Dublin. Lastly, he aided the Crystal Palace at Sydenham; from whence he was appointed deputy storekeeper to the Army Works Corps; and it was whilst going out to the Crimea, in charge of the 3rd division, with which he sailed in the Berwick transport, December 2, 1855, that he met with the fearful injury which, combined with anxiety, disappointments, and neglect, caused his untimely death. A subscription has been set on foot for his widow and children, and we cannot but believe the public will cheerfully and liberally contribute to it.

PHOTOGRAPHY APPLIED TO ENGRAVING ON WOOD (XYLOPHOTOGRAPHY).

WE lay before our readers a description of a method we have devised for printing photographs direct on to wood.

We take a suitable block and cover it, in the darkened laboratory or by candlelight, with a mixture composed of oxalate of silver and water, to which may be added a little gum or pulverised bath brick, to suit the convenience of the engraver. The mode in which the oxalate is spread over the surface is precisely the same as that we have mentioned as being employed by wood engravers in applying the mixture of flake-white and gum-water. A little of the substance, that is to say, about as much as would lie on a fourpenny piece, for a block four inches square, is sprinkled on the surface, and, the finger being then dipped in water (either with or without the addition of a little gum), the mixture is spread evenly over the whole surface of the block by rubbing the finger backwards and forwards across the block in various directions until the evaporation or absorption of the water leaves the surface impregnated with a delicate and almost impalpable coating of oxalate of silver. The block may be then placed in a drawer, or any other place from whence daylight is excluded, and there left till dry, or for any length of time until required, as we have detected no deterioration or loss of sensitiveness, even in blocks which had been prepared six months ago, so long as they remained protected from the light. Oxalate of silver is susceptible of being acted upon by the actinic rays, and when the block has been prepared in the manner above indicated, it is only necessary to expose it under a negative in the printing frame to sunlight, and a positive picture is obtained in the same manner as on paper prepared in the ordinary way. The block requires no subsequent washing, nor any preparation of any description, before being placed in the hands of the engraver; so that he receives it in precisely the same condition, as regards the surface to be operated upon, as under ordinary circumstances. The engraver, however, must not expose the block to the direct action of the solar rays while working at it, or it will gradually blacken on the surface; exposure to diffused daylight, however, has no deleterious effect on it, unless it be continued for a great length of time—say several hours.

There is at present little probability of metal plates superseding wood blocks in printing with type, and is therefore of great importance that the drawings on these blocks should be made with the greatest exactness, and this can only be adequately attained by means of photography. It is not necessary that we should enumerate all the cases in which this extreme correctness is absolutely essential to convey a correct idea of the object sought to be represented, but we may mention the reproduction of anatomical subjects of enlarged microscopic objects, and generally of all animal and vegetable specimens. We see no reason either why it may not be applied to the reproduction of stereoscopic views, which would, indeed, bring the stereoscope within the reach of the humblest classes. Of course the beauty and correctness of these views would depend, to a certain extent, on the skill of the engraver; but most engravers would succeed in producing a block which would be sufficiently correct for the purpose. Again, with respect to reduced photographic copies of maps or plans required to be printed with type, the reduced copies can be transferred to the block with the most perfect accuracy as to scale.—*Photographic News.*

LAW REPORT.

COURT OF CHANCERY, JAN. 12.

(*Before the* LORD CHANCELLOR.)

RE SPENCE.

THIS was a petition of James Spence, of Liverpool, praying that the great seal might be attached to a patent for an improvement in the manufacture of tin plates and terne or leaden plates, notwithstanding a *caveat* which had been entered by Messrs. Clay, of the Mersey Ironworks, Liverpool, and Messrs. Vickers Benzon, of Sheffield, on the ground that the article of "puddled" steel, upon the application of which the patent was sought for, was not a new invention.

Mr. Malins and Mr. Webster (of the common law bar), appeared for the petition; Mr. Hindmarch and Mr. Drewry were for the opposition.

The Lord Chancellor said that this was one of the cases in which the question in dispute between the parties ought to be tried at law. By refusing to seal the patent this court would prevent such right from being exercised, and therefore the proper course would be to order the patent to be sealed.—Ordered accordingly.

CONVEYANCE OF HEAVY ORDNANCE.—Experiments have been made on the high roads from Woolwich to Greenwich and back, to test the packing and casing of a new species of artillery ammunition. The loaded wagons, posted with six horses each, were driven at the rate of six miles per hour, and continued travelling with fresh relays of horses for eight successive hours, and, as it was stated, with favourable results. A portable 13-in. siege mortar, weighing 65 cwt., drawn by eight horses, was also conveyed from Woolwich to Blackheath and back to test the facility of its transport, which was proved to be perfectly practicable, after the manner of moving the ordinary field guns. The mortar attached to its bed is mounted on an artillery carriage, and on reaching its destined point is in complete readiness for immediate use.

THE NEW GUANO ISLAND.—The following is a description of the island of Navassa, in the Windward group, from the pen of Lieutenant Broadrick, of her Majesty's ship Basilisk, who visited it in January, 1858:—"The island of Navassa is two and a-half miles long from its north-west point to its south-east, and about two miles wide at its east end, which is the broadest part of the island. It is surrounded by cliffs of from 15 ft. to 20 ft. high, except the western portion of the north side (where there is indifferent landing in calm weather on the rocks, which are only a few feet high), and one spot on the south-west side, where there is a sloping place which is now occupied by an American company, who are loading guano, which is plentiful on the level ground. From the top of the cliffs the land rises at an angle of nearly 45 deg. to the height of about 300 ft., from thence the top of the island is level; and, although there is no soil on the surface except where guano occurs, yet it is covered with brushwood and small trees, which spring up between the stones. They are for the most part cabbage palms (which grow to the height of from 12 ft. to 15 ft.), the palmetta, a species of sea grape, and one or two other shrubs, of which we do not know the names. The north-west part of the island, where most of the guano lies, appears to be composed of limestone, and the remainder of scoriæ. The south-west side is the resort of great numbers of boobies, and other sea fowl, who build their nests on the rocks and in the low trees which grow on the rising ground above the cliffs. The Americans number about fifty people on the island, and load their vessels with guano by means of a wire rope, down which they lower the bags from the top of the hill to the landing place, from which it is taken off by boats in bad weather, but in moderate weather the vessels come alongside the loading stage. They have already exported from the island about 1,000 tons, and have stored up, ready for shipping, about 3,000 tons. The part of the island explored cannot contain less than 1,000,000 tons; but there is no doubt more on the north-east part, which was not visited. There is a very fair anchorage on the lee side abreast the loading stage, in full sixteen fathoms (sand), within half a mile from the shore—the vessels waiting to load anchor within a cable's length, in about twelve fathoms, but the ground is rocky and foul, and they have already lost two anchors there."

ON THE RESISTANCE OF TUBES TO COLLAPSE.

By WILLIAM FAIRBAIRN, Esq., C.E., F.R.S., &c.

(*Concluded from p.* 4.)

Reduction of the Results of Experiments 22, 24, 33 on the Collapse of Sheet-iron Tubes to unity of length and diameter.

No. of experiment.	D.	L.	k. Thickness.	P.	p.
22	18¾	5½	·25	420	40,030
24	9	3½	·14	378	10,495
33	14⅝	5	·125	125	9,140

To find the Value of the Constants a and C in the General Formula.

In equality (4.), taking $p = 40{,}030$, $k = ·25$, $p_{,} = 820$, $k_{,} = ·043$; we get

$$a = \frac{\log 40{,}030 - \log 820}{\log ·25 - \log ·043} = 2·23$$

Similarly, taking $p = 40{,}030$, $k = ·25$, $p_{,} = 9140$, and $k_{,} = ·125$; we get

$$a = \frac{\log 40{,}030 - \log 9140}{\log ·25 - \log ·125} = 2·14;$$

and taking $p = 10{,}495$, $k = ·14$, $p_{,} = 820$, $k_{,} = ·043$; we get

$$a = \frac{\log 10{,}495 - \log 820}{\log ·14 - \log ·043} = 2·16;$$

and taking the mean of these values we get $a = 2·19$.

For the value of the constant C, we have from (5.),

$$C = \frac{p}{k_a} = \frac{820}{·043^{2·19}} = 806{,}300$$

Substituting these values in (2.), we get

$$P = 806{,}300 \times \frac{k^{2·19}}{LD}, \quad . \quad . \quad . \quad . \quad . \quad (6.)$$

which is the general formula for calculating the strength of wrought iron tubes subjected to external pressure*, within the limits indicated by the experiments; that is, provided their length is not less than 1·5 ft., and not greater probably than 10 ft.

In order to facilitate calculation, formula (6.) may be written,

$$\log P = 1·5265 + 2·19 \log 100\,k - \log (LD);$$

and by an obvious transformation, we have

$$P = \frac{820}{L.D}.$$

The following Table will show how nearly formula (6.) represents the results of the experiments on the different classes of tubes.

No. of experiment.	D. Diameter. inches.	L. Length feet.	k. Thickness. inches.	P. By experiment in lbs.	P. By formula (6.).	Proportional error by formula.
2	4	1 7/12	·043	137	130	−1/19
5	4	5	·043	43	41	−1/22
7, 10, 11	6	2½	·043	55	54·7	−1/200
14	8	3¼	·043	32	31·6	−1/80
16	10	4⅙	·043	19	19·7	+1/30
19	12	5	·043	12·5	13·6	+1/12
23	18¾	5 1/2	·250	420	407	−1/32
26	9	3 1/2	·140	378	392	+1/27
33	14⅝	5	·125	125	116	−1/15

So far as regards practical purposes, this formula appears to possess every desirable precision. As already anticipated, the results derived from the thin 12-in. tubes present the greatest deviation. The value of P, derived from the following formula, gives a still closer approximation to the results of the experiments, viz.—

$$P = 806{,}300 \times \frac{k^{2·19}}{L.D} - ·002 \times \frac{D}{k}.$$

It is highly desirable that we should verify the law $P.L.D = P_{,}.L_{,}.D_{,}$, as applied to thick tubes. Now, we know the valve of a independently of these experiments, for its value, as determined above, closely approximates to the value derived from the experiments on the compression of sheet-iron plates. Let us, therefore, reduce the collapsing pressure of these plates to unity of thickness, with the view of ascertaining the law of variation of pressure as regards length and diameter.

Let P be the pressure of collapse of a tube k inches thick, and P′ the pressure when the tube is ·1 inch thick; then

$$\frac{P'}{P} = \left(\frac{·1}{k}\right)^a,$$

$$\therefore \quad P' = P \times \left(\frac{1}{10k}\right)^a = \frac{P}{(10k)^a},$$

and

$$\log P' = \log P - 2·19 \log (10k).$$

Reducing the values of P by this formula, we derive the following results:—

No. of experiment.	D. Diameter.	L. Length.	k. Thickness.	P. Pressure.	P′, or value of P reduced to unity of thickness, viz. ·1.	Value of P′. L. D.
5	4	5	·043	43	273	5400
22	18¾	5 1/2	·250	420	57	5400
24	9	3 1/2	·140	378	190	5300
33	14⅝	5	·125	125	76	5600

The remarkable approximation of the numbers in the last column to one another distinctly establishes the law (P.L.D = P,, L,, D,,) in relation to tubes composed of thick plates.

* By taking 2 instead of 2·19 for the index of k, this formula becomes

$$P = 806{,}300 \times \frac{k^2}{L.D} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (a.)$$

whence the value of P, the collapsing pressure may be readily calculated by ordinary arithmetic.

For thick tubes of considerable diameter and length, this formula may be regarded as sufficiently exact for practical purposes.

For example, let $k = \frac{1}{2}$ in., L = 10 ft., D = 36 in.; then

$$P = 806{,}300 \times \frac{(\frac{1}{2})^2}{10 \times 36} = 560 \text{ lb.}$$

By formula (6.), — $P = 1·5265 + 2·19 \log 50 - \log 360 = 502$ lb.

It will be observed that these results differ widely from each other.

Deduction from the Results of the Experiments on the Collapse of Elliptical Tubes.

By comparing the result of experiment (34) on the elliptical tube with the result of the experiments on the cylindrical tubes, we find that the general formula (6) will apply approximately to elliptical tubes, by substituting for D in that formula the diameter of the circle of curvature touching the extremity of the minor axis. Thus we have—

$$\text{Diameter of the circle of curvature} = \frac{2a^2}{b} = \frac{2 \times 7^2}{5} = 20 \text{ nearly.}$$

Now the pressure on this elliptical tube was 6·5 lb., which, reduced to unity of length and diameter, gives 650 lb., which result nearly agrees with 688 lb., the mean pressure of the 12-in. tubes also reduced to unity of length and diameter.

Although this deduction is based on merely one experimental result, yet it appears to be confirmed by the following proposition derived from mathematical analysis.

The pressure P per square inch, requisite to flatten equal angular portions of a tube of variable curvature, varies inversely as the diameters of curvature.

Hence it will be observed how very much the strength of a tube subjected to external pressure is deteriorated by a deviation from the cylindrical form.

Strength of Cylindrical Tubes subjected to Internal Pressure.

Taking the mean of the results of Experiments 36 and 39 on iron tubes, we have from formula

$$E = \frac{425 \times 6}{2 \times ·043} = 30{,}000 \text{ nearly.}$$

Hence we find

$$P = \frac{60{,}000\,k}{D}, \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7.)$$

which gives the formula of strength of thin sheet-iron tubes subjected to internal pressure.

Now the tenacity of boiler plates has been found to be 23 tons, or 51,520 lb. per square inch; hence it appears that a considerable reduction of tenacity must be made for the rivetting of the plates. The ratio of reduction is in this case ⅖.

One remarkable fact distinctly established by these experiments, is the comparative weakness of tubes subjected to external pressure. If p be put for the internal pressure per square inch at which a tube is ruptured, then for tubes of the same thickness and diameter, we find from (6) and (7) the following relation of strength:—

$$\frac{p}{P} = \frac{1}{13·44} \times \frac{L}{k^{1·19}}$$

If L = 2½ and k = ·043, then $\frac{p}{P} = 7·77$; that is to say, in this case the tube subjected to internal pressure will have about 7¾ times the strength of a similar tube subjected to external pressure. When

$$p = P,$$

we find

$$L = 13·44k^{1·19}.$$

If k = ·25, then we find L = 3¾ ft. nearly; that is, a tube of this length and thickness will be equally strong whether subjected to external or internal pressure.

Taking the mean Experiments 41 and 42 on the lead pipes, we have from formula (1),

$$E = \frac{370 \times 3}{2 \times ·25} = 2220,$$

which gives us the tenacity of lead per square inch.

Here we find

$$P = \frac{4440\,k}{D}, \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (8.)$$

which gives the formula of strength of lead tubes subjected to an internal pressure.

Practical Application to Construction of the Results of the Experiments.

Throughout the whole of the experiments enumerated in the preceding pages, it has been proved that the resistance to collapse from a uniform external pressure, in cylindrical tubes, varies in the inverse ratio of the lengths. This law has been tested to lengths not exceeding fifteen diameters of the tube; but the point at which it ceases to hold true is as yet undetermined, and could only be ascertained by a new and laborious series of experiments on tubes of considerably greater length, in which the strength of the material modifies the above law of resistance to collapse. Such experiments are, doubtless, very desirable; but the vessels necessary for the purpose would be most expensive, and the results already obtained appear to supply all the data necessary for calculating the strengths and proportioning the material in all ordinary cases.

If we take a boiler of the ordinary construction, 30 ft. long, and 7 ft. in diameter, with one or more flues, 3 ft. or 3 ft. 6 in. in diameter, we find that the cylindrical external shell is from three to four times stronger in its powers of resistance to the force tending to burst it, than the flues are to resist the same force tending to collapse them. This being the case in boilers of ordinary construction it is not surprising that so many fatal accidents should have occurred from the collapse of the internal flues, followed immediately by the explosion and rupture of the outer shell. To remedy such evils, and to place the security of vessels so important to the community upon a more certain basis, it is essential that every part should be of uniform strength to resist the forces brought to bear upon it. Ths equalisation of the the powers of resistance is the more important, as the increased strength of the outer shell is absolutely of no value, so long as the internal flues remain, as at present, liable to be destroyed by collapse, at a pressure of only one-third of that required to burst the envelope which surrounds them.

The following table, deduced from my own experiments, exhibits the safe working pressure, and the bursting pressure of boilers of different diameters, calculated for an external shell of a thickness of ⅜ths of an inch.

Diameter of Boiler.	Working Pressure.	Bursting Pressure.
ft. in.	lbs.	lbs.
3 0	118	708½
3 6	101	607
4 0	88½	531
4 6	78½	472
5 0	70¾	425
5 6	64¼	386½
6 0	59	354
6 6	54½	328½
7 0	50½	303½
7 6	47	2 3½
8 0	44	265½
8 6	41½	250

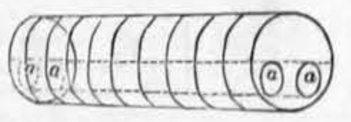
Taking from the above table the strength of a boiler 7 ft. in diameter, we find its bursting pressure to be 303 lb. per square

inch. For such a boiler the flues would be ordinarily 3 feet in diameter, and of the same thickness of plates as the shell; and by the formula, $\log P = 1{\cdot}5265 + 2{\cdot}19 \log 100k - \log (L.D.)$, we obtain for their collapsing pressure 87 lb. per square inch. As, however, the formula does not apply with strictness to tubes of such length, the actual collapsing pressure will be somewhat greater than this. The immense excess of strength in the outer shell is, however, sufficiently apparent; the extra thickness of boiler plate which causes it being so much material thrown away, adding nothing to the strength whilst the flues remain in so dangerously weak a condition.

To meet this disparity of strength, the experiments indicate the necessity of *shorter* flues, and one of them shows how this may be obtained, practically and efficiently, without interfering with the present construction of boilers. In Experiment 6, Table I., the tube F was divided into three parts by two rigid rings soldered upon its exterior, and its powers of resistance were thus increased in the ratio of three to one; *virtually*, the length was reduced in this ratio, and the strength was *actually* increased from 43 lb. to 140 lb. per square inch.

It is proposed to apply a similar construction to the flues of boilers, to equalise their powers of resistance with those of the outer shell, on the supposition that the law of decrease of strength holds true, within no great limits of error, to tubes of much greater length than in the preceding experiments. That this conclusion is not empirical will be seen by the following experiments upon boilers of full size, where it will be observed that the flues were distorted with one-third the pressure required to rupture the external shell.

These boilers were made for the north-eastern division of the London and North-Western Railway Company, and were respectively of 35 ft. and 25 ft. in length. They were 7 ft. in diameter, and composed of plates three-eighths of an inch thick. Each boiler had two cylindrical flues 3 ft. 6 in. in diameter, and of the same thickness of plates as the outer shell. They were fixed in the position shown in the annexed diagram, and were intended to resist an ordinary working pressure of only 40 lb. upon the square inch. In submitting them to the usual test of double pressure, the flues of the first or longest boiler gave way with 97 lb. upon the square inch; and those of the shorter boiler required 127 lb. to effect the same distortion. With these large tubes a complete collapse was not accomplished, but the circular form, indicated by the dotted line, was *distorted*, and the flue became elliptical, as shown at *b b*.*



The weakness of the flues in the above experiments is so evident as to need no comment. To remedy it, it has been already stated, we need only resort to a construction so simple, and yet so effective, as to meet at a small expense all the requirements of the case.

FIG. 1.

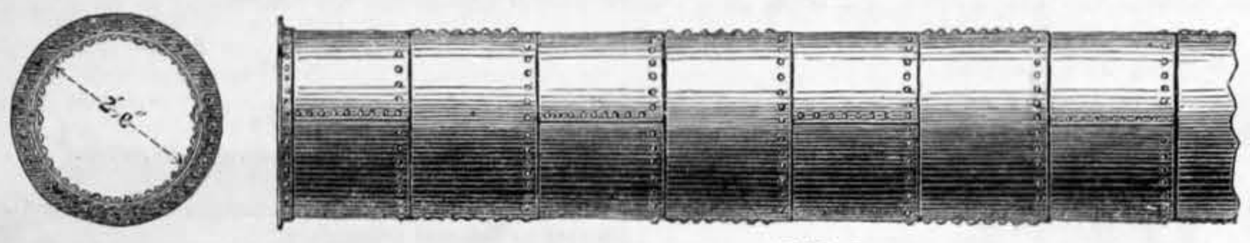


FIG. 2.

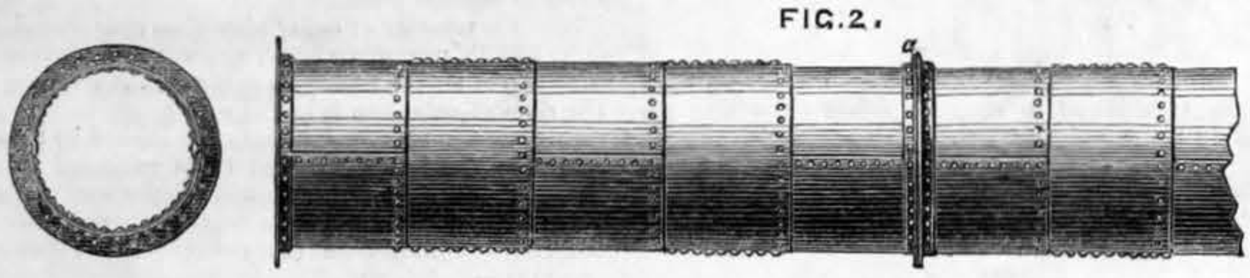


FIG. 3.

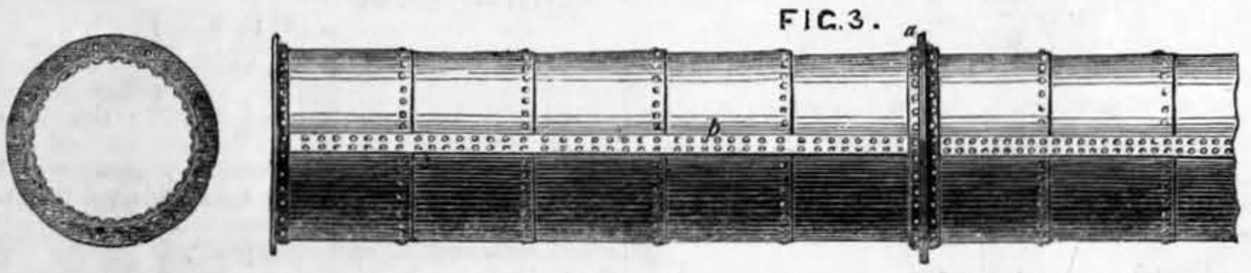
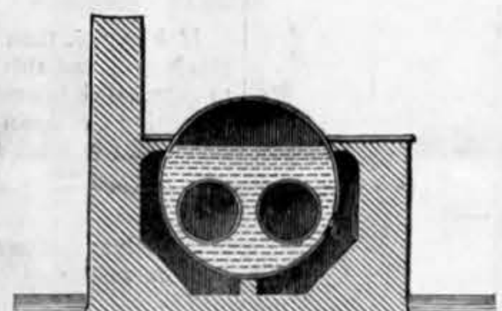


Fig. 1 exhibits an ordinary boiler flue, 30 ft. long and 2 ft. 9 in. in diameter, with simple lap-joints, as hitherto invariably constructed. To attain nearly three times the strength of this it will only be necessary to introduce two strong, rigid, angle-iron ribs, as exhibited in Figs. 2 and 3, at *a*, *a*. This arrangement will not only remove all doubts as to the strength of these flues, by bringing them within the limits to which the formula applies with strictness, but will give to flues 30 ft. long a strength equivalent to that of flues only 10 ft. long, and make them uniform in their powers of resistance with the other parts of the boiler.



The reduction of the strength of flues by the lap joints has already been stated; the deviation from the true cylindrical form which they cause, lessens, in some cases seriously the strength of the vessels, as may be seen in Experiments 23 and 24, Table VI. Hence it is also proposed that flues required to resist an external pressure should be formed with double-riveted *butt-joints*, with longitudinal covering plates, as shown at *b*, *b*, *b*, Fig. 3, plate XXIX. It is believed that these alterations will secure ample safety in these important constructions, and in this trust they are commended to the attention of the engineer and the public generally.

* Reducing the above results to unity of length, which with flues of this size should give a nearly constant quantity, we have—

	D.	L.	P.	P.L.
First boiler	42	35	97	3395
Second boiler	42	25	127	3175

The correspondence in the last column shows that these flues obey the law of inversely as the lengths, very nearly, in their powers of resistance.

It may be well to test the accuracy of the formula which has been found to apply to tubes of a length not greater than 10 ft., by determining from it the strength of flues similar to the above, and comparing the results with those derived from experiment.

Here, for the boiler 35 ft. long, we have by formula

$$P = 806{,}300 \frac{k^2}{L.D.},$$

$= 78$ lb.; by experiment 97 lb.

This difference confirms the view already stated, that the formula for short tubes does not apply *strictly* to tubes longer than 10 ft.

For the boiler 25 ft. long, we have

$P = 109$ lb.; by experiment 127 lb.

A less difference between the experimental and calculated result, as would have been anticipated from the shorter length of the flue.

It will be observed that even these experiments, upon full-sized boilers, are remarkably consistent, and offer no discrepancies which cannot be easily explained consistently with the general formula.

CLAYTON AND GOODFELLOW'S IMPROVEMENT IN PISTONS FOR PUMPS.

PATENT DATED JUNE 3RD, 1858.

THIS invention, by William Clayton and Jacob Goodfellow, of Blackburn, relates to the pistons or buckets employed for lifting or forcing pumps, and in the air pump of steam engines, and is designed for preventing particles of sand, "grit," &c., from passing between the piston and the cylinder. The improvement consists in extending the depth of the piston packing, so that it may project or stand above the piston cover, the upper edge or flanch of such projecting packing being bevelled inwards so as to prevent the lodgment of sand, &c., on the flanch, and to ensure its deposit on to the top of the piston or to be carried off by the water, and thereby prevented from working or grinding between the piston and the cylinder to the great injury or destruction of both.

FIG. 1.

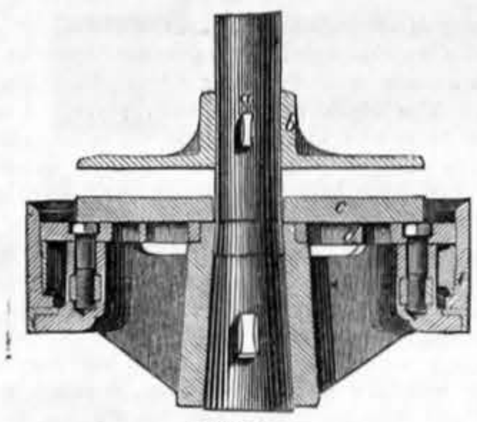


FIG. 3.

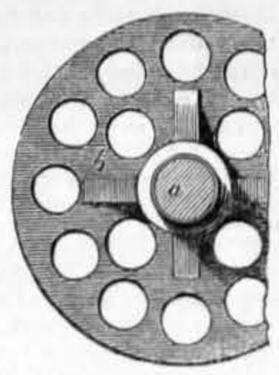


FIG. 2.

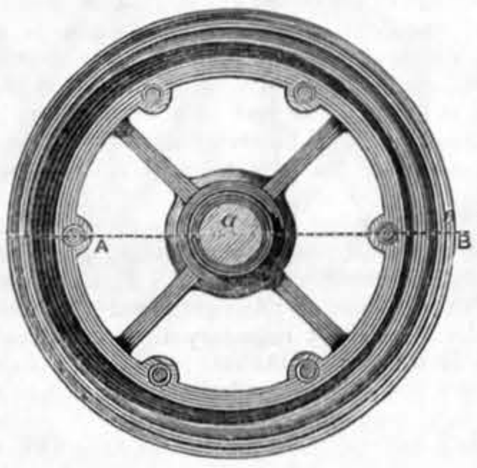


FIG. 4.

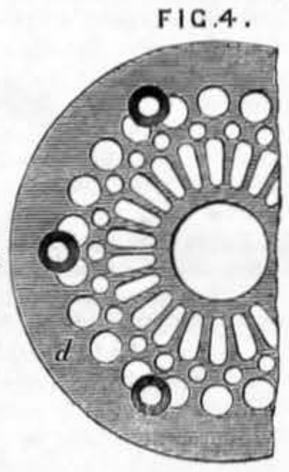


Fig. 1 is a sectional view of the piston complete, taken through the piston at the line A, B, in Fig. 2, showing clearly the extension of the packing and the internal construction of the piston or bucket; Fig. 2 is a plan view of the piston; and Figs. 3 and 4 are respectively plan views of the valve guard plate and valve seating, both of which are perforated for the passage of the liquid. In Fig. 1, *a*, *a*, is the piston or bucket rod carrying the guard plate *b*, which prevents the india-rubber disc *c* rising beyond a certain limit; *d* is the valve seating; and *e* the improved packing, having its edge bevelled, and extending above the valve seating and piston cover *d*, such extension of the depth of the packing ensuring the deposit of any grit, sand, or other extraneous matter, upon the valve seating or piston cover, whence it is removed by the flow of water through the piston, and is thereby prevented from entering or working between the packing or between the packing face and the pump cylinder face, which has hitherto caused much destructive wear and tear upon both surfaces. By the use of this improved form of packing about one-third (or more) wearing surface in depth is obtained in the packing face, which renders the packing more durable than those heretofore employed.

AUSTRALIAN TELEGRAPHS. — Electric communication between Melbourne, Adelaide, and Sydney, was opened on the 2nd November.

THE ATLANTIC TELEGRAPH.—Recent advices from Newfoundland state that several signals have been recently received there *via* the Atlantic cable, including the name "Henley." It is believed, however, that the Valentia office has been entirely closed for some time, and the report is probably a hoax.

PROGRESS OF MASONRY AT THE VICTORIA BRIDGE.—At the great bridge at Montreal one of the piers, containing 12,600 tons of masonry, was commenced on the 16th of September last and finished on the 4th of December, the time occupied being seventy-nine days, working about eighteen hours daily. The average amount of masonry placed in position was ten tons an hour, or two cubic feet per minute.

TRADE OF RUSSIA.—The value of Russian exports in 1857 was 169,688,134 roubles, those of 1856 having amounted to 160,247,872 roubles. The value of imports was 151,686,799 roubles in 1857, as compared with 122,562,442 in 1856. Of gold and silver specie the imports in 1857 were 8,775,727 roubles, and the exports of gold and silver ingots 23,670,076 roubles.

AUSTRALIAN EMIGRATION.—Messrs. Cornish and Bruce, the Australian railway contractors, having addressed a letter to Mr. Bright, M.P. for Birmingham, offering to find employment for 1,000 masons and 2,000 navvies, the masons' society in Melbourne have drawn up and published a lengthy rejoinder, addressed to Mr. Bright. They assert that Messrs. Cornish and Bruce cannot employ such a number of masons, and that their object in writing to England for men is to enrich themselves by sacrificing the welfare and happiness of the industrious classes. Accounts from Australia state that the labour market was never so abundantly supplied as it is now, and, with this fact before us, were the invitation of Messrs. Cornish and Bruce responded to, the addition of 2,000 or 3,000 people to the Australian working population might certainly be the means of enriching the contractors, but it would be ruinous to the interests of the workmen.

MR. ARMSTRONG'S GUN.—The Trusty floating battery underwent on the 5th inst. the test of Armstrong's 32-pounder long range gun at ranges varying from 200 to 400 yards. The vessel had been towed to Shoeburyness flat, where she was moored broadside to the southward. The gun, which loads at the breech, was charged with a 6-pound cartridge, and one of Armstrong's invented shot. The shot are about 10 in. and a-half long and about 4 in. in diameter; the shot are covered with lead, the outer end of some of the shot very much resembles the circular ends of Mr. Hall's rockets; others from a square of about an inch and a-half; the barrel of the gun is rifle-fluted down to the chamber. The target was marked chequered, taking in three ports of the broadside. Some common shot were fired, none of which exceeded 400 yards; these shot started the plate bolts, woodwork inside the plates, beam knees, decks, &c. One of the newly invented shot steel-pointed was then fired, which drove in a portion of one of the plates, went through the side, tearing away one of the beams, deck, &c., and passed out over the upper deck; another embedded itself in the shattered plate and lodged in the woodwork, the outer end being just flush with the surface of the plate. From twelve to fourteen shots were fired with great accuracy on the part of the artillery officer who on each occasion laid the gun, and placed his shot within a foot or so, in every instance, where requested on the target part of the ship's side. Some idea may be formed of the power of the gun from the following statement:—The 12-pounder gun at Shoeburyness has passed 1,500 of the newly invented shot, one of which, at 800 yards' distance, passed through a solid body of oak timber 9 ft. thick. Mr. Armstrong now proposes bringing out a gun of much larger calibre to carry a 56-pound shot. The whole broadside for a considerable distance before and abaft the target is started in every direction. One shot separated one of the plates, splitting the plate through about one-fourth of the square of the plate.

CAPE TOWN RAILWAY.—The contractor, by his agreement with the company, undertakes to complete the whole of the works, exclusive of rolling stock, for the sum of £400,000, which also includes the amount required to pay the interest to the shareholders at £6 per cent. during construction. The works are to be commenced within the time agreed upon between the company and the Government, and completed within two years and a-half from the 5th of October last, or six months within the time required by the contract with the colonial authorities.

GAS IN THE METROPOLIS.—According to an estimate of George Lowe, Esq., C.E., engineer to the Chartered Gas Company, London, the annual consumption of coal, for the purpose of gas making in London, was then about 840,000 tons, which would yield 7,728,000,000 cubic feet of gas. The value of this volume of gas would be at 4s. 6d. per 1,000 cubic ft., £1,738,800, so that the annual sum paid to the various gas companies in London is near £2,000,000 per annum, and which is continually increasing.

UNIFORM WEIGHT FOR THE SALE OF CORN.—The movement in favour of selling and buying (wholesale) all grain, flour, and meal by a uniform quantity of 100 lb. appears to be extending. At a meeting of the Glasgow Corn Trade Association on Monday last Mr. Ure moved a resolution, which was to the effect, "that the resolution adopted here, at a meeting of the trade, on the 22nd of October last, in favour of selling all grain, flour, and meal by a uniform quantity of 100 lb. be now carried into effect, and that the same come into operation on the 1st of February next." This was seconded, and, after some discussion, it was carried unanimously.

CONVEYANCE OF RAILWAY TRAINS BETWEEN DOVER AND CALAIS.—M. Fromage, of Darnetal (Seine Inferieure), proposes to complete the communication between the railways of England and France by means of very large steamers, capable of conveying a railway train across the Channel. On the arrival of a train at Calais he proposes that it should be run on to the deck of the steamer, secured, and conveyed across the Channel to a basin in Dover, where he proposes to run the French train on to the English railway, and send it on to London. The return train, on its arrival at Dover from London, he proposes should be run on to the deck of one of those large steamers, secured in its position, and conveyed across the Channel to Calais, where, by means of certain apparatus it could be landed on the French railway, and conveyed by locomotive power to Paris. He considers this mode of railway communication practicable, easily accomplished at a moderate cost, and far superior to any scheme having for its object the construction of a tunnel under the sea, or a tubular bridge over the Channel.

NEW RAILWAY IN FRANCE.—The Minister of Public Works has approved the plan of a railway from Limoges to Agen. It is expected that the Orleans Company, which has obtained the concession, will open it to the public on the 1st of July, 1860.

LARGEST PIECE OF STEEL IN THE COUNTRY.—There is now lying at the Mersey Ironworks, Liverpool, the largest piece of steel supposed yet to be manufactured. The mass weighs upwards of 7 tons, is manufactured by Mr. Clay's process, and is intended for the piston and piston-rod (solid) of a new steam hammer, the most powerful in this country, though we believe, there are heavier in France. The forging is considered a very fine piece of work.

PRICE OF SCREW STEAMERS.—It is understood that the four large steamers, recently purchased by the Peninsular and Oriental Company, were purchased at £12 per ton—about one third of their original cost.

LEAKY IRON STEAMSHIPS.—The Cuba, a fine new iron steamer, lately foundered off Land's End, having sprung a leak in a gale. The Weser, a large iron steamer recently launched on the Tyne, sprung a leak and came near being lost on her first return voyage from New York to Bremen. It was rumoured that the Royal Mail Company's magnificent new steamship, Paramatta, had just put into Sheerness, leaky, but the report has been denied. The Persia has been said to be more or less leaky ever since her first voyage in 1856, when she run down a small iceberg.

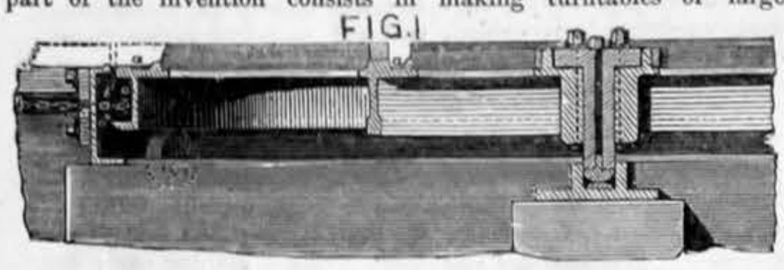
PARTRIDGE'S SUPERHEATING APPARATUS. — Mr. Lowes, chief engineer of the steamship Prince Alfred, has written from the Cape of Good Hope, giving the following particulars of the working of the superheating apparatus recently fitted to the machinery of that vessel: —"I am glad to inform you that your patent apparatus has given me great satisfaction, and I have had no trouble in the tropics with the temperature of the steam. There have not been more than 10 deg. difference since we left Milford, which happened when the tubes were nearly full of soot. We had them swept, and the steam came to the old mark on the gauge—namely, 330 deg., which is about the mean temperature. The highest temperature we have ever had is 350 deg., which occurred on the 2nd of November, the thermometer at 70 deg. We have had the thermometer up to 120 deg. in the tropics, on which occasion the steam was at 325 deg., the tubes being clear at the time. We have been 700 hours under steam, and have had no trouble with the cylinders, trunks, stuffing-boxes, &c. The same stuffing that we left London with is in now, and is in good condition. We save from twenty-five to thirty per cent. in fuel, and, as coals are very expensive in the colonies, the economy is important, and I am of opinion the apparatus will take well."

DUNN AND IRLAM'S IMPROVEMENTS IN RAILWAY TURNTABLES.

PATENT DATED 28TH MAY, 1858.

THE first part of this invention, by Thomas Dunn and William Irlam, of Manchester, relates to machinery for turning ordinary turntables by power, and consists in casting a flange at or near the lower edge of the ring of the turntable top, by which means greater strength is obtained and a saving in labour is effected. The second part of the invention consists in making turntables of large

FIG.1



dimensions with bowstring sides or with tubular stays, to avoid the necessity of deep pits. The third part of the invention is applicable to the machines called railway traversers, and consists in making the ends of the traversers' rails of iron or steel plates forming spring points, which points are depressed by the wheels of the carriage that is being pushed on to or off the traverser. Fourthly, in making the ends of the traverser rails to swivel on fixed studs, and in such wise that the inner ends overbalance the points, thereby raising the points clear of the rails while the traverser is being moved, but when an engine or carriage is being placed on or off the traverser the wheels depress the points of the traverser until they bear on the rails of the permanent way, thereby forming the inclines for the wheels of the carriage. Fifthly, in placing the cross tram rails for the traverser on different levels, the outer rails are level with the permanent rails and the inner rail or rails are raised sufficiently to act as guides; by these improvements the low shelving of the traverser may be brought lower than heretofore. And, sixthly, in making a portion or portions of the cross tram rails for the traverser capable of being raised and lowered by levers, screws, or other suitable machinery, so that one end of the traverser may rest on the main line or that the whole traverser may rest on the main line when the engine or carriage is rolled on to or off the traverser, and that the whole traverser may be raised when it has to be moved laterally.

Fig. 1 is a section of part of an ordinary turntable, illustrating the first part of the invention. *a* is the top of the turntable, to which is cast the pulley or ring a^1 in the usual manner; to this ring is cast the flange a^2. The end of the chain *b* is attached to the ring a^1, and after passing round the guide pulley b^1 it is connected to a crane or other suitable mechanism, by means of which the turntable is moved round. It has hitherto been customary to make the flange a^2 of angle iron rivetted to the ring a^1, which mode of construction is very expensive, and necessitated holes to be cut or drilled in the ring a^1, thereby weakening it; according to the improvement of casting the flange a^2 with the pulley or ring of the turntable top, greater strength is obtained at less cost.

Fig. 2 is an elevation of a turntable of large dimensions, to which the improved bowstring sides are supplied. The platform consists of the side beam *c*, and cross beams c^1, which support the rails c^2; the platform swivels upon a centre, and runs upon rollers in the usual manner. *h*, *h*, are the ends of the rails of the permanent way. The sides of the platform are made on the bowstring principle, that is to say, each side consists of five or other suitable number of planks *d*, sprung into the shape of a bow, and stayed from the side beams *c* by the uprights d^1; the planks *d* are secured to the beams *c* by the bolts d^2, and the whole is made rigid by the diagonal stays d^3 and longitudinal tie rods d^4.

Fig. 3 is a side elevation of a railway traverser to which the improved spring rail is applied; the body of the traverser and the wheels upon which it moves are constructed in the usual manner. To the low shelving *f* are fixed the iron or steel plates *g*, the ends of which project beyond the low shelving *f*, to form springs. The

FIG.2.

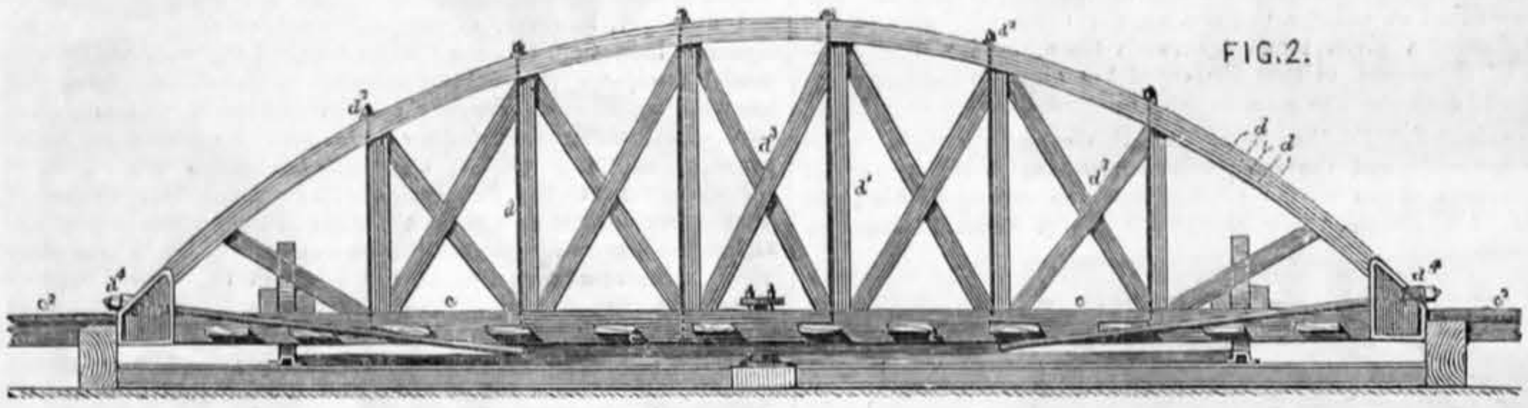


FIG.4.

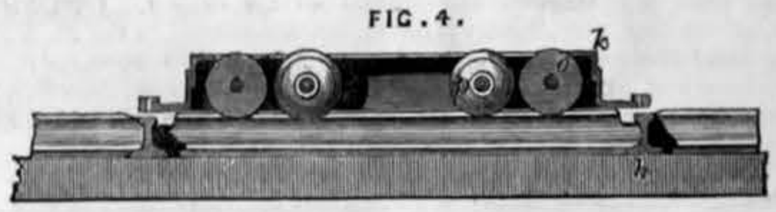


FIG.7.

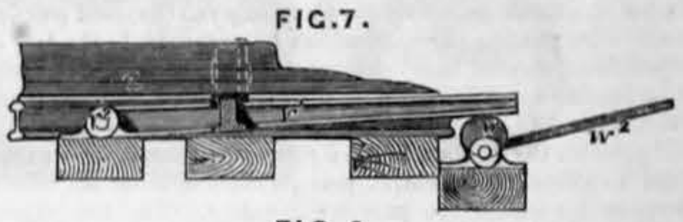


FIG.3.

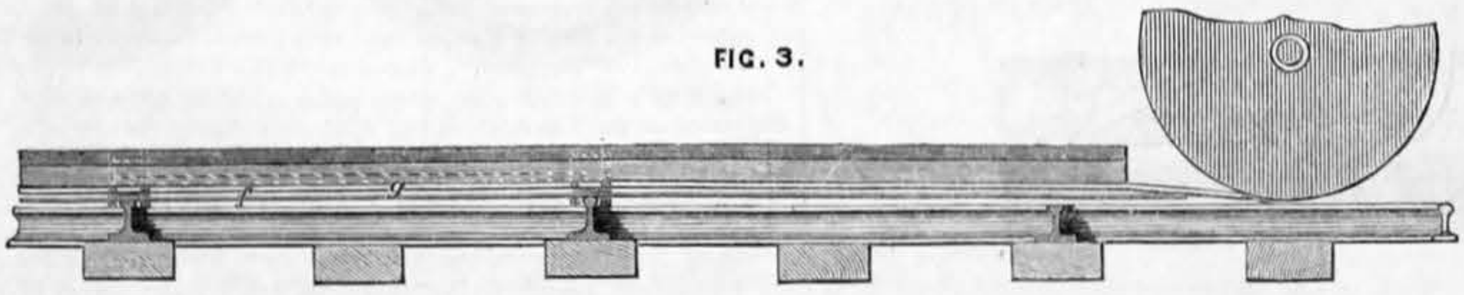


FIG.5.

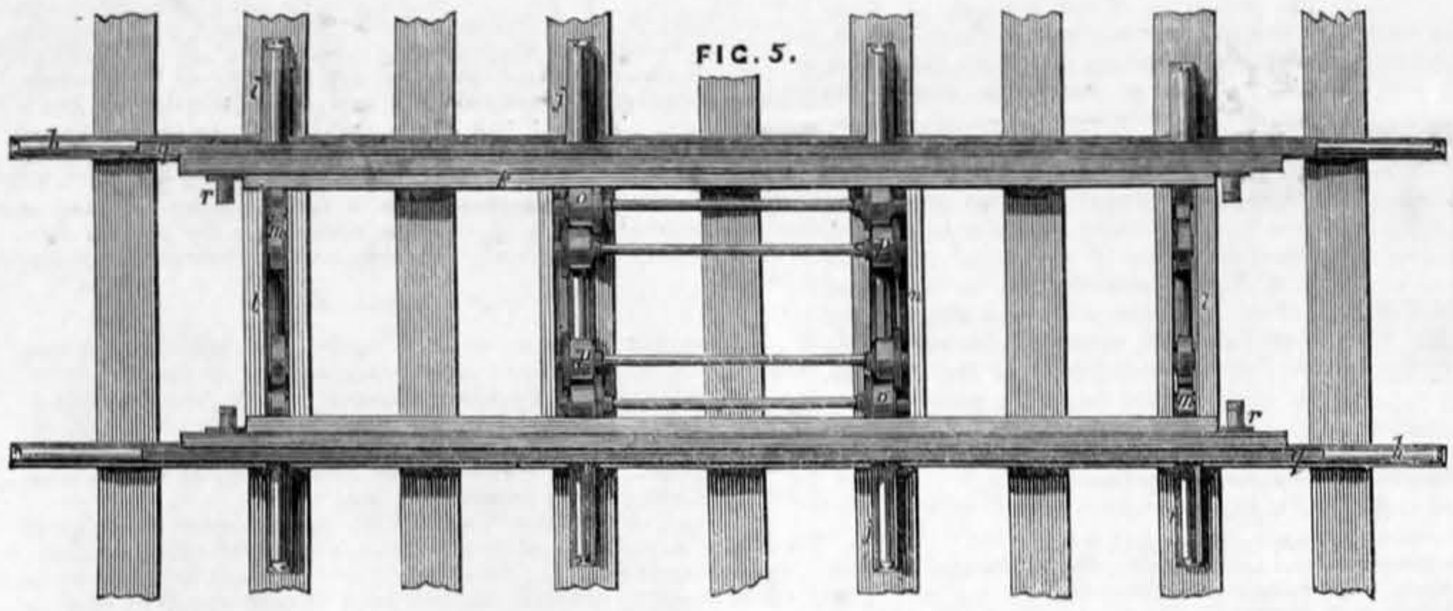
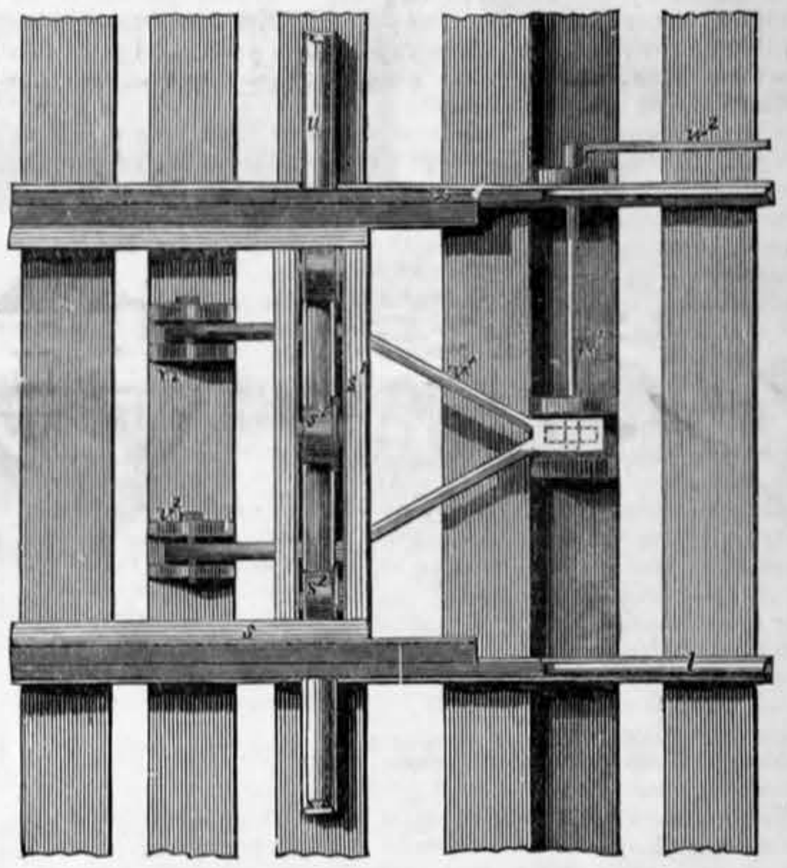


FIG.8.



plates *g* are fixed to the low shelving *f* by screw bolts or otherwise, and it is preferred to place the last bolt or rivet at about twelve inches from the ends of the low shelving, so that when the points of the spring are depressed by the wheel of the carriage, the springs may have more liberty of action than if the points of attachment were nearer the ends of the low shelving. It is evident that when the carriage wheels depress the points of the plates *g*, as shown to the right hand of Fig. 3, the ends of these plates form the inclines for the carriage wheels to run up or down, and that when the carriage is on the traverser or when there is no carriage on the traverser, the spring of the plates *g* raises the points or ends above the rails of the permanent way, consequently the traverser can be moved along its cross rails without obstruction from the points, which are entirely self-acting.

Fig. 4 is a transverse section, Fig. 5 a plan, and Fig. 6 a side elevation, of a railway traverser, illustrating the fourth and fifth of the improvements; *h*, *h*, are the rails of the permanent way; *i*, *i*, are the two outer cross rails for the traverser, which are on the same level as the rails *h*, *h*; and *j*, *j*, are the two inner cross rails, which are raised a little above the rails of the permanent way. The traverser consists of the side beams *k*, *k*, each formed of two angle irons, and end cross beams *l*, *l*, in which are the bearings for the axles of the wheels *m*, *m*, running on the cross rails *i*, *i*, and the intermediate cross beams *n*, *n*, in which are the bearings for the wheels *o*, *o*, and *p*, *p*; the wheels *o*, *o*, have internal flanges, and the wheels *p*, *p*, have external flanges; these flanges pass on each side of the cross rails *j*, *j*, which thus act as guides to the traverser. In shorter traversers, one cross rail *j* will be sufficient.

The cross tram rails *i* and *j* must be cut away near the rails *h*, so that the lines of the permanent way may be unobstructed when the traverser is not in use.

The points *q*, *q*, of the traverser swivel upon fixed studs *r*, *r*, Fig. 6, and the inner ends of the points overbalance the outer ends, consequently the points have been depressed by the wheels of the carriage, as shown to the right of Fig. 6, they regain the position shown at the left-hand end of Fig. 6, that is to say, the inner ends being heavier than the outer ends, lift the points clear of the rails of the permanent way; the joint between the low shelving rail of the traverser and the points is scarfed and overlapped. By means of these improvements the low shelving of the traverser can be brought lower than heretofore.

Fig. 7 is a partial elevation, and Fig. 8 a plan of the machinery required to illustrate the last part of the invention. The traverser may, in this instance, be made without moveable or flexible points, as the object of these improvements is to raise and lower certain portions of the cross tram rails, to accomplish the same object as the moveable or flexible points. *t*, *t*, are the rails of the permanent way. The traverser consists of the low shelved rails *z*, *z*, side beams *s*, *s*, and cross beams s^1, s^1, supporting the wheels or rollers s^2, s^2. The cross tram rails *u*, *u*, between the rails *t* of the permanent way, are placed a little above the level of the said rails, in order that the flanges of the wheels s^2 may pass over them without obstruction, but that portion of each cross rail placed between the lines of the permanent way and marked *v*, is fixed to a frame v^1, which hinges at v^2, v^2, and bears upon the eccentric *w*; each of these eccentrics is fixed on a shaft w^1, furnished with a handle w^2. The mode of operation is as follows:—When it is requisite to remove a carriage from one line of rails to another, the traverser is brought over the lines of the permanent way, as shown in Fig. 8, and the eccentrics *w* are turned with their full parts down, the low shelving *z* of the traverser then bears upon the lines of the permanent way, and the carriage to be moved is then run thereon in the usual manner; the eccentrics are then brought into the position shown in Fig. 7, to raise the cross rails *v* to the level of the cross rails *u*, the traverser with the carriage upon it is then moved along the cross rails, the flanges of the wheels s^2 being clear of the rails *t*, *t*. When the carriage is to be run off the traverser, either one or both the rails *v* are lowered by turning the eccentrics *w*, as above described. Screws or other suitable mechanism may be employed to raise and lower the rails *v*.

THE FIRST BREATH OF THE STEAM-PRESS.—Having taken his measures for securing the receipt of early intelligence, Walter began to be impatient at the slowness of the process by which it was issued out to the public, and, for some time after 1804, had been in silent confederacy with an ingenious compositor, named Thomas Martyn, who had been visited with an idea of the practicability of working the press without manual labour. So violent was the opposition of the pressmen to any scheme of the kind, that the experiments were all to be made in the greatest secrecy; but the enterprise came to a dead lock for want of funds; the old logographic printer, who was still the principal proprietor, coming to a resolution to advance no more money for the purpose. Still, his son, the manager, cherished the idea, and, in the year 1814, gave an opportunity to Frederick Kœnig, a Saxon printer, and his friend Bouer, of maturing a scheme which they had in their heads. The machinery was set up in secrecy and silence; a whisper that something was going on had got among the printers, and they had not scrupled openly to declare that death to the inventor and destruction to his machine awaited any attempts to introduce mechanism into their trade. At last all was ready for the experiment; the pressmen were ordered to await the arrival of the foreign news, when, about six o'clock in the morning, Walter entered the room, and announced to them that the *Times* was already printed—by steam! He then firmly declared that, if they attempted violence, he had sufficient force at hand to repress it; but that, if they behaved quietly, their wages should be continued to them till they got employment. The men wisely saw that resistance would only lead to their ruin, and gave in to the power of steam. On that morning, the 29th of November, 1814, the readers of the *Times* were informed that the "journal of this day presents to the public the practical result of the greatest improvement connected with printing since the discovery of the art itself. The reader of this paragraph now holds in his hands one of the many thousand impressions of the *Times* newspaper, which were taken off last night by a mechanical apparatus. A system of machinery almost organic has been devised and arranged, which, while it relieves the human frame of its most laborious efforts in printing, far exceeds all human powers in rapidity and dispatch."—*The History of British Journalism. By Alexander Andrews.*

SPONTANEOUS COMBUSTION.—The ship Meroo, from the Sand Head, Calcutta, for London, and loaded with seeds and jute, took fire and was entirely burnt on the 28th of November, from the spontaneous combustion of the cargo.

THE DARLINGTON IRON COMPANY'S WORKS, at Darlington, are fast approaching completion, the roof over the rolling mills, when completed, will be a splendid structure, the wrought-iron principals are the same as covered the centre aisle of the Art Treasures Exhibition, at Manchester, they are 56 ft. 6 in. span, and form a perfect half circle, and are placed two in width, forming a total span of 113 ft. by 420 ft. long. They are placed on cast iron columns 15 ft. high, and, being perfectly free from inside tie rods of any description, have a very light and airy appearance, and will, undoubtedly, form the most complete and perfect roof for a rolling mill in the United Kingdom. The building will have a noble appearance from the North Eastern Railway, the main line of which, from York to Newcastle, passes directly in front of the works, and is connected therewith by sidings, &c. The works also comprise spacious foundries, fitting shops, blacksmiths' shops, &c. The engines and principal part of the machinery have been constructed at the Pendleton Ironworks, Manchester, and combine all the latest improvements with the most perfect workmanship. Mr. J. B. Statham, of Manchester, has been the architect for the buildings, and the whole has been erected under the superintendence of Mr. W. Baringham. We understand that the works will commence next month with an order for rails for the Eastern Bengal Railway Company, and it is expected will shortly employ about 500 workpeople.

FRENCH RAILWAY RECEIPTS.—The traffic returns on the Eastern of France Railway, from the 1st of January to the 30th of December, 1858, both inclusive, amounted to £2,168,337, against £1,921,063 in the corresponding period of 1857, showing an increase of £247,274; on the Northern of France to £2,203,481, against £2,059,084 in the corresponding period of 1857, showing an increase of £144,397; on the Western of France to £1,731,273, against £1,671,617, showing an increase of £59,657, and on the Southern of France to £723,502, against £582,154, showing an increase of £141,349. The receipts for the same period of 1858 on the Paris and Orleans Railway amounted to £2,335,950, against £2,293,381 in the corresponding period of the preceding year, showing an increase of £42,569. The receipts on the Paris, Lyons, and Mediterranean Railway amounted to £3,267,274 against £3,168,598 in the preceding year, showing an increase of £98,676. The receipts on the Lyons and Geneva for the same period of 1858 amounted to £193,924 against £105,961, showing an increase of £87,963. The total receipts of those seven railways during the above 364 days of 1858 amounted to £12,623,741 on 4,985 miles of railway, and for the corresponding period of 1857 to £11,801,858 on 4,481 miles, showing an increase in the receipts of £821,883, or about 7 per cent., and in the mileage of 504 miles, or 11¼ per cent.

LETTERS TO THE EDITOR.

(We do not hold ourselves responsible for the opinions of our Correspondents.)

INDUCTIVE RETARDATION IN SUBMARINE WIRES.

SIR,—Having found it impossible, last week, to reply to the admirable letter of "X. Y. Z.," which appeared in THE ENGINEER of the 31st ult., I trust to your kind indulgence to give to the few remarks which I have now to offer a place in your next number, the more especially as I find that in consequence of the pressure of other duties I shall not be able to continue the discussion any further, although I shall be always glad to listen as a respectful auditor to "X. Y. Z.," or to any of your other correspondents on this most interesting subject. My object in addressing you upon it, first of all, was simply to point out the fact that the idea of employing a return-wire, instead of the earth, to obviate the effects of induction in long submarine lines—an idea which Mr. Tatlock believed to be entirely his own—had not only occurred to myself, but had, as I afterwards found, been patented in 1855. This patent was taken in the name of Professor Gordon; but it now appears that the real patentee was M Werner Siemens, of Berlin—a name eminent in the science of electro-telegraphy, and who, as your readers may be aware, was the first to observe and make public the singular phenomena of induction in subterraneous wires. His interesting paper on this subject appeared in the '*Annales de Chimie*" for 1850, vol. xxix., and was only brought to sne notice of Dr. Faraday in April, 1854, or four months after he had published his own experiments on the subject. With his usual candour, Dr. Faraday immediately transmitted to the *Philosophical Magazine* (in which his own lecture had appeared) a summary of M. Siemens' paper. It is not surprising, therefore, that Siemens, who had been the first to observe these effects in the system of underground wires, at that time exclusively adopted in Prussia, should have been the first to endeavour to apply an effectual remedy for them; and it strikes me as remarkable that a man like Siemens, who must have enjoyed the most ample opportunities for putting the plan which he proposed to the test of rigid experiment, should have neglected to do so before incurring the considerable expense of a patent in this and other countries. This I can scarcely believe, and yet I have seen no account of any experiment on the subject which I consider decisive, or even as calculated to afford the slightest presumption against the efficiency of the plan for which the patent was taken. The two experiments mentioned by a "Telegraph Engineer" in your journal of the 24th ult., bear entirely upon the plan for which Mr. Tatlock has—I think unwisely—incurred the expense of a provisional protection—the method, namely, of two wires in two separate cables; and the results of the experiments in both cases were such as I should have been prepared to anticipate *à priori*. It is true that, with regard to the second, the writer says:—"The above experiment was repeated by Wheatstone, upon a cable where the return-wire was in the cable itself, with similar results;" and he adds—"The above experiments, together with "X. Y. Z.'s" arguments, are conclusive on the point. Whether a return-wire be used in the same casing, or as a separate cable, induction is manifested. Return currents, retardation, prolongation, are still visible, but to what extent experiment alone can show. Mr. Tatlock's proposal is therefore valueless."

Now there is not one word of all this with which I do not agree. I believe that Mr. Tatlock's proposal is valueless, because I believe that the use of two wires in separate cables would not diminish the effects of induction in the slightest degree. I believe also that, even with the two wires embedded in the same cable, the effects of induction would still be visible; but what I contend is, that in the latter case these effects could, by a proper construction of the cable, be so greatly diminished as to prove of immense advantage in the working of long submarine lines; and this is to some extent conceded, even by "A Telegraph Engineer" himself, when he says, that to what extent the effects would still be visible experiment alone can show.

There is no doubt that, reason as we may, experiment must decide the point at last. Even the partial success of the Atlantic cable has shown that experiment is the great arbiter to which we must appeal in the last issue on all cases connected with that mysterious agent which works in the electric telegraph wire. At the same time, a little cautious theory may help us in correcting or avoiding rash deductions even from the results of experiment; and, acting on this principle, I am not prepared to admit that the results obtained by Professor Wheatstone in the case to which "A Telegraph Engineer" refers, afford any good ground for believing that the effects of induction might not be obviated to a great extent, or almost entirely neutralised, by a properly constructed cable on the principle of M. Siemens' patent. Professor Wheatstone's experiment was performed on the cable intended to be laid across the Mediterranean, from Spezzia, on the coast of Italy, to Corsica. It was 110 miles in length, and contained six copper wires, one-sixteenth of an inch in diameter, each separately insulated in a covering of gutta-percha only one-tenth of an inch in thickness, the wires being arranged in a circle of half an inch in diameter, and only one-fifth of an inch from the internal surface of the iron envelope. Now, leaving out of view the necessary proximity of the wires in this case to the outer surface and to each other—affording so much scope for induction—we cannot draw any conclusion from the experiment unless we know in what precise order the wires were connected with each other, because unless this was such as to give alternate currents in either direction successively, so as to produce a symmetrical or balanced system of inductive forces, the experiment proves little or nothing as regards the point under consideration. Altogether the system was too complex, the wires were too numerous, too near each other, and too near the iron envelope, to permit the cable to be advanced, with any justice or reason, as a fair subject of experiment for our present purpose. And, moreover, the cable was in a coil, which renders the experiment, however valuable in itself, utterly "valueless" for that particular purpose for which it is adduced by your correspondent. Who that knows anything of electricity (and your correspondent I believe knows much) would undertake to find in such a cable, so coiled, one vast mass of inductive action and reaction?

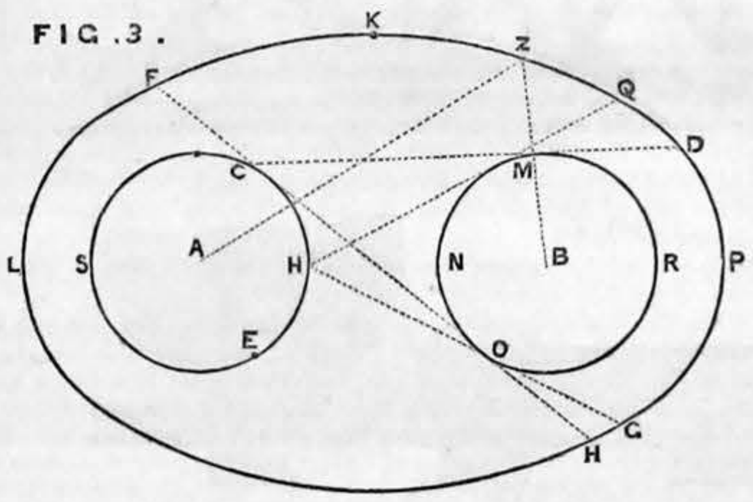
And yet, as a set-off even against this experiment, we have Mr. Whitehouse's testimony, who states that in a cable 166 miles long, and containing three wires, so as to afford an available length of 498 miles, he found that the inductive influence exerted by either of the wires on the others was only a ten-thousandth part of the entire current transmitted. In this experiment, however, we are not informed as to the actual condition of the cable, and I consider it, therefore, to be also of little value for the purpose more immediately under review, except as showing that the one wire exerts an almost inappreciable inductive action on the other; and this, if fully confirmed, would be indeed a most valuable result.

Leaving the region of experiment, in which we have found nothing satisfactory or conclusive—nothing even strongly presumptive, except in so far as the result of the experiment just mentioned is highly encouraging and favourable to the plan proposed—I now come to "X. Y. Z." and the region of theory. And here I confess that I remain unconvinced. I shall not deny that I may have expressed myself too strongly if I said that in such a cable as that proposed static induction would not take place to any *appreciable* extent. After the very clear, although, I think, very exaggerated exposition of the action given by "X. Y. Z.," I am willing to withdraw that word, and to substitute the term *considerable*. We are, therefore, making some progress. On the other hand, however, I think it would be easy to show, as I have previously hinted, that the injurious effects of the static induction which would still occur would be partly compensated by that dynamic induction which evidently showed itself in the experiment last mentioned.

The fallacy which appears to me to pervade "X. Y. Z.'s" reasoning consists in his ignoring the necessity of a certain thickness of the insulating case as compared with the size of the wires. Allow me to state distinctly, that for Siemens' arrangement to act efficiently, I conceive it to be necessary that the two wires should be embedded pretty near to each other, and as nearly as possible in the centre of a considerable thickness of gutta-percha or other insulator. "X. Y. Z." seems to think that the thickness of this insulating coat is of no consequence—that if the principle holds good for a thick covering, it ought to hold good for a thin one. Now I mention, on the contrary, that one of the essential and vital elements of success is a certain proportion between the thickness of the insulating medium and the distance between the two wires; because, with a certain proximity of the wires, we can render each of them virtually the centre of the system by sufficiently enlarging the section of the surrounding insulator; and the more that we enlarge this section, the more will each of the wires, having a given interval between them, hold virtually the place of the centre, so that the equal but opposite inductive influence of each shall be more equally diffused all around.

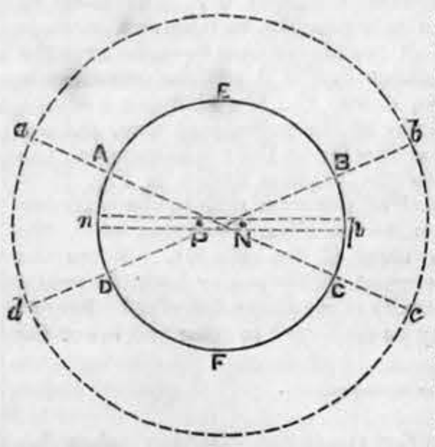
Now, in "X.Y.Z.'s" article I find this essential condition entirely ignored; and the same will be obvious, I think, to any of your readers, if you will have the goodness to reproduce his third figure. I do not ask you to reprint his fourth figure, because in

FIG. 3.



that he has omitted the insulating medium entirely, except in the interval between the wires. But looking merely at the figure before us, the first thing which strikes an observer is the miscroscopic magnification of the wires A B as compared with the thickness of the insulating envelope R P, and also the elliptical form which he gives to this envelope. It is true that it might be necessary to enlarge the wires to afford space for his geometrical demonstration, but if so, the envelope might have been enlarged in proportion. Here its thickness on each side of the wires is not more than one-fourth, or at most one-third, the diameter of each, whereas in the cable which now lies buried in the Atlantic, the internal strand of seven copper wires is only $\frac{1}{10}$th of an inch in diameter, and the diameter of the surrounding gutta-percha is three-eighths of an inch.

In the section, as represented by "X. Y. Z.'s" figure, above given, it requires no measurement or calculation, or geometrical lines, to show that the inductive action exerted by each of the wires would be little, if at all, diminished by such an arrangement. The result would be much the same as if two separately insulated wires were simply placed side by side; and in that case I have all along admitted that inductive action would take place as before, and that little or no benefit would be derived. But now let us take the arrangement represented in the annexed figure, in which P and N are assumed to be the two wires in section, and A E B C



the circumference of the insulating envelope, composed of gutta-percha or caoutchouc, tarred hemp, &c. It is obvious that in such an arrangement as this the inductive influence of the positive wire P, and that of the negative wire N, must tend to almost neutralise each other around the entire circumference A E B C D. At E and F they will perfectly neutralise each other, and even at the points A, B, C, D, the wires are so nearly equidistant that the inductive action of the one must greatly counteract that of the other. The only spaces exposed to the entire and exclusive action of each wire, and not affected by the other, are those represented by p and n between the parallel dotted lines. In each of these small spaces alone may each of the wires be supposed for the present to act with its entire inductive force. Even in the penumbral spaces p B, p C, n A, n D, each of the wires will act with continually increasing effect in opposition to the other the further that we recede from the centres p and n. And on arriving at B, for example, if the distance from B to N were equal to only half the distance from B to P the inductive effect of N at B would be equal to four times the inductive effect of P at the same point, because, as "X. Y. Z." justly observes, the inductive action is inversely as the square of the distance of the inducting surfaces. Even in this case the action of P would diminish the effect of N by one-fourth; but I think it may be safely assumed that the ratio of the distance B N to B P, could be rendered practically as 5 : 6; in which case, supposing the inductive action of N at B to be 36, that of P at B would be 25; or in other words, P would so far counteract N as to allow it to exert only two-sevenths of its natural inductive effect at the point B; and in proceeding from B to E, even this small fraction would go on rapidly decreasing at a constantly higher rate, as it approached O. It is evident, in fact, that for at least 45 deg. on each side of E, the inductive action of P and N would almost entirely and absolutely neutralise each other.

I have hitherto supposed that the small spaces, p and n, which lie between the parallel dotted lines, would each be exposed to the inductive influence only of the nearest wire; but if it be true, as Dr. Faraday affirms, that induction is capable of being exerted in curve lines, the effect of N at p, and that of P at n, would each be partially neutralised even at these points. From certain experiments of Professor Riess, I have sometimes been inclined to doubt the existence of the inductive action exerted in this anomalous manner; but any conclusion that is stamped with the venerated name of Faraday must ever command the highest respect; and in this case, I gladly accept his dictum as furnishing the only addition that was wanting to diffuse the divided influence of the wires around the entire circumference of the gutta-percha or other insulating medium.

Enlarge this insulating medium so as to embrace the sectional area, *a b c d*, and supposing the distance between P and N to remain constant, it is evident that the inductive action of each would be still more equally diffused around the external surface, because the ratio of *b* N : *b* P, for example, is more nearly a ratio of equality than B N : B P.

On "X. Y. Z.'s" remarks, with reference to the practical considerations involved in the construction, the paying out, and the difficulties in case of fracture connected with a cable of this description, I shall say nothing, for two reasons: first, because the construction of a cable of this kind involves nothing new; and, secondly, because I conceive that the question which chiefly interests us at present is this—Would such a cable diminish to a great and important extent the effects of induction?

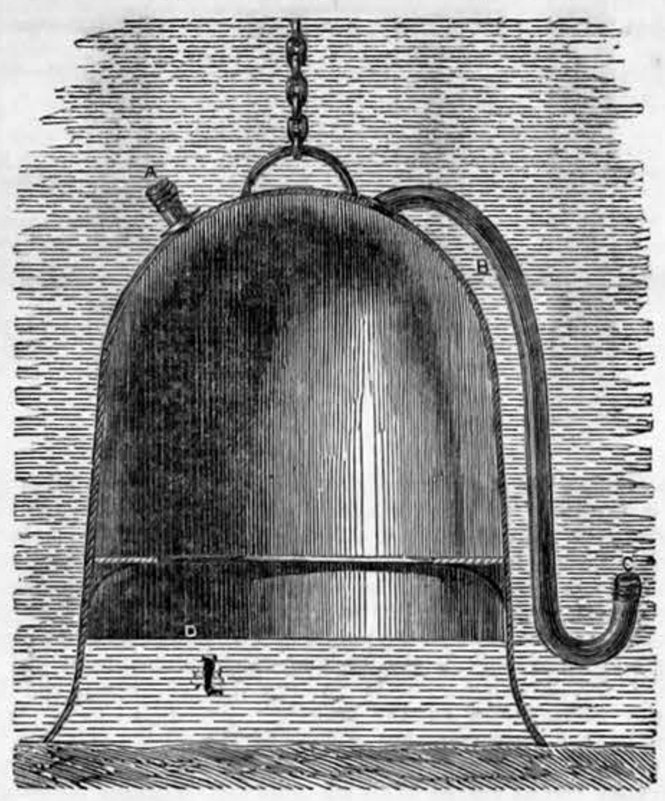
I have also said nothing with reference to the static induction which would be exerted between the two wires, because I conceive, both from Mr. Whitehouse's experiments already alluded to and from the small surface which they present to each other, that this would be very small.

I have yet, however, to add one word on the subject of the dynamic induction, because I believe that in this we should find a useful coadjutor in working a cable of this kind. It is well known, as one of Faraday's great discoveries, that when two wires, either extended or in a coil, are placed in juxtaposition, and a current is transmitted through one of them, that current, at the moment of its transmission, excites a momentary current or wave in the other in the opposite direction; and at the moment when the primary current ceases, a secondary wave or current is excited in the other in the same direction. Hence, at the instant when a positive current was transmitted through one of the wires, that positive current would strengthen or intensify the negative current in the other, and *vice versa;* whereas, at the moment of the cessation of both currents, each would tend to immediately destroy and extinguish whatever remained of the other. This I conceive to be a point which well deserves consideration; but feeling that I have already trespassed at too great length on your indulgence, I leave it to be developed by others who are better qualified than myself.

Glasgow, Jan. 10, 1859. GEORGE BLAIR, M.A.

DIVING BELLS.

SIR,—Having been a continual subscriber from the first of your valuable journal, and seeing, by last week's number, that one man nearly lost his life in the diving bell at the works of the new Westminster Bridge, I beg to inclose you a rough sketch of an application of the air pipe being fixed either externally or internally of the bell from the top to bottom, which will keep the water out of the bell in case the air supply pipe should accidentally get broken short off; as in the case referred to, it will give the man an opportunity of giving the signal to be drawn to the surface; A is showing the air pipe which is generally fixed to the

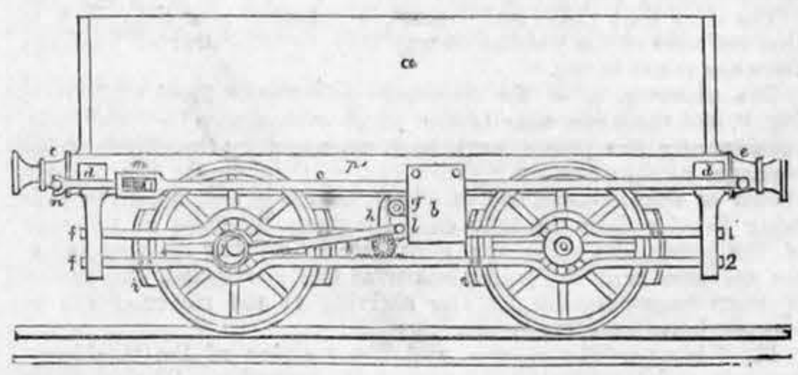


bell; B the improvement in the pipe attached to top of the bell with the bend C, which keeps the water out of the bell to the line D, and by bending a piece of pewter or other tube in a common glass globe will show the practicability of the same.

27½, Charles street, Hampstead-road, Dec. 21st, 1858. CHAS. ASKEW.

RAILWAY BRAKES.

SIR,—The frequency of railway accidents induces me to offer the suggestion that to prevent them we must have good brakes. I inclose a sketch of a brake of which I have made a working model; *a*, is a section of carriage; *b*, cistern attached to the carriage frame, and filled with water; *c*, a square rod which runs



underneath the carriage, and also through the cistern in which there is a two way lock to be opened and shut by the rod *c*. At *m* there is a slot in the rod, and a square slide, and behind this a spiral spring to keep it in proper place. This rod is attached to different carriages by means of a link and universal joints; *d* are two guard irons for brake rods f^1, and f^2; *g*, is a ram or piston which fits in a barrel that is fixed in the cistern *b*, which piston is forced out by the water that the force pump *l* forces behind it. This pump is worked by an excentric sheave which is fixed on the

carriage axle *g*. Now, by turning the rod *c* one-eighth of a revolution it allows the water to pass into the force pump, which causes the piston to be forced out against the lever *h*, and so causes the rod f^1 to be pressed backward and the rod f^2 to be pressed forward, of course tightening the brake blocks *i*, *i*, *i*, *i*, until the wheels are made to slide upon the rails. At this time the pump stops working, and to release the brake we need only turn the rod *c* one-eighth of a revolution further, when it will open communication between the barrel and cistern, and the block be forced back either by weight or spring. Thus the same water will do without waste.

I should feel much obliged for your opinion or that of any of your correspondents on the merits and defects of such an arrangement.

RICHARD ROBERTS.

Rhymney Ironworks, Dec. 28th, 1858.

BOILER EXPLOSIONS.

SIR,—The article on Boiler Explosions in THE ENGINEER of the 31st ult. induces me to offer a few remarks on the circulation of water in boilers, which I have never seen treated with the attention it deserves.

Rather more than twenty years ago I gave a good deal of time and attention to the construction of boilers, and experimenting with the same; and some years later valuable experiments were conducted by Messrs. Josiah Parkes, Charles Manby, Professor Dr. Schafhautel, and others, on the evaporative power of anthracite coal in boilers, designed and patented by myself. The chief object I kept in view was to effect a rapid circulation of the water in the boilers, as well as to secure a proper combustion of the gases generated by the fuel, as I was, and still am convinced that the danger of explosion would be greatly lessened by attention to the power, and a greater evaporative effect also produced.

In one of my first experiments with a small boiler I could not keep the water in it, on account of priming so much, and in a short time the fire-box became leaky; but after I placed a perpendicular funnel-shaped tube in the water, the top of which was an inch or two below the surface, and the lower end nearly to the bottom of the boiler, I then found the difficulty (of priming) at an end, and immediately the fire was raised the surface of the water streamed towards the funnel, and descended to the bottom of the boiler, and the heated water ascended and threw off its steam, and again descended through the tube. I urged the fire with a powerful (3 ft.) fan blast, but could not raise the water level.

I have in later years used this plan in large steam boilers with very good effect, and I feel satisfied that if tubes were placed in the side water spaces of locomotive boilers they would cause an uninterrupted descending current, and the real level of the water would be better shown by the trial cocks.

The instance you have given in the paper of the 31st ult. of the centre tubes of a boiler having been burnt out leads me to recommend as a preventive to similar accidents the fixing two middle of the tubes, the whole length of the boiler, the upper thin plates, about 2 in. apart, perpendicularly through the part of the same being level with the top row of tubes, and the lower part to within 3 or 4 in. of the bottom of the shell, the effect would be a perfect circulation of the water, and an uninterrupted descending current would be produced from end to end of the boiler between the two plates. Many methods may be adopted to cause circulation in cylindrical and other boilers which would also prevent the injury of the plates over the fire.

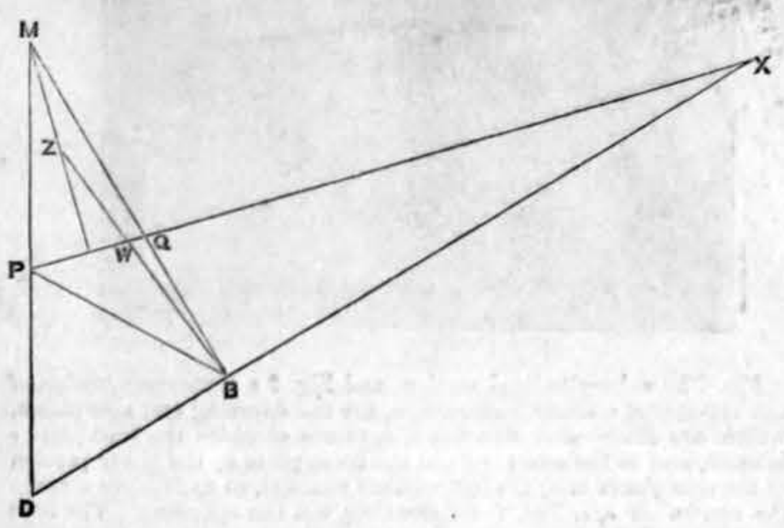
JOHN PLAYER, C.E.

Middlesbro'-on-Tees, Jan. 8, 1859.

RECTIFICATION OF THE CIRCLE.

SIR,—I beg to thank "Old Engine" for his calculation of the line BW. The approximation certainly is less correct than that resulting from my former figure, whose error (page 6, vol. iii.), is less than the $\frac{1}{500,000}$th part of the diameter. But the figure in last month's number is easily drawn, is quite uncomplicated, and true to the third decimal.

"If this won't do, try something else that will," is not a good rule, and must be changed when we get a better; however, I had a point in reserve by which to produce a greater approximation, and beg your kind permission to hand the following improvement:—



Let P be the middle, M and D the ends of the radius; on P D construct an equilateral triangle P D B, and join B M; produce D B till B × the produced part equals B M, plus B D, and join P × cutting B M in Q. Then the three sides of D B M plus the three sides of P B × equals 5·905083411 of the radius D M. The difference between the sum of these lines and the circumference will be found as follows:—From M draw a line to the middle of P Q, and upon this perpendicular line take M Z equal to one half of it, *i.e.*, draw a line from B to the middle of this perpendicular line, and join Z B, cutting P Q in W; then B W will be the difference required, *i.e.*, B W plus the three sides of D B M plus the three sides of P B × equals the circumference.

But the three sides of D × P plus D × also equals 5·905083411 of the radius D M; therefore B W plus D × plus the three sides of P D × also equals the circumference of the circle whose radius is M D.

On the rectification of the circle see THE ENGINEER, vol. iii., Nos. 61, 62, 64, 65, 66, 68, 70, 71, 72, 73.

Old *Daily Press* Office, W. E. WALKER.
21, Great Charles street, Birmingham,
January 10th, 1859.

SUBMARINE CONDUCTION.

SIR,—Since writing my last letter to you I have ascertained that the account given of Professor Faraday's experiment, in the "Encyclopædia Britannica," differs from the account of the experiment given by Professor Faraday himself (in a paper read before the Royal Institution, January 20th, 1854). From the former account it appeared that the circuit was closed by the pole of the battery being connected with the first wire, and the other pole with the earth, whilst the end of the wire was also in communication with the earth. But it appears that such was not the case, and that the current transmitted along the wire was sent from one pole of the battery solely, the other pole being insulated. Your correspondent, "A Telegraph Engineer," is therefore, no doubt, correct in the account of the experiments detailed in your journal of the 24th December.

The plan which I suggested for obviating the effects of induction was based upon this incorrect account of Professor Faraday's experiment.

JOHN TATLOCK.

January 2nd, 1859.

SMITHFIELD SHOW—OAT BRUISERS.

SIR,—The paragraph in the last letter of your correspondent "A Visiting Engineer," referring to oat-bruisers, is (unintentional, we are quite sure, on the writer's part) calculated to do us an injury by misleading your readers as to an important point of detail in the construction of our mills.

It appears that his experience is derived not from one of our mills, but, in his own words, "from one ordered from a firm of thirty years' standing, the principle of which is nearly the same as Messrs. Turner's, the brasses fitted in the same round bush style." Now we never made our larger mills with the "round bush" bearing, and long before 1854 we used bearings to which the description of wheel he has since adopted accurately applies, viz., "octagonal shaped brasses in halves with flanges at each end and fitted into the block at an angle of forty-five degrees. Proof of this we can readily furnish him, if provided with his address.

At the present time we manufacture ten varieties of bruising mills; five of these are adapted for working by horse or steam power, and the main spindles of which are carried by angular plummer blocks with brasses in halves. The other sizes being for hand use, the bushed bearings are still retained in them, and they very rarely require to be renewed.

E. R. and F. TURNER.

St. Peter's Ironworks, Ipswich, 5th January, 1859.

THE SUEZ CANAL.

A CURIOUS illustration has recently been offered of the way in which editors of French newspapers understand the liberty of the press, whenever they chance to possess it. An eminent merchant at Havre, M. Frederic de Coninck, was consulted a short time since by a working man upon the propriety of the latter investing his savings in M. de Lesseps' company for cutting a canal through the Isthmus of Suez. The prospectus holds out the hope of a *minimum* of 20 per cent. interest upon capital. The applicant for advice argued that as his savings amounted to £80, the investment in this philanthropic and patriotic scheme would give him a yearly income of £16—no trifling consideration in his position.

M. de Coninck, before offering an opinion, was anxious to examine the project in a conscientious, businesslike manner, and to ascertain its chances as a financial operation. The result appeared to him so unpromising as an investment that he considered it his duty to communicate them to his fellow-citizens. He accordingly addressed a series of letters to the local newspaper, the *Journal du Havre*, purporting to set forth what he conceived to be fallacies in the arguments favourable to the scheme, and the erroneous calculations on which they were based. Instead of being inserted in the *Journal*, the first letter was returned to its author by the editor in person, who expressed to M. de Coninck, "in the most courteous terms, his regret at being unable to open his columns to critical observations upon the company for piercing the Isthmus of Suez." Not to be defeated in his purpose, M. de Coninck has since published his letter in the form of a pamphlet, headed with this quotation, "*L'Exaggeration Révèle la Faiblesse.*" The letters are well written, the language courteous, the wit keen, the reasoning cogent. These are merits, but perhaps they were considered sufficient to justify the rejection. One is naturally curious to know why the editor of the journal was unwilling, or unable, to admit legitimate and temperate criticism on a public company. M. de Coninck's remarks seem to throw some light on the fact. "The newspapers of Havre," he says, "stop my mouth with one hand, and with the other brandish the advertisement trumpet." If this be so, the secret of the unanimous support which the scheme has received in the French press is not a mystery, and we are left to conclude that no paper will publish critical remarks on a scheme which is largely advertised in its columns.

M. de Coninck confines his criticism to the financial part of the project, for he says, "This splendid enterprise has all my sympathies, except so far as regards debit and credit, were it only to teach the English Government that in our day great things may be accomplished in the world without it, and, if needs be, in spite of it." Surely this is patriotic enough. M. de Coninck does not seek to depreciate M. de Lesseps, nor the political value of his project; he only doubts its practicability, according to the estimates that have been issued, its security as an investment, and its certainty of success as a commercial speculation. Under these circumstances, and because the letters are meant to warn people from an enterprise which the author declares will prove their ruin, the conduct of the journalist appears, to say the least, very strange.

The invitations issued by the Suez Canal Company for subscriptions have been addressed to persons with small means—*petites bourses*—whose discernment is often, unfortunately, on a par with their resources. These invitations have been accompanied with the most tempting statements of prospective profits, calculated to excite cupidity to such a point as to render the "small purses" very unreasonable in their expectations; and these in turn have been followed by appeals to that lower description of patriotism which in France is known as *Chauvinisme*. For the purpose of showing what little trust can be placed in the prospectuses of public companies, and to justify the course he has taken, M. de Coninck recalls to mind the advertisements of a certain maritime company which covered the fourth page of all the journals, from the sublime and stately *Moniteur* to the laughing *Charivari*, and which promised 40 per cent. profit upon shares which, were they realised, would produce to their holders from 60 per cent. to 70 per cent. loss. He anticipates a similar result from the Suez Canal, while fully admitting the perfect good faith of M. de Lesseps.

An important feature in the scheme is the construction of two piers at Pelusium, running out into the sea for a distance of 6,000 metres, in order to obtain a depth of water of from 7½ to 8 metres. M. de Lesseps' statement, based upon the report of the "eminent engineers," Linant Bey and Mongel Bey, is quoted, and is to this effect—that there can be no doubt as to the possibility of building these, since, a century back, the Dutch Government built a pier 8,000 metres in length in Lion's Bay, near the Cape of Good Hope, and sunk to depths greater than 16 metres. This argument, M. de Coninck observes, would be unanswerable but for one thing, viz., that no pier 8,000 metres long has ever been built by Dutch or English at the Cape in Lion's Bay, which does not exist, and the engineers have mistaken an abandoned project for works constructed; or, in other words, "*Ils ont pris des vessies pour des lanternes.*" Again, Linant Bey and Mongel Bey estimate the cost of the masonry of the piers under water at 15f. the cubic metre, which the author of the pamphlet finds uncommonly cheap when compared with the cost of masonry on land in France. On a matter so purely technical it would be presumption for any but professional men to pronounce an opinion; yet, if the Pelusium works may be judged by the standard of similar structures in Europe, the official estimate will certainly appear very moderate. Starting with masonry at 15f. the cubic metre, MM. Linant Bey and Mongel Bey assert that the cost of the piers will be 30,000,000f. Besides the piers at Pelusium there are to be others at Suez 4,000 metres long; and the Egyptian engineers just mentioned, following a like mode of estimating cost and quantities, make the estimate of expenditure on the erection of piers at both ends of the canal amount to 47,750,000f., or £1,910,000. Comparing these estimates with those for like works in England, some very curious results may be found. Taking the piers at both ends, it would appear there will be a total length of masonry to construct of 20,000 metres, or nearly twelve miles.

In the report of the Select Committee of the House of Commons on Harbours of Refuge information is given as to the cost and mode of constructing piers and breakwaters. Mr. Teasdale, the deputy-engineer of Yarmouth Harbour, proposed to build a breakwater on timber piles cased in iron, at a cost of £34 the lineal foot, and which, I believe, would be much cheaper than masonry. Yet, to build 20,000 metres upon this system, and according to this estimate, in Yarmouth, where iron and skilled labour are said to be cheap, would cost 10 per cent. more than the estimate for masonry in Egypt. Mr. Abernethy suggested the construction of a breakwater at the Mumbles, in the Bristol Channel, upon a novel system, which would effect an economy "in material and time, and consequently of money," by forming the structure of rubble work encased within a framework of creosoted timber. The Mumbles headland is composed of mountain limestone, available and close at hand, where there is an immense accumulation of copper slag by the side of Swansea river, which can be procured in any required quantity. Yet, with all these advantages, Mr. Abernethy estimated the cost of his system at £370,000 a mile; so that, supposing there were equal facilities for procuring timber and stone at Pelusium and Suez, which do not appear, and that Egyptian labour were as cheap as Welsh, the cost of the piers at both ends of the Suez Canal would be £4,440,000, or more than half of the total capital of the Suez Canal Company. The last "detailed statement relative to Harbours of Refuge," dated 6th of May, 1858, shows the estimated cost for Dover to be £550,000. Should the piers at Pelusium and Suez prove as expensive as the one at Dover, they would cost £23,000,000 sterling within a fraction, or nearly double the total capital of the company.

Leaving the question of cost, M. de Coninck examines the chances of remuneration to shareholders. He quotes the sources of revenue as given in M. de Lesseps' book, namely, 3,000 000 tons of shipping passing through the canal annually, and paying duties of 10f. a ton = 30,000,000f.; anchor dues for that tonnage, 1,500,000f.; revenue from the Nile canal on 156,000 tons, 1,560,000f.; 250,000 hectares of land, at 350f. the hectare—produce of the lands at the end of twenty years, or annually, 990,000f.; making a total income of 40,056,000f., from which will have to be deducted for maintenance, administration, and sinking fund, 1,201,680f.; leaving a net profit, out of which 15 per cent. is to be repaid to the Egyptian Government, 10 per cent. to the promoters, 3 per cent. to the directors, and 2 per cent. for retiring pensions; which would leave the shareholder nearly 13 per cent. for his money, if all the sources of revenue prove as productive as stated.

M. de Coninck next passes in review the sources of revenue. He is sceptical as to the sand downs producing any profit, and as for the lands, he shows that in Normandy, the richest and most fertile part of France, it is difficult to let land at more than 120f. the hectare, not half what the company estimates would be paid for model farms in the Arabian deserts. The revenue from the Nile appears not inappropriately to be a myth. As to 3,000,000 of tons of shipping passing annually through the canal, M. de Coninck says he should be glad to learn where M. de Lesseps discovered that 6,000,000 tons of shipping double the Cape of Good Hope and Cape Horn every year; and he also desires to be informed how ships whose course would lead them round Cape Horn can be relied upon to pass through the Suez Canal, especially since M. Felix Belly has proposed his Nicaraguan waterway.

M. de Lesseps states that the saving which passing through the canal would effect would be 32f. a-ton, from which the toll, including anchor dues, would have to be subtracted, leaving 21f.; but as this includes a presumed saving in insurance of 9f. on the ship and cargo, whereas underwriters charge from two to four per cent. more on ships navigating the Red Sea, M. de Coninck reduces the saving to 12f. a ton. At present the additional freight on coals from Aden to Suez is 30f., in consequence of the difficulties of navigating the Red Sea. Wherefore he asks, how can merchants be expected to send their goods up the Red Sea at an extra cost of 30f. to save 12f.? He shows that a ship sailing, from October to April, from the Straits, would arrive at the Cape of Good Hope in thirty-five days, from the Cape to St. Helena in fifteen days, and from St. Helena to the Channel in fifty-five, making 105 days in all. On the other hand, a ship sailing from the same point would reach Bab-el-Mandeb in thirty days, at Suez in thirty days more, would take five days to pass through the canal, and then forty-five days to sail into the Channel, or 110 days in all. The Suez route would make the passage longer by five days. In the other season the canal would shorten the passage by fifteen days, but for a ship of 500 tons it would cost 5,500f., and shippers would, consequently, prefer being the extra time at sea to paying this sum, which is at the rate of 11,000f. a month.

The most amusing part of the discussion is, that M. de Coninck shows that for any merchandise to be imported *via* Suez the whole of the French Custom House system must be changed, for it imposes a differential duty greatly in favour of the ocean route. Thus, the duty on cotton imported by the Cape of Good Hope is 72f. the ton, against 144f. the ton if imported by any other channel from non-European localities. On coffee the difference against the Suez route is as 846f. the ton to 1,026f; on indigo as 60f. to 200f. the 100 kilogrammes. So that, in order to save 12f. a-ton, and supposing the Government fixed a medium duty, merchants who imported *via* Suez would have to pay on cotton 36f., on coffee 90f., and on indigo 420f. a-ton more than those who imported by the Cape of Good Hope.

One source of revenue M. de Lesseps points out:—"The current established by the action of the locks will draw in a multitude of fish (gudgeons, probably?) both from the Red Sea and the Mediterranean."

After this estimate M. de Coninck ceases to treat the canal scheme seriously. He considers it as an Oriental allegory, and says that it is because the little fish, proceeding not only from the Red Sea and the Mediterranean, but also from the mouth of the Seine, are drawn in by the action of locks, that he raises his voice of warning, and cries aloud—"Take care, little fishes; do not get in, you will be caught; for it is on you, little fishes, that they depend to furnish large revenues!"—*Correspondence of the "Times."*

THE DANGERS OF THE DEEP.—The number of wrecks reported in 1858 was 1,887. This seems a distressingly large total.

HALLIWELL'S IMPROVEMENTS IN MULES FOR SPINNING AND DOUBLING COTTON.

PATENT DATED MAY 11TH, 1858.

FIG. 3

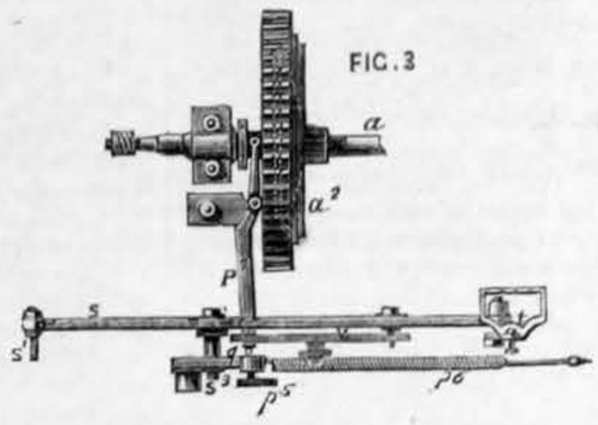


FIG. 4.

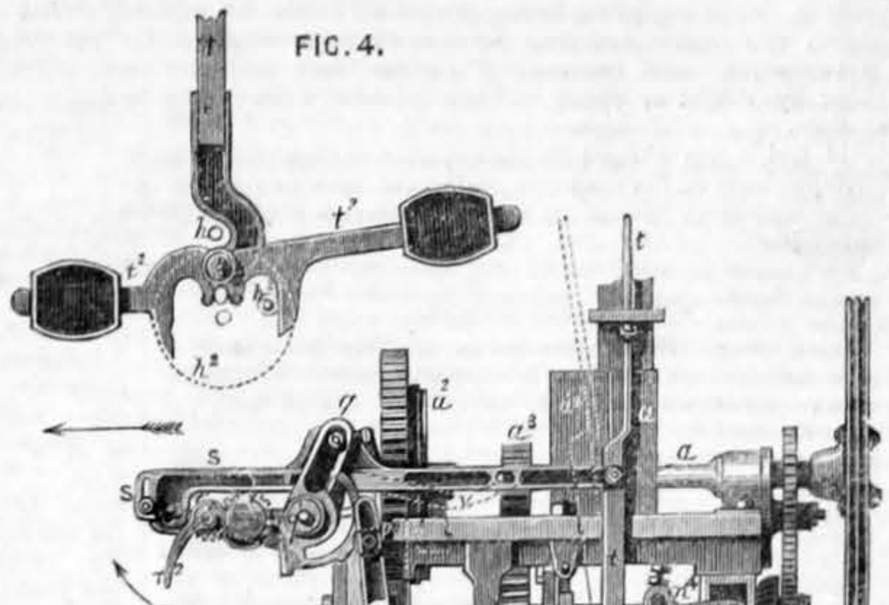


FIG. 2.

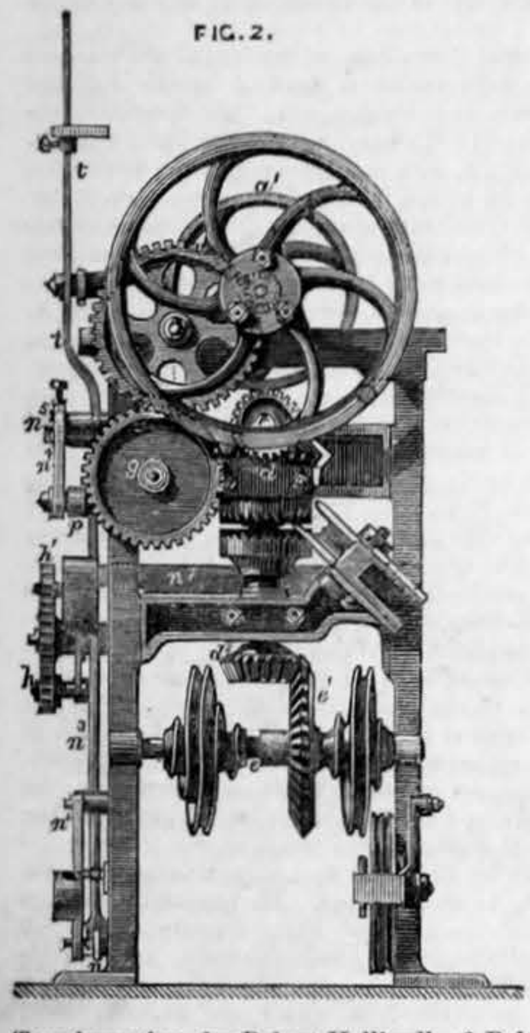


FIG. 5.

FIG. 1.

THIS invention, by Robert Halliwell, of Bolton-le-Moors, is applicable to self-acting mules for spinning and doubling, and consists of an improved combination of machinery for effecting the changes performed by the cam shaft, in the mules known as Roberts' patent self-actors.

Fig. 1 is a side elevation of a self-acting mule to which the improvements are applied; Fig. 2 is an end elevation, taken from the back of the same; and Figs. 3, 4, and 5 are detached views of parts of the improvements. *a* is the rim shaft, to which are fixed the driving pulley a^1, and backing-off friction cone a^2; *b* is the twist shaft, which is driven by a worm on the rim shaft; *c* is the lower shaft, which is driven by the spur wheel a^3, fixed to the boss of the pulley a^4, loose on the rim shaft *a*. To the end of the shaft *c* is fixed a bevel wheel c^1, which gears into the bevel wheel d^1, loose on the vertical shaft *d*; to the lower end of which is fixed the bevel pinion d^2, gearing into the wheel e^1 on the scroll shaft *e*; *f* is the front roller shaft, which is driven from the rim shaft *a* by a train of wheels shown best in Fig. 2, and by an horizontal shaft *g*; *h* is the squaring or drawing-out shaft, which is driven from the shaft *g* by differential wheels. *i* is the carriage supporting the spindles *j* and the faller and counterfaller shafts *k*, *l*. The faller motion is clearly shown in Fig. 1, and does not require to be particularly described here. *m* is the winding-on quadrant, which is worked by the pinion m^1 on the front scroll pulley shaft m^2. The parts above enumerated, and all the others necessary to complete the mule, and which are not more particularly referred to hereafter, are made in the usual manner.

The invention consists of an improved combination of parts for putting in and out of gear the machinery for drawing out and putting up the carriage, and for putting the backing-off friction cones in and out of contact. The lever *n*, which is similar to the long lever used in Roberts' patent self-acting mules, vibrates upon the fulcrum stud n^1; the front end of this lever is held up while the carriage is going out by the catch n^2, and to the back end of the lever *n* is hinged the bar n^3. To the carriage square i^1 is jointed the weighted lever *o*, furnished with a bowl o^1, which, as the carriage moves to and fro, runs on the upper surface of the lever *n*. The upper end of the bar n^3 is jointed to the horizontal arm of the bell-crank lever n^6, which is mounted on the stud n^5, fixed to the framing; to the vertical arm of the lever n^4 is jointed the horizontal rod *p*, which slides to and fro in a bracket p^1, projecting from the framing; to the rod *p* is fixed the incline p^2, which acts on a bowl projecting from the lever p^3, by which the drawing-out catch box is worked; to the rod *p* is also fixed the stud p^4, for acting on the lever p^5, shown also in Fig. 3. At the upper end of the lever p^5 is a slot in which a stud fixed to the cone fork lever p^7 enters; on this stud is mounted a bowl p^8, which is held in contact with the catch or curved plate *q*, by the spring p^6, fixed at one end to the lever p^5, and at the other to the rod *p*. The curved plate *q* vibrates on a fixed stud q^1. To the twist shaft *b* is fixed a pinion b^1, gearing into the pinion r^1 fixed to the second twist shaft *r*, which is sometimes used in mules for spinning fine numbers. To the shaft *r* is fixed the finger r^2, which, as the shaft revolves, comes against the stud s^1, projecting from the bar *s*, and raises it off the stud s^2, fixed to the framing. In coarse spinning, when the twist shaft is not required, the bar *s* is raised off the stud s^2 by a lever acted upon by the carriage. To the bar *s* is mounted the bowl s_2, taking into the slot of the curved plate *q*; the end of the bar *s* is jointed to the strap fork lever *t*, which is hinged to the stud t^1. Upon the boss of the strap fork lever *t* are fitted the weighted duplex levers t^2 and t^3. To the squaring shaft *h* is fixed the pinion h^1, gearing into the wheel h^2, to the face of which is fixed a stud for the bowl h^3, seen also in Fig. 2; this bowl is brought alternately into contact with the levers t^2 end t^3, as will be described hereafter.

The illustration represents the parts of the mule in the positions they occupy when the carriage, in going out, has performed about half its traverse. The mode of operation is as follows:—When the carriage arrives at the end of its stretch, the finger i^2 disengages the catch n^2 from the stud projecting from the long lever *o*, which being pressed upon by the weighted lever *o*, then drops on to the catch n^4; this change in the position of the long lever *n* causes the bar n^3 to rise, and consequently moves the rod *p* in the direction of the arrow sufficiently to cause the incline p^2 to throw the drawing-out catch box out of gear, thereby instantly stopping the outward motion of the carriage, the drawing rollers having been previously stopped in the usual manner; the carriage then remains stationary until sufficient twist has been put into the yarn, at which time the finger r^2 comes against the stud s^1, and liberates the bar *s*, which then moves in the direction of the arrow, being influenced by the weighted lever t^3 acting on the strap fork lever *t*, as shown in Fig. 4, which represents the parts in the positions they occupy when the carriage is out, that is to say, the bowl h^3 has then lifted the lever t^3, so that the stud projecting from it is not in contact with the strap fork lever *t*, but the stud projecting from the lever t^2 is acting on the said strap fork lever, and causes it to assume the position indicated by dotted lines in Fig. 1. As soon as the bar *s* has been liberated, as above described, by this means, the driving strap, which during the going out of the carriage had been held on the pulley a^1 and partly on the pulley a^4, is moved entirely on to the pulley a^4. When the bar *s* is moved, as above described, the bowl s^3 moves the curved plate *q* until the bowl p^8 enters the recessed part of the plate *q*, the spring p^6 then acting on the levers p^5 and p^7, press the backing-off friction cones into contact; the backing-off is then effected, and the fallers are acted upon in the usual manner; and when the faller has descended to its proper position for winding the yarn on the cops, the faller arm i^3 comes under the faller rack i^4, the upright i^5, to which is fixed the inclined piece i^6, then drops, and the inclined piece i^6 acting on the trigger n^5 disengages the catch n^4 from the long lever *n*, which then drops the second time; the dropping of the front end of the lever *n* disengages the holding-out catch *z* in the usual manner, and raises the back end of the said lever until it is latched on the catch n^8, the bar n^8 is thus again raised, and the rod *p* is moved a second time in the direction of the arrow, thereby slackening the spring p^6, and bringing the stud p^4 against the lever p^5, which, acting on the lever p^7, disconnects the backing-off friction cones; the stud p^9, projecting from the bar *p*, then presses against the strap fork lever *t*, and holds it in position

The bar n^3 in rising the second time, acts on the lever n^7, to which the putting-up catch box n^8 is connected in the usual manner; the carriage then commences running-in, and when up the finger i^7 disengages the catch n^7, the back end of the long lever *n* then drops, being pressed down by the weighted lever *o*; the bar n^3 in descending pulls the drawing-up catch box n^8 out of gear, and draws the rod *p* into its original position as shown in the drawing; the bowl h^3 has by this time raised the lever t^2 in the manner above described, and liberated the lever t^3, which then acts on the strap fork lever *t*, and brings the bar *s*, the curved plate *q*, and driving strap back to their former positions, at the same time the incline p^2 is brought from under the bowl of the lever p^3, thereby allowing the drawing-out catch box to be put into gear by the action of the spring p^{10}. The drawing rollers having been put into motion, and the fallers unlatched in the usual manner, the various parts are in their proper positions for performing another stretch.

The catch *v*, shown by dotted lines in Figs. 1 and 3, is for the purpose of keeping the backing-off cones out of contact until the curved plate *q* is brought back to the position shown in Fig. 1; it is then unlatched by the stud v^1 acting on the end of the catch *v*.

SHUTTLEWORTH'S IMPROVEMENTS IN PORTABLE STEAM ENGINE BOILERS.

PATENT DATED MAY 29TH, 1858.

THIS invention, by Joseph Shuttleworth, Lincoln, has for its object improvements in portable and other steam engine boilers. For these

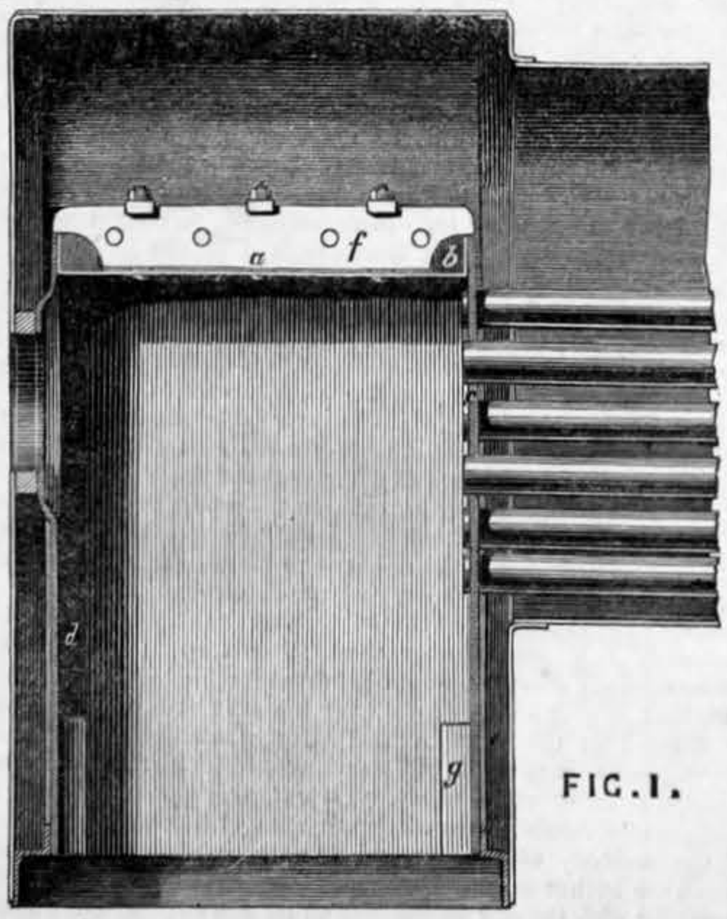


FIG. 1.

purposes, in constructing the fire-boxes of steam boilers, the covering and side plates are made with flanches, which project upwards and outward, and to which the tube plate and front plate are fixed, leaving lower portions of the side plates without flanches, with a view to leave space for cleaning out the sediment. The upper edges of the flanches of the covering plates and of the tube and front plates receive the ends of the bars or stays, which strengthen the covering plate, and give support to such bars or stays.

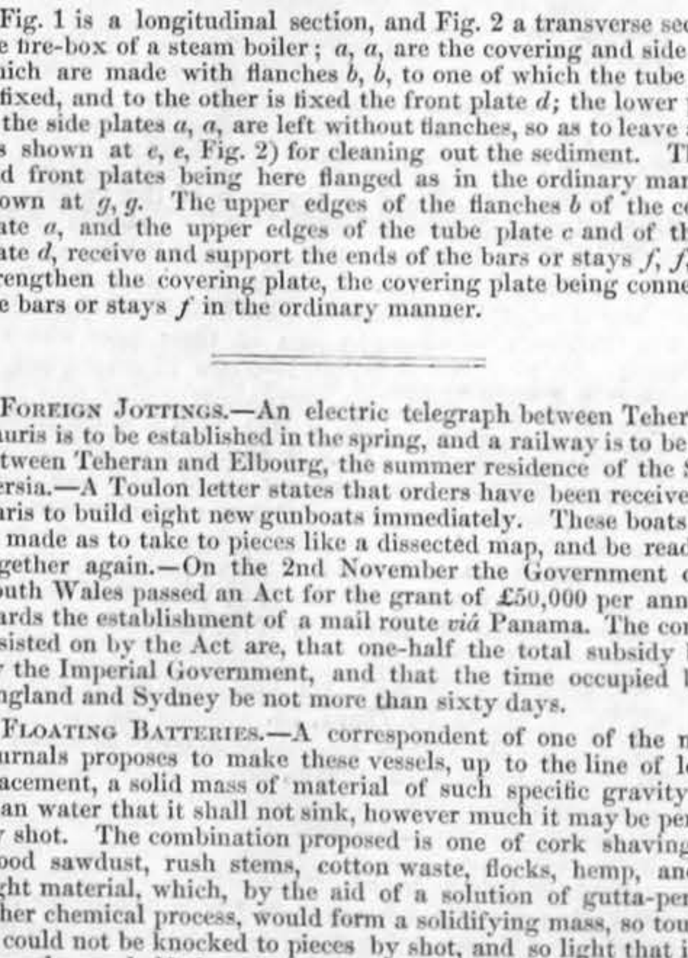


FIG. 2.

Fig. 1 is a longitudinal section, and Fig. 2 a transverse section of the fire-box of a steam boiler; *a*, *a*, are the covering and side plates, which are made with flanches *b*, *b*, to one of which the tube plate *c* is fixed, and to the other is fixed the front plate *d*; the lower portion of the side plates *a*, *a*, are left without flanches, so as to leave a space (as shown at *e*, *e*, Fig. 2) for cleaning out the sediment. The tube and front plates being here flanged as in the ordinary manner, as shown at *g*, *g*. The upper edges of the flanches *b* of the covering plate *a*, and the upper edges of the tube plate *c* and of the front plate *d*, receive and support the ends of the bars or stays *f*, *f*, which strengthen the covering plate, the covering plate being connected to the bars or stays *f* in the ordinary manner.

FOREIGN JOTTINGS.—An electric telegraph between Teheran, and Fauris is to be established in the spring, and a railway is to be formed between Teheran and Elbourg, the summer residence of the Shah of Persia.—A Toulon letter states that orders have been received from Paris to build eight new gunboats immediately. These boats will be so made as to take to pieces like a dissected map, and be readily put together again.—On the 2nd November the Government of New South Wales passed an Act for the grant of £50,000 per annum towards the establishment of a mail route *viâ* Panama. The conditions insisted on by the Act are, that one-half the total subsidy be paid by the Imperial Government, and that the time occupied between England and Sydney be not more than sixty days.

FLOATING BATTERIES.—A correspondent of one of the morning journals proposes to make these vessels, up to the line of load displacement, a solid mass of material of such specific gravity lighter than water that it shall not sink, however much it may be perforated by shot. The combination proposed is one of cork shavings, light wood sawdust, rush stems, cotton waste, flocks, hemp, and other light material, which, by the aid of a solution of gutta-percha, or other chemical process, would form a solidifying mass, so tough that it could not be knocked to pieces by shot, and so light that it would be only one-half the specific gravity of water, and therefore unsinkable, however perforated by shot, and capable of carrying armament and naval equipment to the extent of nearly one-half the weight of its own displacement in tons. Such vessels of light draught would accompany fleets of war as tenders to line-of-battle ships, whence they might be manned and stored as occasion might require.

TO CORRESPONDENTS.

Next week we shall publish our usual half-yearly extra number, which will comprise the Index for the last half-year's volume. It is just to ourselves that we should call general attention to the fact that this half-yearly compilation includes a perfect List of all the Patents granted during the period to which it relates, *and in this respect alone is of the utmost value to the Engineer, Manufacturer, and Patentee. The utmost care is given to its production, and we think we may guarantee that it is as correct as such a voluminous work can be made.*

NOTICE.—*Four volumes of* THE ENGINEER *may now be had ready bound. Vol. I., price 20s.; Vols. III., IV., and V., price 18s. each; covers for binding each volume, price 2s. 6d. each, can also be had. Orders received of the Publisher, 163, Strand.*

*** *It is advisable for correspondents to give initials rather than general signatures, as Constant Reader. We have many thousands of kind constant readers.*

CONSTANT READER.—*We cannot give you any better advice than to advertise the invention for sale, stating its merits and not asking too high a price for it. The great difficulty in effecting the sale of a patent is the very extravagant idea of value too frequently attached to it by the inventor, and which forms an insuperable obstacle to a sale. It should be remembered that a patent is absolutely valueless unless it can be profitably worked, and that it is not a matter easily accomplished to bring into notice and to introduce into practice a new invention, however good it may be, and however numerous its merits; and that, after all, the man who has to look to the* commercial result *of a patent is not always to be blamed if he decline to risk the thousands often asked upon what may possibly prove a failure.*

A CONSTANT READER (Great Yarmouth).—*We should imagine that, having done the work you mention, the parties to whom you refer are quite competent to manufacture the machines you desire. The terms seem very fair.*

J. F. (Poplar).—*We understand that Messrs. H. M. Lawrence and Co., of the Sandon Engine Works, Liverpool, have just manufactured an ice machine on the principle invented by Mr. Harrison, of Geelong, and we believe they will be happy to afford you or any of our readers any information respecting it.*

W. H. (Blackburn).—*We thank you for your suggestion, of which we hope shortly to avail ourselves.*

CASE-HARDENING. — *Your correspondent, "R. T.," will find bone-dust and hoof-parings (from the farrier's) very suitable—indeed the best material for case hardening. The article to be operated upon should be enclosed in an iron box, surrounded by the composition, and kept at blood heat for a time in proportion to the depth of iron desired to be converted into steel. For an eighth of an inch in depth, eight to twelve hours will be required. The quality of the iron will make a difference, but experience is the best teacher.* G. P.

A SUBSCRIBER (Carlisle).—*Troughton's work is one that would probably suit you. There is a work also by Truran, very complete. Both are published by Spon, in Bucklersbury.*

J. O. (Bolton).—*Yes, a patent was taken out on 28th Nov., 1856, No. 2819.*

H. H. (Northampton).—*There are two patents, one dated 10th Dec., 1845, the other 7th March, 1850, consequently neither has expired.*

S. S.—*The sketch will appear next week, with a few suggestions.*

A MINER.—*No description of the apparatus mentioned has been published in* THE ENGINEER. *We will endeavour to obtain the required information.*

FOLIO. — *Your paper, when submitted to the council, becomes the property of the institution, and you would not be at liberty to publish it. An abstract would appear during the week following its reading, but its complete publication would be delayed, perhaps for a year.*

DIVING BELL.—*A submarine boat was constructed by Mr. Scott Russell, nearly at the close of the Crimean war. It was, we believe, fitted with apparatus by Mr. Siebe. We cannot state what became of it.*

S. T. J. (Blackwall).—*Before calculating the weight or the safety valve (from the ratio of the levers) you must deduct from the total pressure of the steam against the under surface of the valve, the weight of the lever, valve, and attached spring-balance (the latter being disconnected from its bottom fastening), the whole being weighed at a point exactly over the centre of the valve.*

K. F. (Belfast).—*No advantage has ever been demonstrated to result from the use of heated air in ordinary combustion in furnaces. In blast furnaces the only advantage of hot air is in preventing the cooling effect of cold air on the* iron. *Cold air does not cool a burning coal, however. The production of heat is caused by the chemical combination of the carbon of the coal with the oxygen of the air, and is not believed to be dependent upon their previous temperature.*

J. S. T. (Bombay).—*The matter has been arranged as you requested. The sleepers were Greaves' patent.*

A STUDENT.—*The steepest railway slope for its depth in such material is probably that at Corvran Hill, on the Newcastle and Carlisle line. It is at one place 110 ft. deep, and although through sand, with a few thin horizontal seams of clay, it has stood well for several years at 1½ to 1.*

TUNNELLING.

(To the Editor of The Engineer.)

SIR,—In reply to your correspondent (Gorton), allow me say that I believe the most important work of tunnelling, now going on in England, is that through the Malvern Hills—about seven miles from Worcester—on the line in course of construction from Worcester to Hereford. J. J. T.

Lincoln, Jan. 8th, 1859.

[*We have to thank "Ledbury" also for a similar answer.*]

PISTON RINGS.

(To the Editor of The Engineer.)

SIR,—We find, in perusing THE ENGINEER, dated 24th Dec., 1858, that J. and M. Swaine, of Hyde, and Dukenfield, Cheshire, have taken out a patent for a metallic piston with three rings. We have made pistons with three rings during the last two years exactly the same as the piston patented, with this exception only, that the patentees cut their rings in four, and we cut ours only once. We will thank you to give publicity to this letter this week, if possible, for we do not think it right that Messrs. Swaine should patent a piston that is in almost general use. We will thank you to give us your opinion whether their patent will in any way prevent us from making our pistons in our usual way.

Barnsley, Jan. 12th, 1859. JOSHUA BARRACLOUGH AND SON.

[*You may go on making the pistons without any fear; that is, just as you have hitherto made them.*]

RAILWAY CARRIAGE BUFFERS.

(To the Editor of The Engineer.)

SIR,—In your impression of the 31st ult., a "Mr. W. B. C." suggested the propriety of detaining the buffer rods when driven home, and likewise at half stroke, similar to the action of a gun lock. In the first place, I may remark that there is not so much to fear from the reaction as your correspondent imagines; such catastrophes as carriages turning over, &c., are not caused by the buffer's reaction, but are consequent upon the unyielding nature of the obstacle run into, such as an engine off the road, or a train of loaded dead buffer wagons, &c.

Mr. W. B. C.'s remark relative to the rebound of two bodies brought violently into contact, is only applicable in certain cases, which may be exemplified by causing two carriages to be run into each other, at an equal speed, when each will rebound an equal distance from the point of contact providing they are of the same weight and spring power. Again, let one carriage remain stationary, and run the other against it at any given speed, the result will be very different; the moving carriage will impart all its momentum to the stationary one, which will be driven forward, leaving the other in a state of rest, at the point of contact, without retrograding so much as an inch. I do not pretend to argue that no accidents have arisen from the breaking of couplings caused by sudden reaction of buffing springs, the late melancholy affair on the Oxford, Worcester, and Wolverhampton Railway is clearly attributable to this cause—in this case your correspondent's plan would have been of service. This class of accident is peculiar and rare, and can only occur to heavy trains coming to a sudden stand whilst ascending a steep grade. The plan proposed would be attended by a host of inconveniences in shunting, running, &c., to say nothing of the complicated arrangement, cost, and danger, in setting the springs at liberty—*i.e., discharging the gun.*

SPRING BUFFER.

THROTTLE VALVES.

(To the Editor of The Engineer.)

SIR,—I shall be obliged to any of your readers who will inform me what is the best construction of throttle valve for steam engines. It is for a pair of coupled land engines 50-horse power each (nominal), working up to 380 indicated horse power; pressure of steam 20 lb. per square inch, and cutting off at a fourth of the stroke. Regularity of speed is essential, especially when the weight is thrown off and on. J. G. S.

Glasgow, 12th Jan. 1859.

COMBINED STEAM.

(To the Editor of The Engineer.)

SIR,—A paper was read by the Hon. Mr. Wethered before the British Association, at Leeds, last summer, on combined steam. His method of superheated steam was to have a pipe in the uptake to the engine chimney, which conveyed part of steam to the cylinder—this pipe entered close or very near to the cylinder.

Will you be so kind as to state in your notices to correspondents whose method is best—if there is one better than Mr. Wethered's—and the proportion of the pipe with the superheated steam to the steam pipe.

ISLE OF MAN.

[*A note from Mr. Wethered, giving an explanation of his apparatus appeared some time since in* THE ENGINEER. *Mr. Patridge, of Woolwich Dockyard, has applied an apparatus for heating all the steam, and, as we understand, with much success, though the originality of the invention is disputed.*]

STEAM POWER.

(To the Editor of The Engineer.)

SIR,—In answer to the inquiry of your correspondents, Messrs. Forster and Williams, a short 1-in. pipe will be suitable for a 4-horse power engine, and for 40 lb. steam pressure in the boiler (the horse power reckoned as work done by the engine at 33,000 lb. lifted 1 ft. high per minute, *not* nominal horse power). An 8-horse power engine may be driven by such a pipe, but with considerable waste of steam. Supposing no engine has to be driven by it, but steam to be wanted for heating or other purposes, and little counter pressure obstructing the discharge of the steam from the 1-in. pipe, the amount of steam passing might be sufficient for a 40-horse power engine when supplied by large piping.

A long 1-in. pipe with sharp elbows, leaky joints, exposed to rain, drafts, radiation, and other obstructions to the useful application of steam, will only allow a fraction of the above given powers to be obtained, notwithstanding the steam entering from the boiler may be a large portion of the quantity passing a short pipe under favourable circumstances.

Could you give us the standard of horse power to which your correspondents refer? Is there one kind generally understood in a general inquiry? Is there one acknowledged in law? C. SCHIELE and Co.

Oldham, 12th Jan., 1859.

[*We presume the standard intended was that of the actual capacity of the engine, at its working speed and pressure in horse power of 33,000 lb., raised one foot per minute. In a general inquiry we believe this is always understood. We must refer your last query to the lawyers.*]

THE ENGINEER.

FRIDAY, JANUARY 14, 1859.

METROPOLITAN JUNCTION RAILWAYS.

RENEWED attention is being directed to the connexion of all the railways which come into the metropolis. The North London, which connects only the Northern and Eastern lines, has already become a good property—a fact which promises much for the success of similar undertakings for the connection of the Northern, Western, and Southern lines. The North London, nine miles in length, cost £1,300,000, carries about 6,000,000 passengers, and earns about £133,000 per annum, and pays five per cent. dividend. Upon this successful result Mr. Charles Pearson projected the Metropolitan Railway, which was intended to connect the Great Western and Great Northern lines by a subway railway under the New-road, and to extend thence down the Fleet Valley to a central station in Victoria-street. The cost of this work was estimated at £950,000, of which about one-half has been subscribed. There appears but little prospect, however, of further subscriptions, and the company which was organised to carry out the undertaking is likely to be wound up.

In the mean time a project has been started, with the concurrence of the directors of the London and North Western and North London Railways, to extend the West London (the famous line of *Mr. Punch*) from Kensington, across the Thames and through Brixton and Camberwell, to the South Eastern Railway at the Spa-road. This line, together with the North London, would then connect all the railways which come into the metropolis, and the circle of railway communication around the City would be interrupted only between the London Bridge and Fenchurch-street stations. The estimated cost of the new line—which is known as the North, West, and South London Junction—is £700,000, of which the directors of the London and North Western have resolved to recommend their proprietors to contribute £100,000.

The South Eastern Company is also promoting a line from their London Bridge station to Charing Cross, one which would connect the three great lines on the south side of the Thames. This line would be carried through Southwark on arches, and at some distance away from the river, until it reached the Waterloo station, near which it would diverge to Hungerford Bridge, where it would cross the Thames and enter a large station at Charing Cross. The length of the proposed line would be about one and three-quarter miles, and its estimated cost—including the bridge and terminus—is £1,070,000.

Another plan is that of Mr. H. J. Yeatman, C.E., which contemplates the connexion of the London and South Western with the Great Northern and North London lines, by a railway from Waterloo station, across the Thames to the lower end of Somerset House, whence the line would be carried on arches over the Strand to Lincoln's-inn-fields, and thence parallel with Gray's-inn-road to King's Cross and the North London Junction. A great central metropolitan terminus is proposed to be made in Lincoln's-inn-fields, which affords a convenient open space of ground, one-eighth of a mile square. The plan proposes also the connexion of the South Western and South Eastern lines by a railway from Vauxhall-road, through Kennington and along the bed of the Grand Surrey Canal, to the Bricklayers' Arms branch of the South Eastern.

Then there is Mr. Bell's plan, which is to lay four lines of rails on the bottom of the Regent's Canal throughout its length, between Paddington and Stepney, eight and a-half miles, and to extend the City-road branch by an open cutting three-quarters of a mile long to a central terminus in Fore-street, near the Bank. Another cutting, with a tunnel under the London Dock gates, would extend also from Stepney to the Thames Tunnel, whereby the railway would be carried to the south side of the river, and thus to the South Eastern line at New Cross.

Whilst these schemes are being urged upon the public the West End and Crystal Palace Railway is being extended across the Thames to the New Pimlico terminus, and twenty-one trains are running each way daily, over the portion already finished. This line is the first to cross the Thames within the limits of the metropolis, but, as has just been seen, not less than four other schemes of metropolitan railways are projected, to pass either over or under the river.

In most of the plans enumerated the junction of the various railways is merely incidental, whilst the accommodation of local, or the extension of existing traffic, is the principal object sought. Of the 6,000,000 passengers carried annually by the North London—the model of profitable metropolitan lines—the principal portion are local only, and it is from passengers mainly that the revenue of the line is derived. Whilst we do not doubt that the extension of the London Bridge railways to Charing Cross would accommodate 8,000,000 passengers annually, we do not suppose that 4,000,000 more would be carried even if the three great northern and western lines were extended to a common junction at that point, although such extensions would doubtless have a large local traffic of their own. If it were possible, indeed, there should be railway communication throughout the metropolis. Our population of 2,800,000, at a moderate estimate, performs an annual local movement of 1,000,000,000 miles, which, if estimated at a railway charge of 1½d. per mile, would yield more than £6,000,000, or twice as much as the revenue of the London and North Western Railway annually. The London General Omnibus Company derives £600,000 from this movement, and conveyances for hire at least as much more. Altogether £2,000,000 a year are spent on the vehicular accommodation of the metropolis, although, as the average charge is perhaps 3d. per mile, not one-fifth of the local movement is thus accommodated. In a cab, a passenger is carried at a slow rate at a charge of sixpence a mile (to say nothing of frightful cases of overcharge), whilst the entire moving establishment occupies an average street space of 10 ft. by 5, and weighs probably a ton and a quarter. If one could be carried at four times the speed, and at one quarter the cost, how many of those who are now foot passengers would ride, and how great would be the relief of the streets! More,—business would be carried on over a much larger area, and the value of metropolitan property would be far more nearly equalised than at present. What our general railway system has done for the kingdom a metropolitan system might accomplish for London.

A journey from Paddington to London Bridge is as formidable in time and almost in expense as that from the latter point to Tunbridge Wells, whilst the number who must annually make the former is perhaps five times that of those who perform the latter journey. But how to bring railway communication within the reach of the numbers who would so quickly avail themselves of it? The cost of the viaduct would be frightful in most districts, whilst in some it would not be permitted at all. Mr. Pearson's underground plan, known as the dry sewer system, will hardly answer the purpose. It could only be carried out at great cost, whilst it would never become altogether popular with the public. The only remaining resource is in street railways, about which much may be said on both sides.

Whatever plans may be adopted for the improvement of our metroplitan communication, there can be no doubt that the extension of the leading railways, where practicable, to those portions of the City whence their principal traffic is derived would be of great advantage to the public, whilst it is probable that such extensions might be made profitable to the railways themselves. Among these the extension of the London Bridge railways to Charing Cross, and of the northern and north-western lines to Lincoln's-inn-fields or to the Bank, are especially desirable, and promise to prove profitable. Whether the latter extensions should be carried across the Thames merely to join the South-Western line is, however, very doubtful. At the same time it is important that the latter should be extended to the north side of the river, and this is provided for in the London Bridge and Charing Cross scheme. Whilst it is rather too much to propose two new railway bridges over the Thames, within 200 yards of each other, it must be admitted that Lincoln's-inn-fields is not the proper place for a general terminus of the southern lines, inasmuch as it is inconvenient for the West-end, whilst for the City a much better accommodation already exists at London Bridge; and the absolute connexion of the northern and southern lines by any other means than the suburban lines already proposed is a matter of secondary importance. Very few passengers indeed who arrive from York, Liverpool, or Bristol, are likely to proceed through London, without halting, on their way to Southampton, Brighton, or Dover. It is rather for those who wish to come by the respective lines to the City, and to return again, that more central termini are desirable. And whilst the traffic between such termini is not likely to be excessive, the condition of our principal thoroughfares will be improved by diffusing—not concentrating—the throngs of passengers arriving by railway.

If all the London railway traffic were to be concentrated at any one point, the streets, for a considerable distance around, would become impassable. It is for this reason that the metropolitan railway scheme, with its general terminus in the Fleet Valley, would increase rather than diminish the overcrowding of the narrow streets leading thence to the City. A terminus in Lincoln's-inn-fields would doubtless also add to the present crowded state of the neighbouring thoroughfares, although the junction of the northern lines only at that point would be attended with far less inconvenience in this respect than would result from a general connexion of both the northern and southern lines.

It is evident to all, that upon the present rate of increase of the metropolitan traffic the existing arrangements for its accommodation will soon be found totally inadequate, and that some means of improvement will become indispensable. The very fact of this increase, by reason of the consequent increase in the value of property, is constantly adding to the difficulty of dealing with the question. This circumstance should hasten the execution of such plans as promise the greatest amount of improvement, and among these we should class the extension of the London Bridge railways through Southwark to Charing Cross, and the conversion of the Regent's Canal into a railway, as proposed by Mr. Bell; the extension of the northern lines also to Lincoln's-inn-fields would unquestionably be productive of great public convenience if its execution be practicable.

MALLEABLE IRON GIRDERS.

The cast iron girders, 41 ft. long, made by Mr. J. U. Rastrick for the British Museum, were once considered as wonderful achievements in the art of iron founding. They were cast, too, before Mr. Hodgkinson had shown us the strongest section for an iron beam. Their success was followed by a considerable increase in the use of cast iron girders, and it is only since 1853 that Mr. Fairbairn's able researches have led to the adoption of malleable iron on an extensive scale, in such applications. We once saw a handsome girder casting, perhaps 30 ft. long, springing as if it had been a bar of thin steel, whilst being drawn on a truck along a rough pavement. A moment after, hearing a sudden crash, we turned to see the casting broken short off, one half lying on the ground. A very small blow-hole, until then concealed, sufficed to explain the cause of the accident. From that time we lost faith in cast iron as a material for beams, and we foresaw, in the admirable details of the great factory at Saltaire, the general substitution of malleable iron wherever wide spans of permanent, strong, fireproof, and economical flooring might be required.

To our ironmasters one of the most interesting features of the Paris Exhibition of 1855 was the excellent character of the malleable iron beoms of French manufacture. At that time, 7-in. girders, over 40 ft. long, were not at all common, although those of less length were being extensively adopted in the construction of first class Parisian houses. There is now a very long and beautifully roiled beam, about 8 in. deep and 5 in. across the top, lying in the *Conservatoire aes Arts et Metiers*. The flanges appear to have been rolled purposely broad to show how well it could be done, since such a width is out of all useful proportion to the depth. The success with which this and similar beams have been rolled is due, however, in a great measure, to the good, or rather the adaptable quality of the French charcoal iron, which, as we have seen proved upon the same beams, can be cut with a knife, almost like lead. Such iron, although hard in the bloom, will work like wax into the thinnest grooves, just as our Lowmoor iron withstands the test of rolling into the flanges of engine tyres, a test which, although not remarkably severe, is sure to prove what iron is good and what bad.

It has been a difficult matter to roll heavy beams with wide flanges from our hot-blast coke iron. When, several years ago, Sir John Guest undertook to make flat-bottomed rails 7 in. deep and 92 lb. to the yard, for Mr. Stevens, the American railway engineer; a large number of rolls were broken, and nearly one half of all the bars rolled were defective. To crush down a square pile into a thin web, with light wide flanges, is a tremendous test for the best iron, and requires heavy rolls and ample power in any case. Nor even then must the inspector insist on too rigid a standard of finish. If the iron is at all red-short, the edges will be sure to be more or less jagged, whilst if cold-short the beam had best be broken up for scrap. By working good iron at a high heat, and reducing it to shape by a few passes through very powerful rolls, a fair quality of beams may be had. The manager of the Butterley Ironworks has succeeded in rolling sound 8½-in. beams 45 ft. long, and 10-in. beams (108 lb. per yard) 25 ft. long. A sample rail was rolled also at the same works 63 lb. to the yard, and 86 ft. long, perfectly sound, and without the least flaw! These are among those things which few will believe can be done until their execution has been proved by actual trial, as it was also with the 4-in. iron plates required for covering shot-proof ships.

The difficulty of rolling increases greatly with the width of the flanges. The French beams, notwithstanding the case of the sample at the *Conservatoire*, have very narrow flanges, hardly more than 2½-in. on top and bottom for a 7-in. girder. Where a broad bearing is required two beams are used side by side, and bound together with stout iron wire. Our knowledge of the proper width of flanges for rolled beams is still defective. Of course, with that portion of the beam subjected to tension, the farther it is carried below the neutral axis, and consequently the thinner and wider the flange, the greater the theoretical resistance of the whole against deflection. But the particles in the flange are brought into action only by their lateral adhesion to the vertical web, and Professor Barlow found that with a flat-bottomed rail 2½ inches wide, a slight apparent increase of strength was shown after planing off half an inch on each side of the flange, which was thus reduced to a width of 1½ in. His opinion was, that in the loss of flange-width the rail had suffered no loss of strength, the slight apparent increase being due to the slight but inevitable inaccuracy of the hydraulic apparatus used in making the experiments. On the other hand, at the convention of German railway engineers, held at Berlin in 1850, it was found that a considerable increase in strength attended the increase of the width of the bottom flange of the Vignoles rail. Whilst the Great Western Railway has many flat-bottomed rails, with a base 6 in. in width, chiefly to prevent crushing into the longitudinal timbers, rails of similar pattern are also in extensive use on cross-sleeper lines in Prussia. We are aware that formulæ have been given for the determination of the proportions of rolled girders, but we do not deem them entirely conclusive on the subject.

There can be no doubt that rivetted plate iron girders are much inferior in strength to solid beams of the same section. Mr. Fairbairn's well-known experiments—showing that where the strength of a solid plate is 100, that of a single rivetted joint is but 56—apply as much to bridges as to boilers. If we could imagine the tubes of the Britannia and the Victoria bridges to be rolled whole without a seam or crack, how much stronger they would be, and how much more permanent! In the present structures a ceaseless abrasion and oxydisation is going on in every hole of the millions of rivets. This destructive action is of a far more powerful kind than exists in iron ships, where the strains, although severe, are gradually applied and withdrawn. We do not know what may hereafter be accomplished by improved modes of welding in the construction of such immense bridges, but it is already practicable to roll solid 18-in. girders — possibly those of greater depth — for smaller spans. An improved mode of arranging the pile has been adopted at one of the rolling mills in the United States, whereby heavy beams can be rolled perfectly sound and with comparatively little power. The pile is made to approximate in its form to that of the finished section. Thick, wide slabs, grooved on one side, are made for the top and bottom, and between a pair of these, and keyed into their grooves, are slabs forming the central web of the pile. Thus laid up, the pile has the form of the letter H. In this form it is heated and easily rolled to the finishing dimensions. The grain of the iron being already arranged in the pile to correspond with its ultimate arrangement in the finished beam, the whole comes out sound, and in its best condition for resistance. Of a large number of beams already rolled in this manner, less than 1 per cent. are reported to have proved defective. 7-in. beams have been thus rolled perfectly sound, and 51 ft. 2 in. long, for the United States Capitol extension, and the 9 in. beams, of 90 lb. per yard, are easily rolled in a train of 16-in. rolls. Bridge girders, 18 in. to 24 in. in depth, with flanges of from 8 in. to 10 in., might be rolled with corresponding facility. Two of these 9-in. beams, of beautiful finish, were sent last year to England, one having been sent to Mr. Fairbairn as a token of acknowledgment of the very great services which his researches have conferred upon the manufacture of malleable iron beams. The other, we believe, is still lying at Liverpool. We hear that the process has been patented here, and in this connexion we cannot forbear giving an illustration of the action of the United States Patent Law, of which we had something to say in The Engineer of last week. The applicant—a Mr. Griffin, we believe—for a patent for the improved mode of arranging beam piles was refused off hand, and for the reason, that Mr. Daniel Gooch had applied a bar of steel to one side of an ordinary pile, in order to roll steel-faced engine tyres! A very formal remonstrance and lengthened argument succeeded in overthrowing this objection, and after much delay and a good deal of expense, the patent issued. While Gooch's plan bore no resemblance to Griffin's, other arrangements, much more nearly like it, entirely escaped the notice of the examiners. And within a few weeks afterwards a patent was granted to a Mr. Stevens for a so-called "hollow rail," which was nothing more than an ordinary bridge rail, with its lower inner edges compressed together, as was done with the rails of the Dublin and Drogheda line, more than a dozen years ago. It might be mentioned, as a commentary upon the intelligence of the examiners, that although it is their business to reject any application for a patent for an old, useless, or impracticable contrivance, they allowed Mr. Stevens to claim the practical impossibility of welding the inner sides of the rail together after it had been already rolled to size! Mr. Stevens, however, who was not one to stick at trifles, produced a "hollow rail," with the inner sides ostensibly welded together for a distance of nearly an inch from the bottom. After, however, scraping away a rich coat of varnish, an interstice was found, corresponding to the pretended weld, which was only effected by a compound of white lead and oil, known as "putty!"

But to return to iron beams. No difficulty has been found to arise from their expansion or contraction. Embedded as they are in masonry, they are exposed to very slight alternations of temperature, a source of disturbance of which we need have little fear if Mr. Brunel be correct, who has stated that a rail welded up to a length of 100 ft. showed no alteration of length when exposed in the open air! In some parts of the world large blocks of warehouses and public buildings are built almost wholly of cast iron, a thing which, although done some years before the time of the Crystal Palace, was thought, twenty years ago, to be absolutely impracticable.

In rolling 7-in. and 9-in. beams, which we believe will ultimately be made nearly as cheap as railway bars, an important application might be made by using them as rails upon the very simple and economical plan which has been introduced upon the Eastern Counties line. A remarkably thin flange will withstand the wear of the wheels, if it be of good iron, and supported continuously on timber. We have before mentioned the instance of the flat-bottomed rails, which were reversed, and in that position had withstood a considerable traffic for nearly four years. The flange had not crushed at any place, but had been permanently deflected for nearly one-eighth of an inch along its inner edge. In the plan referred to, a 7-in. beam, with a ⅜-in. web, and a head not exceeding ¾-in. thick, and weighing less than 70 lb. per yard, would be bolted between longitudinal balks of timber, which would lie hardly below the surface of the ballast. If this system of permanent way should be brought into general use, as from its considerable economy in construction, and probable low cost of maintenance, it promises to be, a rail very similar to the present patterns of beams will be adopted with it. This system of construction has, we believe, been proposed for some American lines, where ordinary 7-in. beams of 60 lb. per yard will be used in laying experimental lengths.

THE MECHANICS' INSTITUTE AND LORD BROUGHAM.

It is a proof of the humanising character of modern civilisation that public ingratitude is being more and more regarded with the same detestation that is visited upon a similar vice in individuals. Society is constantly attaining to a better appreciation of the services of those whose lives are devoted to its welfare. When any great public benefactor—and few can now go unrecognised—fails to receive his due reward, everyone admits that such neglect is very shabby, to say the least; and there are never wanting some, and generally a sufficient number of noble spirits who will cry "Shame" in earnest, and at once step forward in a substantial vindication of justice and honour. Not only in acknowledgment of military services, for which England has dealt noble measure to her manly heroes, but towards social, educational, and philanthropic efforts have modern communities shown the same spirit by which individual gratitude is inspired. What a testimonial was tendered to Mr. Cobden! George Stephenson, too, had his reward whilst living, if not in a gratuity, at least in the honour and respect of the English nation, which we are sure would have offered something even more substantial, had not his admirable genius placed him beyond the need of it. Professor Morse has had votes of money from most of the continental governments in acknowledgment of his services in the introduction of the electric telegraph, and Bavaria has just made a similar grant to Steinheil. But we need not multiply instances. The spirit of public gratitude is active, and when the public has learned, as nineteen-twentieths of its number have learned only within the past week, that Lord Brougham — a man whose public services are noble incidents in our history — is likely to be burdened with the debts of an institution, which, whilst it has done him, as its founder, the greatest honour, has outlived its time of usefulness, we are sure that the simple announcement will be sufficient to set the matter right at once. It is not a question whether Lord Brougham be or be not able to bear a burden which, relying on the public recognition of the good he was about to accomplish, he willingly took upon himself. The London Mechanics' Institute, which he founded in the true spirit of enlightened philanthropy, has done its work. As one of its trustees, he became responsible with his associates for the rent of its rooms, a matter of £229 a year, the present value of the lease being £3,500. In the event of the death of his remaining co-trustee, who has reached an advanced age, and is in bad health, Lord Brougham will be liable for the entire charges under this lease, the Institute being no longer self-supporting. It can hardly require an appeal to public magnanimity to have this contingency removed at once, as if allowed to remain, it must be a source of much mortification to one who has rendered such disinterested public services. Thankless, indeed, must be the nation which plumes itself so much upon its practical superiority, if the founder of its first practical institution, and one which has contributed so much to this superiority, should be left to pay the bill. We are certain that this will never be permitted. £2,000 only are required to clear Lord Brougham of the whole matter, upon which, at his time of life, he should have no more anxiety. The announcement of the case in the *Times* has been promptly followed by a handsome subscription by Lord Fortescue to the funds of the Mechanics' Institute; and we have no doubt that, within a few weeks, the whole arrangement will be concluded, to be only mentioned hereafter in proof of the readiness of a British public to do justice to its real benefactors.

SUBMARINE WARFARE.

The *Times* has given us a wonderful account of a wonderful invention, which is to do wonderful things in the destruction of ships and in marine warfare generally. As a matter of course, this invention is of American origin, and the *Times* accordingly couples its announcement with a handsome tribute to the excellent judgment of the Yankees in military and naval matters, "which," the great leading journal tells us, "they handle in a spirit always liberal and generally sagacious." This pretty compliment is only weakened by the subsequent acknowledgment that the invention in question is too much even for the Americans, and that they will have nothing to do with it. Adopting the account of this formidable affair, as given by our contemporary, it is nothing less than a submarine boat made only for working under water, in form much resembling the shape of a porpoise but capable of being made large enough to contain eight, ten, or even fifteen men, if necessary, with a proportionate, quantity of explosives. In this boat, weighing about eight tons, the inventor states that he, with others, has sunk in Lake Michigan, and remained under water for four hours, without any air tube or other communication leading from his boat above the surface of the water, and propelled the boat in and near the bottom of the lake for several miles, at the rate of about three miles an hour. He has, whilst in his boat, and under water, by means of machinery working through its side, sawn off timbers fourteen inches square. He can sink his boat from the surface almost instantly, either to a few inches or feet from the surface of the water, or to 100 or more feet, and again rise quickly or very slowly to or near the surface; go forward, back, or sideways, or come up bows first or otherwise, as may be required. He can attach powder torpedoes to the outside of his boat, on its deck or sides, and proceed under water out to sea, in any weather, to an enemy's ship in sight, fix or anchor the torpedoes under the ship's bottom, set in motion clockwork to fire the torpedoes simultaneously, or at intervals, and retire,

still under water, out of danger from the explosion and out of reach of an enemy's guns. He can also convey powder torpedoes of 100 lb. or more weight, inside his boat, and when under an enemy's ship, pass them outside through his patent hatch, fasten them to the ship's bottom and fire them. He can enter an enemy's harbour, under water, and make surveys, only showing above the surface a sight tube, no more than one half inch in diameter, and retire still under water, and proceed out to sea, and make his report to the commander of a fleet or ship. He can go out to sea, meet a hostile fleet, go under their bottoms, fix torpedoes to go off by clockwork, or bore holes in their bottoms, and come away unseen. If required, with a large boat, he can remain under water with several men with him, and do service at sea off or in harbour for several days, without landing or showing one inch of his boat above water.

Certainly, if all this, or, as the *Times* remarks, one half of all that the patentee guarantees can be done with it, be true, the submarine boat "will make such a change in the mode of carrying on a naval war as will put steamers out of the question, and render of no avail the tremendous forts of Cronstadt or Cherbourg."

Before we enter into any consideration of this wonderful invention, we must state at once that its announcement is attended with many improbabilities. It is spoken of as forming the subject of a patent; yet what patent, in England or America, could have been issued for a contrivance of such character, without being widely copied and discussed? We believe that nothing has been seen of it among those of the American journals in which the lists of patent claims are published. If such an affair were really patented, we should be having drawings and descriptious of it, not only in scientific and practical publications, but in many of the newspapers of the day. We can understand that a descent into Lake Michigan might have been kept secret, although in the case of a patented apparatus there could have been no reason for secrecy. We presume that no account of this descent has been given in America, whilst on the other hand American inventions are rarely allowed to come to this country without being duly heralded to the world. But, what is much more singular, the American Government, which is building the wonderful steam battery at Hoboken, and which paid the late Robert L. Stevens a pension of five dollars a day, from 1815 to his death in 1856, for keeping secret a certain projectile of his invention—the American Government, whose excellent judgment, liberal sagacity, contempt of precedent, and admirable enterprise in adopting all improvements in the art of warfare, the *Times* so handsomely acknowledges—this American Government treats the submarine boat invention as a good joke, and has sent away the inventor with a flea in his ear! Now, we don't believe a word of this. The American Government is celebrated for its hospitality to all new ideas of the kind in question, and however many mare's nests may be thrust upon it, it exhibits noble patience in their investigation. But stranger than all, the crafty Louis Napoleon, whose military ideas are of the most ingenious and strategic character—the Emperor who invents pistols, breech-loading cannon, iron-coated ships, *vaisseaux beliers*, and we don't know what else—this same Louis Napoleon shuts the doors of the *Tuilleries* in the face of this startling invention. Again we say, we do not believe a word of it. It is not his style. No Government is more on the alert than that of France to secure whatever may give a preponderance in war, and any one not clearly *non compos*, who should make a serious proposal to impart the secret of such a formidable engine as that in question, would be sure of the eyes and ears not only of the French Ministers but of their imperial master also. Nor would the shrewd proprietor of a valuable patent, which he was about to sell to the British Government, take pains to publish to the world the fact of the refusal of the French and American Governments to listen to his plans. And these refusals, if any there were, could have become known only through the parties to whom they were made. No Government advertises the facts of, and grounds for, its dismissals of propositions of such a character.

We do not, then, treat the report of this invention as did the Secretary of the American Navy, since however unlikely it is from the circumstances that a practicable submarine boat has been really made, we still believe in its possibility, at least in that of suspending and propelling such a boat at any moderate depth under water for some time together. And when we shall have done this, we shall have produced a very formidable engine of marine warfare—one that must change the whole character of naval operations.

It is a matter of credible history that a "submarine diver," as it was called, was employed in 1780, in New York Harbour, to harrass our shipping. We believe no vessel was at any time injured by this contrivance, but it is well established that under the directions of General Putnam a machine was actually constructed by the inventor, in which he could sink to any depth within a few fathoms, and propel himself in any required direction. Several attempts were made to explode torpedoes upon the bottoms of the vessels which were then blockading the port, but after a few trials, unattended by any important result, the ingenious inventor at length lost control of his apparatus, and was drowned.

In such contrivances the supply of fresh air for respiration is the principal difficulty. There can be no necessity, however, for a submarine boat, when used in war, to be below the reach of air for any considerable length of time. Any apparatus of the kind which could be managed under water for half-an-hour together would have abundant opportunities of taking air from the surface at such intervals. A couple of swing pipes, with cocks at their outer ends, the whole portion to be exposed being no larger than a good sized spy-glass, could be made to answer all the purposes of induction and exhaustion, and these pipes could be put up, worked, and taken in again so suddenly, and in positions so unexpected by an enemy, that there would be very little chance of their being carried away by dragging, and still less by shot. A large cylinder, with a displacing piston within, would enable the operators to sink or float their craft in a very few seconds. Oars or screw propellers, to be moved by hand, could easily be made to work through water-tight joints. A rudder could be similarly worked. Courses could be run by compass, whilst suitable pressure gauges would show the exact depth of submersion at any moment.

Diving operations carried on by the aid of air-pumps at the surface are easy enough, and we are already familiar with the exploits of Mr. Bethell in raising half a million of property from the wreck of the Thetis, and in raising Turkish guns from a depth of 500 ft. in the Bay of Navarino. Dr. Payerne's apparatus, also, used in laying stone at the works at Cherbourg, was so complete as to convince Sir Charles Fox that there would be no difficulty in constructing a submarine vessel so as to form a most powerful engine for the destruction of the ships of an enemy. The Nautilus also exhibited a considerable adaptation to submarine operations, although it had necessarily to be worked from some fixed station at the surface of the water. The probability of a demand for submarine apparatus, in the event of war between any of the great European nations, will lead to renewed efforts on the part of inventors, until we shall doubtless have submarine boats capable of accomplishing nearly or all that is claimed for the extraordinary invention now under the consideration of our Government.

THE METROPOLIS GAS SUPPLY.

THE grievances of the gas consumers formed the subject of a prolonged inquiry during the last session of Parliament, without, however, leading to any results. The inquiry is to be resumed during the approaching session, and we may hope that, before the end of the year, the whole subject will be settled to the satisfaction of all the parties concerned—a good number, by the way. The managers, appointed by the delegates from the various metropolitan vestries and district boards, to conduct the inquiry before the Parliamentary Committee, have made a report of their labours during the past year, and although much time appears to have been consumed in bringing their machinery into action, they have shown considerable industry in the examination of the questions brought before them. The attempt of several of the gas companies, which had been originally chartered with the view of their maintaining a healthy competition with each other, to exchange districts, and in some cases to withdraw from those in which a competition existed, was the signal for resistance on the part of the public, and hence the inquiry before Parliament. Numerous causes of complaint had existed previously, and these were all likely to be greatly aggravated under the threatened combination. These complaints had been urged before Parliament upon former occasions—in 1850, when a general amalgamation of the gas companies was attempted, and in 1855, when they sought also to obtain certain legislation by which the gas consumers would have been more completely subjected to their impositions. It was notorious that, although the price of gas had been reduced to 4s. 6d., the gas bills of the consumers were in many cases more than when the price was 6s.; that incoming tenants were made to pay the arrears due from former tenants for gas supplied; that the gas was frequently cut off by the companies upon the most trifling causes of dispute, whilst it was generally of inferior quality. So, too, consumers were obliged, as they still are, to pay for a certain amount of gas, whether that quantity is consumed or not. The least charge is £1 10s. per annum, whether the quantity burned be 6,600 or 1,000 ft. The fact that the gas was notoriously of low illuminating power, notwithstanding that it was certified to be above the parliamentary standard, raised the question also whether the gas tested by the company was the same as that supplied to the public.

One of the most important disclosures made under the present inquiry was that of the over-registration of meters, a subject which attracted so much attention last summer. The evidence of Mr. Crosley, a manufacturer of meters, showed that a very large proportion of those at present used by the gas companies can be made, by over-filling, to register very considerably against the consumer. Upon this point the report before us says: "It has hitherto been supposed, that if a meter be tested by an inspector, and found to register correctly, the consumer is thereby protected, and cannot be made to pay for more gas than is actually consumed. Mr. Crosley's evidence went to show that this is an entire mistake, and he demonstrated clearly to the committee that the construction of most wet meters was such that although registering correctly at the proper water line, they could be, and often were, so over-filled with water by the inspector, as to register immensely against the consumer. Mr. Crosley handed in a table, showing the result of testing thirty-six meters in Manchester. Out of these thirty-six meters no less than twenty-four were found to be over-charged with water, and to register against the consumer. Of these twenty-four, there were five which registered from 1 to 2 per cent. against the consumer, nine which registered between 2 and 5 per cent. against him, four which registered between 5 and 10 per cent. against him, and six which registered more than 10 per cent. against him. Among these last six there was actually one which registered 35 per cent. against the consumer, and another registered 28. Such was the state in which the meters were actually working in Manchester, the meters being tried just as left by the inspectors."

When the meters, however, were over filled as much as they would bear, their indications were still more erroneous. Mr. Crosley, having tested the meters of six London makers, found that, "when filled to the top of the waste pipe or spout, one meter was found capable of registering 64 per cent. against the consumer; the next 38, the next 17, the next 11, the next 10, and the sixth 9 per cent., all against the consumer. It appeared, from the evidence of this witness, that great numbers of meters are habitually overfilled with water, as, when sent to him to repair, the levels at which the water has been standing are plainly to be seen. The general result of Mr. Crosley's evidence was to show that any system of meter testing at present in use was utterly inadequate for the protection of the consumer."

In respect of the public lighting of the metropolis, which does not cost less than £240,000 a year, the committee has collected a large mass of evidence going to show that an overcharge is made by the gas companies of not less than £60,000 a year on the public lighting alone. The report says: "In most of the contracts for lighting entered into with the gas companies it is stipulated that the public lamps are to burn 5 ft. in an hour, but it was found that in most cases this rate of consumption was maintained only during a few hours after sunset. Generally speaking, a great diminution in the light of the public lamps takes place about ten o'clock, when most of the shop lights are extinguished, and the consumption by meter is considerably diminished. A further diminution of light takes place about midnight, and from this time till sunrise the pressure maintained in the mains is so small that the consumption falls very far below 5 ft. an hour, in some cases as low as 2 ft."

The report states that, whilst the companies have been in the habit of defending the price charged for public lamps by declaring that they consume at least 20,000 ft. per annum, experiments, however, have been made which bring to light the startling fact, that instead of consuming 20,000 ft. a-year, the lamps in certain parishes consume no more than 10,000 ft., and in no instance except one—namely, those of the Phœnix Company in Battersea, were the public lamps found to consume so much as 20,000 ft. per annum!

The report states, also, that at an early period in the Parliamentary inquiry, the gas companies were found to be instilling into the minds of their friends in the committee, an impression that the capital invested in the metropolitan gas works was paying a very low rate of interest; and one of the members of the committee was heard to declare that the whole of the large capital so invested was paying a dividend of only two per cent. An examination, however, of the accounts of the principal metropolitan companies, as presented to their own shareholders, showed that the aggregate gas property has for some years paid an interest of nearly seven per cent. on all share capital, and that the actual dividends have been more than six per cent. The analysis of the accounts, which have been made, shows also that some of the companies are burdened by an extravagant expenditure of capital in proportion to the capacity of the works, and demonstrates the unfairness of taxing the public with a price for gas calculated to pay interest on a swollen and exaggerated capital. It appears that whilst one of the London companies has expended only about £240 of capital for each £100 of gas rental, other companies have expended more than £400, and one company actually nearly £600 for each £100 of gas rental.

Whilst the companies also have endeavoured to show the injustice of a fixed price for an article, the cost of which is affected so much by the prices of coal, iron, &c., the analysis of the accounts presented half-yearly to their own shareholders shows within what small limits the price of gas ought to vary according to the ruling price of coal.

Appended to the report is an abstract of the clauses which the managers, appointed to conduct the inquiry before Parliament, have resolved to propose for insertion in a bill to be introduced into Parliament on the subject of the metropolis gas supply. Among the provisions embraced, the rate of dividends, instead of being limited to ten per cent., is to be graduated by a sliding scale in the inverse ratio of the price of gas. The companies are to be compelled to lay pipes and supply gas at the cost of any person applying for the same, he giving sufficient security, if required, for the payment. Incoming tenants are not to be held liable for arrears due for gas, from outgoing tenants. Each vestry may appoint a chemical examiner to test weekly the quality and pressure of the gas supplied. The illuminating power of the gas shall be such that an Argand burner having fifteen holes and a 7-in. chimney, consuming five cubic feet per hour, shall give a light equal to that of twelve sperm candles of six in the pound, each burning 120 grains per hour; and the gas so supplied is to be free from ammonia, bisulphide of carbon, sulphuretted hydrogen, and other deteriorating agents. A pressure of not less than ten-tenths, or 1 in. (afterwards modified by the committee to eight-tenths) head of water is to be maintained at all times on the service pipes. A penalty of £100 is proposed to be attached to any offence against the stipulation in respect to quality and pressure. No meter is to be affixed unless it has been tested by an officer appointed by the Board of Trade, or by the Justices in Quarter Sessions, and a proof mark impressed thereon; and officers are to be appointed to inspect and report upon the working of the meters. Several other clauses are proposed, in order more effectually to protect the consumer.

What would our friends with the gas grievance say to the fact that, in New York, where the price of coals is not 25 per cent. higher than in London, and where gas is universally used in almost every room of every house, the price is 12s. 6d., or three dollars, per thousand feet? And the gas, too, is of the most villanous quality. There are but two companies supplying a population of about one million; and these companies, although they are not combined, do not interfere with each other. The treatment of consumers is often as unjust and summary as here. As might be supposed, very many large hotels and manufacturing and commercial establishments have taken to making their own gas from resin or fatty matter. So we in London are not so badly off, after all. It is clear, however, that our gas supply is attended with many abuses; and it is to be hoped that the inquiry which will be prosecuted in the coming Session of Parliament will result in suitable legislation in the matter.

NEW ZEALAND.—Fresh coal has been discovered in this province, and the accounts of the quality are most satisfactory. A separate contract for the conveyance of the mails between Melbourne and Wellington has been entered into by the Provincial Government. The idea of a submarine telegraph to Melbourne has been started.

THE PATENT JOURNAL.

(Condensed from the Journal of the Commissioners of Patents.)

Grants of Provisional Protection for Six Months.

2154. MARC ANTOINE FRANCOIS MENNONS, Rue de l'Echiquier, Paris, France, "The separation of iron and steel from their combination with certain foreign bodies."—A communication.—*Petition recorded 25th September*, 1858.

2506. MICHAEL HENRY, Fleet-street, London, "Improvements in the manufacture of locks and fastenings, and keys for the same."—A communication from Mr. Rebour.—*Petition recorded 9th November*, 1858.

2804. JOHN VICKERS SCARBOROUGH, Belfast, Antrim, Ireland, "Improvements in apparatus for the manufacture of boots and shoes.—*Petition recorded 7th December*, 1858.

2830. ETIENNE LEON PENSUETE, Dunkirk, France, "Improvements in apparatus for driving or for drawing up piles by steam."—*Petition recorded 9th December*, 1858.

2913. ROBERT MCLEAN LIVINGSTON, Manchester, Lancashire, "An improved self-detaching 'safety hook' or coupling."

2915. JOSEPH HOLROYD BOLTON and CHARLES GARFORTH, Dukinfield, Chester, Cheshire, "Certain improvements in drying yarns or fabrics, and in the apparatus connected therewith."

2917. WILLIAM SPEAKMAN YATES, Leeds, Yorkshire, "Machinery or apparatus for dragging bristles and drawing air and vegetable fibre."

2919. WILLIAM MAINWARING, Brunfield, Hereford, Herefordshire, "Improvements in brakes for common road vehicles."—*Petitions recorded 21st December*, 1858.

2921. ROBERT MUSHET, Coleford, Gloucestershire, "An improvement or improvements in the manufacture of cast steel."

2923. JOSEPH NICHOLSON, Halifax, and DAVID CROSSLEY, Brighouse, Yorkshire, "Improvements in Jacquard machinery or apparatus employed in weaving."

2925. WILLIAM SPENCE, Chancery-lane, London, "Improvements in granaries or apparatus for preserving grain."—A communication from Charles Joseph Emile Pavy, Indre et Loire, France.

2927. EDWARD GREEN, Wakefield, Yorkshire, "Improvements in tables."

2929. FREDERICK RANSOME, Ipswich, Suffolk, "Improvements in the manufacture of grinding and rubbing surfaces."

2931. JOSEPH JAMES WELCH, Cheapside, London, "Improvements in the manufacture of neckties, scarfs, or cravats."—*Petitions recorded 22nd December*, 1858.

2933. JAMES RONALD, Liverpool, Lancashire, "Improvements in, and machinery for, the manufacture of 'hard-tapped' and 'soft laid' twine, 'mill banding' strands for ropes and other purposes, and cordage generally from hemp, flax, cotton, and other like fibrous material."

2935. JAMES BROOM, Glasgow, Lanarkshire, N.B., "Improvements in the manufacture of steel."

2937. ANDREW BARCLAY, Kilmarnock, Ayrshire, N.B., "Improvements in obtaining and distributing or applying electricity and magnetism, and in obtaining motive power therefrom."—*Petitions recorded 23rd December*, 1858.

2939. JAMES THOMAS PETER NEWBON and THOMAS SMITH, Fenchurch-street, London, and JAMES BROWN, Follit-street, London, "Improvements in machinery or apparatus for raising and lowering or otherwise moving heavy weights."

2491. JOHN WRIGHT CHILD, Halifax, Yorkshire, "Improvements in the manufacture of fabrics adapted to be used for curtains, coverings of furniture, table covers, and such like uses."

2943. LEMUEL DOW OWEN, Tottenham-court-road, London, "Improvements in manufacturing horse-shoe nails."—A communication.

2945. DICKINSON EDLESTON, Halifax, Yorkshire, "Improvements in preparing and finishing textile fabrics, and in the means or apparatus employed therein."

2947. EDWARD HUMPHRYS, Deptford, Kent, "Improvements in brazing metal tubes in tube plates and other metal surfaces to each other."

2949. JOHN LITTLE, Glasgow, Lanarkshire, N.B., "Improvements in lamps."

2951. RAFAELLO LOUIS GIANDONATI, St. Paul's-churchyard, London, "Improvements in ornamenting leather cloth."—*Petitions recorded 24th December*, 1858.

Invention protected for Six Months by the Deposit of a Complete Specification.

26. MARC ANTOINE FRANCOIS MENNONS, Rue de l'Echiquier, Paris, France, "Certain improvements in steam generators."—A communication.—*Deposited and recorded 3rd January*, 1859.

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

44. HENRY BESSEMER, Queen-street-place, New Cannon-street, London.—Dated 4th January, 1856.

71. JOHN ASHWORTH, jun., Turton, Lancashire.—Dated 9th January, 1856.

86. WILLIAM POLE, Storey's-gate, Westminster, and FREDERICK WILLIAM KITSON, Leeds, Yorkshire.—Dated 11th January, 1856.

108. JOSEPH HOSTAGE, THOMAS IVES BRAYNE HOSTAGE, and JOHN TATLOCK, Chester, Cheshire."—Dated 15th January, 1856.

55. RICHARD ARCHIBALD BROOMAN, Fleet-street, London.—A communication.—Dated 7th January, 1856.

List of Specifications published during the week ending 31st December, 1858.

1155, 1s. 1d.; 1156, 3d.; 1157, 6d.; 1159, 10d.; 1160, 3d.; 1161, 5d, 1162, 3d.; 1163, 7d.; 1164, 7d.; 1166, 2s. 11d.; 1167, 3d.; 1168, 6d.; 1169, 10d.; 1170, 5d.; 1171, 3d.; 1172, 8d.; 1173, 3d.; 1174, 3d.; 1175, 3d.; 1180, 3d.; 1182, 10d.; 1183, 3d.; 1184, 6d.; 1185, 10d.; 1186, 3d.; 1188, 6d.; 1189, 3d.; 1190, 1s. 6d.; 1191, 6d.; 1192, 3d.; 1193, 1s. 5d.; 1194, 4d.; 1195, 5d.; 1196, 6d,; 1197, 3d.; 1198, 3d.; 1200, 1s. 3d.

Notices to Proceed.

1955. GEORGE WEEDON, Poland-street, London, and DAVID WILLIAM RICE, New-road, Woolwich, Kent, "An improved knife and fork cleaning machine, part of which is applicable to other purposes."—*Petition recorded 28th August*, 1858.

1963. JOHN OXLEY, Camden-town, London, "Improvements in baths."—*Petition recorded 30th August*, 1858.

1975. JAMES STONEHAM, Audenshaw, Manchester, Lancashire, "Improvements in cleaning and treating cotton and woollen waste, or other fibrous materials, and in extracting oil or grease therefrom."—*Petition recorded 31st August*, 1858.

1984. WILLIAM HOBBS, Piccadilly, London, "Improvements in ordnance and warlike projectiles to be used therewith."

1991. SAMUEL LAING, Millwall, Middlesex, "Improvements in the apparatus employed in the manufacture of gas."—*Petitions recorded 1st September*, 1858.

1994. JAMES BLEAKLEY, Accrington, Lancashire, "Improvements in apparatus for communicating between the guard and engine-driver of railway trains."—*Petition recorded 2nd September*, 1858.

1999. WILLIAM HARKES, Lostock Gralam, Chester, Cheshire, "An improved plough and pulveriser."—*Petition recorded 3rd September*, 1858.

2010. HIRAM HYDE, Truro, Nova Scotia, North America, "Improvements in the construction of carriage springs."—A communication.—*Petition recorded 4th September*, 1858.

2016 RICHARD ARCHIBALD BROOMAN, Fleet-street, London, "Improvements in printing or marking words or figures on papers, parcels, books, pages, tickets, and other articles requiring to be marked, printed, stamped, or addressed."—A communication.—*Petition recorded 6th September*, 1858.

2020. JAMES FYFE, Greenock, Renfrewshire, N.B., "Improvements in stop cocks or valves."

2024. FREDERICK WILLIAM BRIND, Devonshire-street, Bishopsgate, London, "Improvements in sewing machines."—A communication.

2026. LOUIS PELLISSIER and JEAN PUYTORAC, Bordeaux, France, "Improvements in railway brakes."—*Petitions recorded 7th September*, 1858.

2027. BARTHOLOMEW HOCKIN, Gateshead-on-Tyne, Northumberland, "Apparatus for reparing and fitting dock gates and their machinery."

2031. ANDREW LAMB, Southampton, Hampshire, and JOHN WHITE, Cowes, Isle of Wight, "Improvements in life boats."

2035. JEAN ULRICH FAESSLER-PETZI, Lyons, France, "An improved process for the boiling off of tussah silks or wild silks."—*Petitions recorded 8th September*, 1858.

2052. JOHN KNOWLES, Bolton-le-Moors, Lancashire, "Certain improvements in machinery for preparing cotton and other fibrous materials."—*Petition recorded 10th September*, 1858.

2064. JOHN MINTON COURTAULD, Braintree, Essex, "An improvement in clearing and preparing silk crapes, aerophanes, and other like fabrics, lisses, and other gauzes and lace, and in machinery employed therein."—*Petition recorded 11th September*, 1858.

2089. WILLIAM ERSKINE COCHRANE, Osnaburgh-terrace, Regent's Park, London, "An improvement in the fastenings of railways."—*Petition recorded 14th September*, 1858.

2109. ARCHIBALD TURNER, Leicester, Leicestershire, "Improvements in looms for weaving."—*Petition recorded 18th September*, 1858.

2222. JAMES RIDSDALE, Stoke Newington, Middlesex,, "An improved reservoir or fountain pen."—*Petition recorded 6th October*, 1858.

2256. JAMES HOLROYD, Leeds, Yorkshire, "An improvement in the knives used for shearing woollen cloths and cloths made of wool and other materials."—*Petition recorded 11th October*, 1858.

2312. JOSEPH PIERRE GILLARD, Paris, France, "Improvements in generating hydrogen, and in the means of, and apparatus for, applying the same to lighting and heating purposes."—*Petition recorded 16th October*, 1858.

2362. ALEXANDER SHAW, Grantham, Lincolnshire, "A new method or mode of raising nap on the linings of sheep skins."—*Petition recorded 22nd October*, 1858.

2381. GEORGE KENT, High Holborn, London, "An improved churn."—A communication.—*Petition recorded 25th October*, 1858.

2589. EDMUND MELLOR, Rochdale, Lancashire, "Improvements in mules and other machinery for spinning cotton and other fibrous substances, whereby the cop will be built much firmer, and prevent snarles in the yarn."—*Petition recorded 17th November*, 1858.

2612. WILLIAM STEPHENS HAYWARD, Abingdon, Berkshire, "Improvements in the manufacture of a glutinous and viscous substance or dextrine, to be used in the manufacture of paper, and in dressing textile fabrics, by which greater tenaciousness, smoothness of surface and body is obtained."—*Petition recorded 19th November*, 1858.

2791, GEORGE SNELL, Leeds, Yorkshire, "Improvements in machinery or apparatus for cutting woollen fabrics."—*Petition recorded 6th December*, 1858.

2815. ANDREW LAMB and WILLIAM ALLTOFT SUMMERS, Southampton, Hampshire, "Improved arrangements of apparatus for superheating steam."—*Petition recorded 8th December*, 1858.

2848. WILLIAM EDWARD WILEY, Great Hampton-street, Birmingham, Warwickshire, "Improvements in everpointed pencils."—*Petitions recorded 11th December*, 1858.

2862. JOSEPH WADE, Bradford, Yorkshire, "Improvements in means or apparatus employed in weaving."—*Petition recorded 14th December*, 1858.

2883. ROBERT MUSHET, Coleford, Gloucestershire, "A new or improved manufacture of cast steel."—*Petition recorded 16th December*, 1858.

2892. JAMES JONES ASTON, Doughty-street, London, "Improvements in machinery or propellers applicable for the propulsion of ships, boats, and other vessels, on and through the water, and in the propelling of all such vessels on and through the water by means of such propellers."

2897. JAMES CLEGG, Keighley, Yorkshire, "Improvements in lubricating the valves and pistons of steam engines."—*Petitions recorded 17th December*, 1858.

2921. ROBERT MUSHET, Coleford, Gloucestershire, "An improvement or improvements in the manufacture of cast steel."—*Petition recorded 22nd December*, 1858.

2935. JAMES BROOM, Glasgow, Lanarkshire, N.B., "Improvements in the manufacture of steel."—*Petition recorded 23rd December*, 1858.

2941. JOHN WRIGHT CHILD, Halifax, Yorkshire, "Improvements in the manufacture of fabrics adapted to be used for curtains, coverings of furniture, table covers, and such like uses."—*Petition recorded 24th December*, 1858.

And notice is hereby given, that all persons having an interest in opposing any one of such applications are at liberty to leave particulars in writing of their objections to such application, at the said Office of the Commissioners, within twenty-one days after the date of the *Gazette* (and of the Journal) in which this notice is issued.

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

53. SAMUEL CUNLIFFE LISTER and WILLIAM TONGUE, Bradford, Yorkshire.—Dated 7th January, 1856.

77. MARTIN BILLING and FREDERICK AUGUSTUS HARWOOD, Birmingham, Warwickshire.—Dated 10th January, 1856.

116. JOHN ABRAHAM, Birmingham, Warwickshire.—Dated 16th January, 1856.

117. JOHN HAMILTON, jun., Liverpool, Lancashire.—Dated 16th January, 1856.

Errata.

2873. For "Bullouga" read "Bullough."
2919. For "Brunfield" read "Brimfield."
After 2939, for "2491" read "2941."

List of Specifications, published during the week ending 7th January, 1859.

1201, 5d.; 1203, 11d.; 1204, 10d.; 1205, 3d.; 1206, 3d.; 1207, 3d.; 1208, 5d.; 1209, 1s 3d.; 1210, 9d.; 1211, 3d.; 1212, 5d.; 1213, 3d.; 1214, 3d.; 1215, 6d.; 1216, 3d.; 1217, 4d.; 1218, 6d.; 1219, 3d.; 1220, 9d.; 1221, 3d.; 1222, 6d.; 1223, 3d.; 1224, 3d.; 1225, 3d.; 1226, 3d.; 1227, 3d.; 1228, 3d.; 1229, 3d.; 1230, 3d.; 1231, 3d.; 1232, 1s. 10d.; 1233, 3d.; 1234, 3d; 1235, 10d.; 1236, 6d.; 1237, 5d.; 1238, 10d.; 1239, 2s. 10d.; 1240, 3s. 4d.; 1241, 4s. 6d.; 1242, 10d.; 1243, 3d.; 1244, 7d.; 1245, 11d.; 1246, 8d.; 1247, 3d.; 1249, 5d.; 1250, 3d.; 1251, 3d.; 1252, 1s. 7d.; 1253, 6d.; 1254, 6d.; 1255, 4d.; 1256, 3d.; 1257, 3d.; 1258, 11d.; 1259. 3d.; 1260, 3d.; 1261, 9d.; 1262, 3d.; 1263, 3d.; 1264, 6d.; 1265, 3d.; 1266, 5d.; 1267, 3d.; 1268, 3d.; 1269, 9d.; 1270. 7d.; 1271, 4d; 1272, 3d.; 1273, 7d.; 1274, 3d.; 1275, 9d.; 1315, 9d.; 1352, 6d.; 1452, 10d.

*** Specifications will be forwarded by post on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post-office order made payable at the Post-office, High Holborn, to Mr. Bennett Woodcroft, Great Seal Patent Office.

ABSTRACTS OF SPECIFICATIONS.

The following Descriptions are made from Abstracts prepared expressly for The Engineer, *at the Office of her Majesty's Commissioners of Patents.*

CLASS 1.—PRIME MOVERS.

Including Fixed Steam and other Engines, Horse, Wind, and Water Mills, Gearing, Boilers, Fittings, &c.

1419. R. ARMSTRONG, North Woolwich, Essex, "Steam boilers and furnaces." Partly a communication.—Dated 23rd June, 1858.

This invention is more particularly applicable to those usually denominated "upright" boilers, the outside shells of which are constructed of a cylindrical form, or some shape approaching thereto, such a boiler having, when standing vertically on its base, all its horizontal sections circular, or nearly so. Within the lower end of this upright boiler is placed the furnace, furnace flue, furnace chamber, or fire box, which may be of any suitable form and dimensions for containing the kind and quantity of fuel to be used, but the patentee prefers that the said furnace or fire-box be made as nearly as practicable circular or cylindrical, and surrounded by a space (containing water) of any annulated or other convenient shape between the furnace and the shell of the boiler. Within the said furnace chamber or fire-flue is placed the fire-grate, but which may also be sometimes placed entirely below the bottom of the furnace chamber or fire-box, and surrounded by brickwork upon which the boiler may be erected, or in any other convenient manner. The boiler is also to be supplied with a smoke flue, chimney, or funnel, proceeding from the top of the fire-box, and passing upwards through the top of the boiler. Or the smoke flue may be made to pass out laterally or horizontally by one or more openings through the water space in the more usual way, but the former or vertical passage through the steam chamber is to be preferred, in order to dry and superheat the steam, a provision being made, if required, by the interposition of a fire brick shield or otherwise, by which occasional unnecessary or accidental overheating or burning of the lower part of the furnace may be prevented. Through or across the aforesaid annulated or annular water space two or more strong tubular connexions or passages of suitable forms are to be fixed, by rivetted flanges or otherwise, to the fire-box and shell respectively, by which the latter mutually support and strengthen each other. And in order that these connecting passages should thus act as tubular stays, it is preferred that they should be fixed opposite to each other in pairs, so that the greatest uniform strength may be thereby obtained. Two or more of these tubular passages may also be used as fuel passages or feeding mouths, through which to supply fuel to the interior of the furnace; and the patentee prefers that two opposite and lowermost passages may be so used for the purpose of obtaining uniformity of expansion and contraction, and consequent greater durability in this part of the boiler; and also in order that the furnace may be supplied with fuel at each side alternately, for the purpose of attaining the most economical and perfect combustion of the fuel and the gases arising therefrom, or otherwise for the purpose of firing or stoking on both sides simultaneously, and thereby producing the most rapid generation of steam. One or more of these fuel passages may also be advantageously occupied by fire-feeding apparatus, or machinery of any suitable construction, to be used in addition to the ordinary hand firing when a maximum production of steam is to be effected with economy. The next improvement also relates to the furnace and the combustion of the gases, when either bituminous or non-bituminous coal or coke is used. One or more pairs of the aforesaid tubular stays or passages not required for the supply of fuel, and which may be made smaller than the others, are to be used as air ducts or passages through which to supply an excess of atmospheric air to the upper portion of the smoky flame, or the unconsumed inflammable gases arising from each fresh supply of fuel, according as bituminous or non-bituminous fuel is used, and thereby causing any hydro-carbon and carbonic oxide gases they may contain to be more perfectly burned or consumed. And in order that such comparatively perfect combustion of the fuel may be attained without the great diminution of the steam generative power and destructive effect on the material of the boiler, which universally accompanies the admission of cold air for that purpose, the said air passages are to be partially filled or lined with perforated fire bricks, tiles, or other substances for heating the air which passes through them to the interior of the furnace. It is also preferred that this projection of the air into the flue should proceed from two opposite air ducts at the same time, so that the two opposing currents may neutralise, and commingle with each other and with the flame in the upper part of the furnace, and thereby be prevented from producing the usual injurious "blow-pipe" action of the flame against the inside of the fire-box, which is so generally produced in steam boiler furnaces as frequently constructed, where the supplementary air, especially cold air, is admitted for the alleged purpose of perfecting the combustion. The next and most important part of this invention has for its object an increased production of steam from a boiler of given dimensions, as well as by a given quantity of fuel, and consists in an improved construction of the interior of the furnace chamber or fire-box. In effecting this improvement the said fire-box is to be supplied with a number of peculiarly shaped hollow vessels or retorts, which it is proposed to call generators, to be fixed across the furnace, and crossing each other from side to side. Within and through these steam generators, which may be considered as so many small boilers, the water is permitted to circulate, communicating freely with the surrounding water space at their ends. The position of the generators vertically may be generally at or nearly at right angles to the vertical axis of the fire-box, so as to allow the flame and current of hot air from the fire to strike most advantageously directly against their lower sides. In fire-boxes of small diameter the position of these generators in horizontal plan may be at right angles with each other alternately, but in large furnace chambers the generators may be alternated in superposition, with others at angles of forty-five or sixty, or any other aliquot number of degrees with the former, so as that the transverse sectional area within the furnace chamber may be sufficiently occupied with horizontal heating surface for the most perfect practical abstraction of the heat from the rising column of flame and hot air. The aforesaid steam generators are to be formed of a convenient shape for manufacturing by welding, rivetting, brazing, or otherwise most suitable to the metal of which they are composed, and they are especially to be preferred to be made with each of their ends considerably widened or coned outwards, the tapered or conical part commencing at or about the middle of their length, and they may be made either with or without flanges by which they may be attached to the sides of the fire-box, being more particularly recommended to be connected thereto by means of angle iron rings and rivets placed outside the fire-box, the ends of the generators projecting some little distance into the water space.

1422. W. E. NEWTON, Chancery-lane, London, "Centrifugal governors for steam engines and other motors."—A communication.—Dated 23rd June, 1858.

The inventor employs a centrifugal governor constructed on any of the usual plans with balls and arms, but made very much lighter than usual, and instead of giving it only about the number of revolutions in a given time that would be due or natural to it, considered as a conical pendulum, as has hitherto been customary in the application of centrifugal governors, the inventor proposes to drive it at a very much higher velocity. To the slide of the governor which connects it with the regulator, a counterpoise is attached of a weight much greater than the aggregate weight of the balls and arms, and sufficient to balance, as nearly as possible, the great amount of centrifugal force developed by the rapid revolution of the latter; and it is in the employment of a counterpoise so proportioned in weight in combination with the arms and balls revolving at a much higher velocity than would be natural to them, considered as a conical pendulum, that the present invention principally consists. The invention also consists in so applying the counterpoise to the governor that its effective load on the governor shall be lessened in proportion as the balls and arms of the latter expand so as to render its action constant, or as nearly so as may be desired, relatively to the power of the governor to sustain it. The invention further consists in the employment of the counterpoise as a means of controlling the exact speed of the engine or motor.

CLASS 2.—TRANSPORT.

Including Railways and Plant, Road-making, Steam Vessels, Machinery and Fittings, Sailing Vessels, Boats, Carriages, Carts, Harness, &c.

1392. Sir J. C. ANDERSON, Fermoy, Cork, "Locomotion."—Dated 21st June, 1858.

No. 1. These improvements, in making a permanent way for locomotives to work on, is not to adopt the costly plans followed in constructing railways. On a good firm pitching of large stones, having their broadsides downwards, the chinks to be filled in with chips of stone strongly driven home, and concreted to form a solid and smooth foundation to receive the upper surface of cut stone, blocks, or stone or wood pavement, or well backed bricks, or small broken stones well cemented together, or timber plated with iron, furnished with any of the above materials procurable in a district through which the railway may pass, the inventor forms his compound tram road of the requisite breadth for the wheels of locomotives and other carriages to run on. Equidistant he fixes between his compound tramway a T rail of iron or timber, and to each locomotive engine or other carriage attaches two pairs of horizontal wheels, two wheels to run on each side of the guide rail, and under its horizontal top. By this arrangement a train can be guided round curves, and cannot run off the line. No. 2. To counteract the gravity of a train in steep hills, he fixes another T guide rail at the side of the compound tramway or common road, to guide a small carriage which is to be loaded with a weight sufficient to overcome the gravity of the ascending train. To one end of a rope working in a pulley wheel fixed on the top of the hill, and extending to the bottom of the hill, the train is to be fastened, and to the other end of the rope on the top of the hill the small carriage containing the counteracting weight is to be attached. Thus arranged, the small descending carriage will counteract the gravity of the ascending train. It is quite evident therefore that the same power which will draw a train at any given speed on a level will cause it to ascend a steep gradient at the same velocity, provided the counteracting weight equals the gravity of the train or retarding resistance. No. 3. He forms the wheels of his steam and other carriages in such a manner as to run upon his compound tramway, common road, or railroad. The wheels are to be made conical, as used on railways, but in place of having the flanges narrow, as railway wheels, makes them 3 in. to 4 in. broad. By this arrangement the conical parts of the wheels will run on the rails, and the cylindrical on the compound tram roads, or on common roads. No. 4. For the purpose of ascending gradients, where the counteracting weight, as described in No. 2, is not used, he forms the driving wheels of his steam carriages thus:—Against the insides of the locomotive driving wheels he builds cylindrical wheels of a smaller diameter than the larger wheels. From the top to the bottom on each hill he lays a timber tramway, raised above the ground. As soon as a locomotive carriage reaches a hill, its smaller wheels will run on the timber tramway, when the peripheries of the larger wheels, no longer resting on the ground, the engine power will act on the smaller wheels, and thus as speed is lost power is gained. Should it be necessary, in order to prevent the wheels from slipping, they can be cogged, as also the tramway. The guiding rail as described in No. 1 will prevent lateral friction. No. 5. It may sometimes be necessary to run the train off the common tramway on to the common road. He therefore fits to each of his locomotive passenger or baggage carriages a suitable arrangement for steering the fore wheels. No. 6. To secure the friction of any number of the wheels of the train that may be required by their friction on the rails to draw a load, he places the wheels of the carriages so as to revolve on the concave surfaces of

larger wheels. Each wheel of the respective carriages is to work in a large wheel, as above described. He causes the weight of each carriage to become a propelling power, and he obtains the friction of all large wheels that may be used on a tram road, railroad, or common road. Consequently heavy loads can be taken up gradients which cannot be ascended by means of the arrangements now in use. No. 7. For manufacturing purposes he uses a circular cogged tramroad or railroad. To an upright shaft he fixes a horizontal beam, to which carriages using the large wheels as described for loccmotion are to be attached. To the fore part of the first carriage he hooks on a small locomotive. As soon as the steam carriage moves it will draw after it the first carriage, when its weight by gravitation will become a propelling power which may be increased to any extent. Thus the horizontal beam will be made to revolve, and consequently to give motion to the upright shaft, from which the power can be by gearing conveyed in any direction to work machinery of all descriptions. No. 8. To create a powerful blast for locomotive carriages, ventilation, and other purposes, he fixes horizontally a pipe of at least 12 in. diameter, extending from the front of the steam carriage to the front of the ash pit under the fire-place of the boiler, or to fixed boilers. The pipe is to be open at both ends. Into the front opening of the horizontal pipe a small pipe of about an inch in diameter is to be inserted for a short distance, air being forced by a fan through the small pipe; it will retain its velocity for a considerable distance within the large pipe without expanding, and will draw along with it a great volume of air, by which an intense blast can be obtained by a comparatively small power.

1427. J. ROBINSON, East India-road, London, "Adapting water-closets to ships, so as to ensure the safety and more perfect ventilation of the same."—Dated 24th June, 1858.

The pipe from each closet is connected to a main sewer pipe, which is connected to a powerful exhausting pump worked either by hand, steam power, or any other suitable means, so as always to maintain a partial exhaustion of the sewer pipe or pipes, and thereby cleanse the closets, ventilate the ship, and insure its safety, from the fact of there being but one outlet for any number of water-closets.—*Not proceeded with.*

1430. R. PICKERING, Lockerbie, Dumfries, N.B., "Apparatus for communicating signals from one part of a railway train to another."—Dated 24th June, 1858.

This invention relates to certain mechanical arrangements whereby the passengers and attendants of a railway train are enabled to communicate with any part of the train with great facility and certainty. In these arrangements a flexible tube is carried along beneath the bottom of all the carriages in the train, this tube being made to terminate in a whistle at the part where the engine driver stands. This tube is in separate lengths for each carriage, provision being made for coupling the ends when the train is made up. The lengths of tube are loosely held in staples or hooks. Each carriage has extended into it a branch tube from the main line of tubing, with a mouth-piece for blowing into. For the use of passengers, each branch tube is brought up at one end of the carriage, and then turned into the carriage, beneath the roof, along which it passes, being fitted with a sub-branch with a mouth-piece and tap or valve for each compartment. Either a mouth-piece and a tap or valve may be fitted at the end of each branch and sub-branch tube; or a pair of bellows fitted with a tap or valve may be used. The office of the taps is to keep the lines of tubing closed, except at the instant when a signal is to be given, and at that time the signaller must open the tap of the mouth-piece which he uses, the rest being all closed. Instead of a tap a self-acting valve opening into the tube may be used, so that whilst the inmate of a carriage can communicate with the tube, no blast can escape from the tube into the carriage. Wherever there is a branch tube led out of the main tube, two taps are fitted upon the main tube, one on each side of the part where the branch emerges, so that any carriage with a branch tube may be set in the train with either end first, closing the tap which is behind the last branch tube in the train. All the taps in the main tube are of course kept continually open, except that one behind the last branch in the train. The main tubes on the carriages are coupled by screw junctions. A short piece of inflexible tube is attached to the end of the elastic tube at each end on each carriage by drawing the end of the latter over, or in any other convenient way, and the projecting end of this inflexible tube is screwed exteriorly for a short distance. These screwed ends are fitted with an enveloping nut or screwed thimble to effect the junctions of the tube ends at each carriage, this nut being fitted with a pendant weighted lever to turn it by, and to prevent it from turning by the action of the carriages. The tube beneath the engine and tender is made of such materials as will stand the heat well, and the engine portion is brought beneath the footboard and up through it to a suitable height for a whistle. Or this tube may be taken to the outside of the engine frame, and then brought up the outside of the engine ending near to and in front of where the driver stands. In this way various signals may be given by any of the parties in the train as may be agreed upon.—*Not proceeded with.*

1434. T. BOOTH, Rahere-street, Goswell-street, London, "Wheels and axles to carriages."—Dated 25th June, 1858.

This invention of improvements in mounting and fitting wheels and axles to carriages consists, First, in so fitting the axle to its bearings that the friction consequent on its rotary motion is subdivided and distributed on many bearing surfaces, besides which, those bearing surfaces are so disposed that the weight of a carriage when traction force is applied thereto produces a tendency to onward motion. For this purpose the inventor fixes the axle loose in its bearings, these bearings consisting of a number of rings placed one within the other. The smaller ring or bearing surface with which the axle is in immediate contact is fitted somewhat closely to the axle. The next ring is somewhat larger than the smaller one, so that it has considerable play within it; the third ring is similarly adapted to the outer diameter of the second ring, and so on. The outer ring constitutes a fixed bearing surface fixed to the carriage frame. The fixed bearing has annular plates fixed to it, which partially enclose the sides of the several rings and keep them in position; two other annular plates are secured to the axle, which enclose the sides of the smaller rings and embrace or overlap the larger annular plates, thereby keeping the whole of the bearing rings in position. Suitable stop collars or other parts are affixed to the axle for securing the several parts in position. The weight of the carriage resting on its bearings presses all the rings in contact with each other in a vertical line upward from the axle, and in a position excentric to each other. When tractive force is applied to the carriage it throws this line of contact out of the vertical position, and the weight resting on the several rings in this line of contact, now out of the upright, gives the carriage a tendency to onward motion, and at the same time any rotary motion of the axle is distributed throughout the number of bearing rings and does not take effect on any one bearing surface in particular. The improvements in mounting and fitting wheels to axles consist of a similar arrangement of rings placed one within the other, the axle being free to rotate within the smaller ring or bearing surface, which is of considerable thickness. A series of rings surround this bearing surface, which are all received and enclosed within annular plates fixed to each side of the wheels. Between the annular plates of these rings he disposes annular surfaces of india-rubber as cushions to receive any side shocks. A plate of metal is interposed between the india-rubber and the rings as a friction surface. Other annular plates are secured to the axle which embrace the annular plates fixed to the wheel, which is thereby kept in position laterally with regard to the axle. Suitable collars, cap, and stops, are fitted to the axle to secure the several parts in proper position. The remarks before made with reference to the tractive force transmitted through the axle, and taking effect on the wheel, apply with regard to the tendency to onward motion; also to the distribution of the friction on the several rings or bearing surfaces resulting from the rotary motion. The same arrangement of parts is also applicable to pulleys and other parts having motion on axes. —*Not proceeded with.*

1437. J. WESTWOOD, Poplar, Middlesex, "Plating of ships and floating and other batteries, to render the same shot proof."—Dated 25th June, 1858.

The object of this invention is to cover the exposed parts of the hull of wooden and iron ships, and also of batteries, with plates of iron or steel of sufficient thickness to resist the percussive force of heavy shot. This the inventor proposes to do by the use of rebated plates, which will enable him to form some lap joints. In covering the exposed parts of the hull of wooden ships with these plates he uses screw bolts for securing them in place; but for iron ships he prefers the use of rivets. By rebating the adjoining plates, and getting a good lap, it will be understood that one row of screw bolts or rivets will suffice, in place of two as ordinarily used, to make good one joint, and thus an important saving in the cost of plating a vessel will be effected. To prevent the shot from striking the bolt heads he proposes to sink them in the bolt holes in the plates, instead of bringing them flush with the face of the covering plates. Instead of bolting the plates directly to the planking or plates of the ship, or of the floating or other battery, he proposes to bolt or secure thereto parallel lines, or nearly so, of angle iron, to receive the lines of rebated plates, and by means of their flanges form with the plates overlapping joints, and hold the plates securely in position. The outer heads of these bars of iron he proposes shall not come flush with the outer face of the plates, but shall form with the adjoining plates a recess, sufficiently narrow, however, to prevent any shot that may hit the edges of the adjoining plates striking the retaining bars. By this arrangement the lines of bolts employed for retaining the outer covering plates in position will be protected by those plates, and there being no bolt holes through the plates the risk of their splitting from the percussive force of shot will be greatly diminished.—*Not proceeded with.*

1452. J. LUIS, Welbeck-street, Cavendish-square, "Apparatus permitting the different parts of machinery working in the water of screw vessels with wells to be examined and mended."—A communication.—Dated 28th June, 1858.

In screw slips it is necessary (says the patentee) not only to examine the screw, but to examine and repair, if required, the parts which are submerged, without being obliged to put the vessel in dock. On this condition only the improved system here described presents the desirable security, the repairs being in all cases practicable and economical. It is to attain this end that the present apparatus, which cannot be described without reference to the drawings, has been composed.

1473. W. CAPSTICK, Liverpool, "Wheels for carts or vehicles to run on common roads."—Dated 30th June, 1858.

This invention relates to a novel mode of constructing cast or wrought iron naves, and combining them with wrought iron spokes and wrought iron rims or treads. The naves are fitted with a bush of cast or wrought iron, brass, or other metal, which, when placed in the nave is secured therein by keys or wedges, so as to admit of its being taken out and replaced by a new one in case of breakage or injury. Instead of an ordinary linch pin to retain the wheel on the axle, a round head or cap piece is placed on the end of the axle, and prevented from turning round thereon by means of a feather or cross bar on the under side of the cap piece, which is fitted in a groove or transverse slit cut out of the end of the axle, on which it is secured by means of a stud screw, which passes through the cop piece, and enters the end of the axle. Sometimes, instead of making the wheel wholly of metal, the inventor makes the nave of metal in the manner just described, and adapts thereto wooden spokes and felloes. By means of these improvements he is enabled to construct wheels of equal or greater strength than those now used, and occupy considerably less space in width.—*Not proceeded with.*

1475. H. G. PEARCE, Liverpool, "Reefing the sails of navigable vessels."—Dated 1st July, 1858.

To apply this invention to (say) top-sails, an horizontal supplementary bar is fitted across the sail equidistant between the head of the sail and the close reef. This supplementary spar is attached to the sail, and is suspended at the ends on axles by ropes or chains, which reeve through blocks or chocks on the top-sail yard arms, and are carried to the centre of the yard, where they are passed through blocks or chocks for convenience of working. Or these lift ropes may be carried from the centre of the yard up to the cross trees or top-mast head, and thence through blocks or chocks to the "top" or deck. The centre of this supplementary yard, which revolves, is fitted with a boss to receive a "parbuckle" or "semi-parbuckle," one end of which is attached to the supplementary revolving yard, and is passed several times round it, and from thence to a hole or block at the top-mast head, and down to the deck, where it is made fast, thereby causing the sail when dropped down to roll itself up both from above and below, and when twisted to unrol itself as the sail is elevated. The supplementary revolving yard is connected to the mast by two hoops, which are connected together and encompass the yard, on each side of the parbuckle rest, and are secured to a "parral" or hoop that works on the mast. The sail is split in the middle from the upper yard to a little below the close-reef, to admit the centre gear to work through it. The edges of the split of the sail are roped and held together by means of connecting link travellers, and which are attached to the hoops which encompass the yard, and traverse up and down therewith as the sail is hoisted or lowered. It will be readily seen if the supplementary revolving yard be fitted to the centre of the sail, and attached to a "jack-stay" in place of the mast, the whole of the sail might be rolled up on the rotating spar. —*Not proceeded with.*

CLASS 4.—AGRICULTURE.

Including Agricultural Engines, Windlasses, Implements, Flour Mills, &c.

1469. P. P. C. and J. B. BARRAT, Paris, "Machinery for digging, reaping, mowing, certain agricultural operations, and for cutting drains and excavating."—Dated 30th June, 1858.

This invention comprises, First, the adaptation of a single cylinder locomotive engine for the purpose of mellowing land and throwing up earth. Secondly, the adaptation of an intermediate shaft for communicating motion both to the propelling wheels and to the working tools. Thirdly, the employment of a frame resting by its bearings on the propelling wheels, and on the intermediate or driving shaft, and supporting parts for communicating motion to the propelling wheels. Fourthly, the employment of an arrangement of parts for obtaining intermittent action, that is to say, for causing the tools to act twice or oftener on any particular cover. Fifthly, the combination of the two preceding arrangements in the same apparatus so as to obtain, at pleasure, continuous or intermittent action. Sixthly, the placing of the furnace over the fire carriage wheels. Seventhly, the arrangement of a feed-water tank under the boiler and between the large wheels. Eighthly, the employment of a short frame connected to the apparatus for carrying the tools. Ninthly, the adaptation on the small frame of an arrangement of screws and bevel wheels for raising and lowering the tools from and towards the ground. Tenthly, the combination with such small frame of mechanical parts for casting over the sides of the machine the earth mellowed and thrown up by the spades. Eleventhly, the employment of cranks keyed at right angles, or of other mechanical arrangements having the same method of action, for causing the tools to perform their work in two strokes, intervals, or actions. Twelfthly, the adaptation, arrangement, and method of action of peculiar implements, so contrived and acting as to cut into the soil consecutively, and at different intervals, and thereby divide the earth acted on into two or more layers. Thirteenthly, various arrangements and combinations for throwing parts into and out of action or connexion, for communicating the desired motions or actions, and for the arrangements of the tools or implements. Fourteenthly, the adaptation to various machinery and apparatus, and generally where parts or appliances have to be thrown into and out of action or connexion, of a peculiar arrangement and combsnation of parts for such purpose represented in, and described in reference to the drawings. Fifteenthly, a general arrangement and combination of parts of machinery, described with reference to the drawings, adapted for digging, mellowing, reaping, mowing, and performing various agricultural operations, and for cutting drains and excavating. Sixteenthly, in so combining and arranging the parts of the aforesaid arrangement of machinery that it may be worked by draught animal instead of by steam, by applying animal traction to the propelling wheels, and thereby actuating the driving shaft, and thence he working tools.

1485. F. RICHMOND, and H. CHANDLER, Salford, "Machines for cutting hay, straw, and other vegetable substances.'—Dated 2nd July, 1858.

This invention cannot be described without reference to the drawings. It consists, First, supporting the upper feed rollers of machines for cutting hay, straw, and other vegetable substances, in adjustable bearings, so that each roller can rise or fall independently of the other; Secondly, in casting the mouth-piece of machines for cutting hay, straw, and other substances, of cast steel; Thirdly, in making the teeth of the first pair of feed rollers of such machines tapered, and radiating from the axis; Fourthly, in an improved mode of constructing the knives of machines for cutting hay, straw, and other vegetable substances; and, lastly, in an improved mode of connecting the knives to the fly wheels or other fixings of such machines.

1493. J. SCOTT, Drummond-street, London, "Dressing, separating, and cleaning seeds, and apparatus for these purposes."—Dated 3rd July, 1858.

Carrot seeds, and the seeds of some sorts of weeds, and other seeds, have beards or tails, or down, or husks, or hulls; grass seed is often mixed with the seeds of weeds having horns or tails, and also with round or other shaped seeds. The patentee causes the grass seed to descend from a hopper on to a vibrating or reciprocating table or sieve, with longitudinal bars or spaces, and either horizontal or inclined upwards or downwards, and from which it falls on one or more sloping sieves or gratings with longitudinal bars or spaces. The grass seed slides down and off the end of the sieve, while the tailed or horned seeds fall with a spiral motion, or in such a position as to pass through the longitudinal spaces of the sieve. The first reciprocating sieve also separates a portion of the seeds and of the small round seeds which may have been mixed with the grass seeds. He sometimes projects the seeds by centrifugal or other force, and allows them to fall upon the aforesaid sieve or grating; or in some cases the seeds being projected to different distances, according to their weight or form, are received in different boxes or receptacles, provided or not with sieves or screens. For cleaning or dressing carrot seed and similar seeds so as to remove the tails, beards, husks, or hulls from them, he employs one or more cylinders or cones covered with wire card or metallic brushes, or punched or perforated metal, or other suitable rough surface, which is enclosed in a cylindrical or other sieve, or wire gauze casing. Or the wire cards or brushes may be arranged on a disc or plate, which may revolve over or in proximity to a fixed plate or sieve, or the apparatus may be made in a spiral form. In either case the carrot seed or other seed is introduced between the two surfaces, and the tails, or beards, or husks are rubbed off, and pass through the sieve or wire gauze. The carrot seed may pass out at the end or sides, or it may pass through with the detached tails or beards, and be afterwards separated by sifting, winnowing, or otherwise. The wire gauze casing may fit the wire and surface, or may approach or touch it at certain points, or may have cavities or recesses at intervals, and may be adjusted by screws or other means. He sometimes applies a gentle heat for drying the seeds, or facilitating the operation by means of gas burners or other heating apparatus. The last portion of the tails or down may be removed by means of sieves with rubbers, which rub them through the sieve, while the seed passes off at the end or side. This rubbing apparatus may also be used in combination with a winnowing machine, or with the machines before mentioned.

CLASS 5.—BUILDING.

Including Brick and Tile Machines, Bricks, Tiles, Drain Pipes, and House Fittings, Warming, Ventilating, &c.

1403. G. R. SCRIVEN, Philadelphia, U. S., "Apparatus for ventilating and for circulating, moving, or otherwise acting upon air or other fluids."—Dated 21st June, 1858.

This invention consists in the combination of a cylindrical drum of uniform diameter revolving on journals, which may by preference be horizontal, one of which is tubular from the end of the drum, with a spiral pipe or passage wound or coiled around or within the said drum, open at one end, so as to freely admit air and water or other fluids in contact with one outer surface of the drum with a free and unobstructed passage through such coil into the said tubular journal, into which the other end of one pipe or coiled passage enters water and air-tight through the said tubular journal into a vertical or other stationary pipe attached water and air-tight to it, by the usual method of packing, and in which it turns out of one side pipe at its opposite end. A reservoir enclosing the cylindrical drum, and in which it revolves, partially immersed in water or other fluid, provided with air and water feed pipes and a float valve to regulate the quantity of water therein. A reservoir of water, and air-tight, into which the coiled pipe communicates through the tubular journal and the air and water discharge pipe—when necessary the discharge water pipe conducting back to the reservoir—and an air discharge pipe for the escape of air. Lastly, a contrivance to receive the water or other fluids at its maximum point of elevation in the vertical pipe, and transfer it back to the cylindrical drum, there to, act to one extent of its gravity as a motor, or driving power, any deficiency thereof being supplied by any known motive power, or by hand labour when it is so desired. —*Not proceeded with.*

1413. J. ROBERTSON, Glasgow, "Apparatus for regulating the flow or passage of fluids."—A communication.—Dated 22nd June, 1858.

As applied to the purpose of regulating the supply of cleansing water to water-closets, this invention consists under one modification of a short cylindrical chamber of pretty large diameter, having a top and bottom cover screwed on. The bottom cover or end forms the actua shallow shell or chamber through which the supply of water from the main is brought to the apparatus. This portion is cast in one piece on the main or supply pipe, being disposed horizontally, that is to say, with its plane parallel to the axial line of the main pipe which runs along it beneath. In the centre of this end disc or shell there is an aperture communicating with the inlet section of the main pipe, whilst there is a second aperture slightly excentrically disposed, and communicating with the opposite or outflow section of the main pipe leading to the closet pan, the two apertures being of course completely separated by a sectional portion of metal cast in for the purpose. Upon this perforated disc shell face there is fitted a circular disc of caoutchouc or other flexible material, arranged to bear upon an external annular face al round the shell. This flexible disc has screwed upon each face a button or small disc piece of metal, the under one of these small discs having fitted to it a soft or flexible face-piece of leather or other material to form a valvular fit upon an elevated annular working face round the central hole in the shell. The central or barrel portion of the operating chamber has attached to it a lateral water pipe of narrow bore, and fitted with a stop cock for setting the flow. The top cover or end disc of the chamber has passed through its centre a vertical spindle fitted with a helical spring to keep it up. The lower end of this spindle which is passed through the cover has upon it a holding or collar button, to carry a second large flexible disc of caoutchouc, which, like the one already described, is of the same diameter as the cylinder's bore. The upper cover is dished on its inner face for the elastic disc to settle into, and leave more space beneath. The action of this apparatus is thus:—When the closet is about to be used, the pressure upon the seat causes the main upper spindle to be depressed, and this spindle then forces down the upper flexible disc so as to contract the space for water in the cylinder beneath it, and thus force the contained water back through the lateral stop cock into the main, the water way through the stop cock being purposely adjusted to pass the water slowly through. Then, on the release of the operating spindle from pressure, the water in the main pipe beneath meeting little or no pressure from above the disc to interfere with its upward force, lifts the bottom flexible disc, and flows through from the inlet section of the main by the apertures already described into the outlet section, thus reaching the pan of the closet. This flow continues until the upper internal pressure between the two flexible discs in the cylinder is made up by inward flow of water again through the lateral stop cock, when the lower flexible disc will resume its seat, and cut off the supply of water to the basin or pan. The apparatus is then again fit for use. —*Not proceeded with.*

1494. J. BILLING, Abingdon-street, Westminster, London, "Fire-places or stoves."—Dated 3rd July, 1858.

This invention consists in conducting a supply of air from the exterior of the room to the fire by means of a passage in the wall or floor, or other convenient place. The patentee causes this passage to communicate with an aperture or apertures in one side of the fire-place or stove, and conducts a pipe or passage over or round the fire-place to another aperture on the other side of the fire-place. These apertures supply the air to the fire and to the room. They are provided with valves or regulators, and may be adjusted to direct the air in such a manner as to counteract accidental draughts in the room. By regulating the valves suitably the temperature of the room may be raised or lowered at pleasure,

1502. J. G. JENNINGS, Holland-street, Blackfriars, Surrey, "Air bricks."—Dated 3rd July, 1858.

In manufacturing air bricks, in place of using cast iron as heretofore, clay or brick earth is here employed, and the bricks are formed by expressing the clay when in a plastic state through moulding orifices or dies. Numerous air passages are made through each brick horizontally, and such passages may be arranged according to an ornamental device, or simply in parallel directions; or large openings may be formed in each brick, which may afterwards be filled in with an ornamental device in clay or metal. These air bricks are made to correspond in dimensions with the bricks used in constructing the other parts of a building. The air bricks, however, when desired may be made of various lengths, and of a thickness corresponding with one or more courses of brick. In the making of bricks to bond walls which are built hollow, the bricks are made by expressing clay or brickwork through moulding dies or orifices. Each brick is made with vertical passages through it, and each brick is formed of a length corresponding with the thickness of the intended hollow wall in which it is to be used, except where the wall is to consist of three parts, then each brick is made of a length equal to the thickness of two parts of the wall and the space between them. The sides of each brick are made with projections and grooves, and the bedding faces of the brick have hollows sunk, so as to prevent any moisture from flowing from the external to the internal wall; the edges of each end of the brick are jagged so as to hold, when laid, the external and internal walls more firmly together.

1504. J. G. JENNINGS, Holland-street, Blackfriars, and J. LOVEGROVE, Victoria-park-road, "Water-closets, and apparatus used in ventilating house drains or sewers."—Dated 3rd July, 1858.

In constructing stone or earthenware basins for water-closets according to this invention, the basin is formed with a conical outlet in the side or bottom, in which is fitted a hollow plug of metal or other material, which is made by a flexible ring. This hollow plug is made of such a length as to retain the water in the basin to a proper level, and any addition of water flows off through the hollow plug, it forming an overflow pipe as well as a plug. The plug is fitted with an ordinary closet handle, and when lifted liberates the contents of the pan into the ordinary syphon trap. At other times the plug is to remain in position during any determined time, the object being to save water from sinks waste pipes, or other sources where the supply of water may be limited, In order to ventilate house drains and sewers the patentees combine an air valve with the ordinary syphon trap and outlet valve, the valve being metal-faced. The agent or motive power of ventilating is the variation in the temperature of the atmosphere, and the water discharged into and flowing through the drains or sewers.

CLASS 6.—FIRE-ARMS.

Guns, Swords, Cannons, Shots, Shells, Gunpowder, Implements of War or for Defences, Gun Carriages, &c.

1497. THOMAS RESTELL, New Kent-road, London, "Fire-arms."—Dated 3rd July, 1858.

This invention consists in improvements in breech parts of breech-charging arms; First, in applying moving parts in conjunction with a small box screwed in at the rear end of the barrel, just behind what is called in the gun track the "percussioning," and without such percussioning being of necessity altered. This box forms part of a patent granted to the patentee the 14th October, 1857. In the first arrangement of these breech parts the patentee uses a wedge or bolt, and affixes a lever or arm at the top edge thereof, instead of at the side, as shown and described in the specification of the said patent. Upon this wedge being lifted out from where it blocks in the box, it can be pulled backwards, and the breech of the gun will then be open for the purpose of inserting the cartridge. When these parts are again pushed home, the cartridge is forced forward in the barrel, and upon bringing the lever or arm down to a line with the stock the whole becomes secure; or he simply uses a flat disc of steel with a cylindrical nose to enter the barrel; this disc has a spring fixed to its upper edge, which is entirely covered by a long strap, so that no recess is seen in the head or breech part of the gun, which is fixed to the above disc, and the spring has its end playing in a hole or recess formed in the under part of the strap, which causes it to lie flat in the stock, and remain in the curved part at the commencement of the upper end of the stock butt. In this disc there is a hole through which the lock (as will hereafter be detailed) shoots a bolt, and holds the parts just described firmly to the box before mentioned when the gun is fired; but this hole being only opposite the bolt of the lock when the breech is closed, the arm can by no possibility be discharged until the breech is safely home. The patentee sometimes uses a disc of steel, and the strap shorter, with a curved head affixed, to be partially withdrawn with the thumb when this can be lifted up. Upon the top of this strap, at its head, is fixed a joint, having a wire or tube attached, which slides into a hole at the rear end of the barrel upon its upper side. The improvements in locks, constructed expressly for breech-charging arms, and used in the before described modifications, consist in making the centre parts of the hammers partly cylindrical, in which an inclined groove or part of a screw is formed; a bolt, with its side cut away to fit in this incline, is fixed in the lock, and is placed simultaneously to the lock plate with the hammer upon half cocking or full cocking the gun; this bolt is drawn by the action of the incline in the hammer horizontally out of the breech parts of the gun, enabling them to be moved for the purpose of charging. The improvements in the nipples of guns consist in drilling a hole in them directly in the side of any part of the screwed portions of them which is under the flange, and which beds in the hole having the female thread; he is thus enabled to drill a hole (without destroying the number of threads in the screw, or weakening the hold of the nipple) much higher up the percussioning than usual, and to make the communication direct upon the middle of the cartridge. In this method of converting the present military arms into breech-charging arms under the patent before referred to, the patentee finds this of great advantage, as it enables him to pierce the present Woolwich cartridge paper bag (however thick it may be) with the flash of the cap, and without causing the hammer to jut over the barrel. He also stops up the hole in the lower part of the nipple, as far as the hole drilled in its side, thus making a continuous direct communication to the cartridge. Of course in making new guns this will not be necessary, as the vertical hole of the nipple will be drilled one half way down and just deep enough to be under the lower edge of the cap flange. By way of addition to the breech-charging apparatus, as described in the specification of the patent 14th October, 1857, he adds on the opposite side of the hammer a spring fastening, which enables him to remove or replace the breech piece marked H in the drawings annexed to the specification of such patent, without removing any other part, or using a tool of any kind. He also uses such spring fastening in the modifications hereinbefore described. He also uses a pin or screw at the fore end of the trigger guard, which enables him to dispense with the breech pin or screw as at present used for trigger plate and breech, and also the prong and small pin now attached to the guard under the lock; this improvement does away with the connexion between the lock and guard, and admits of either being removed without interfering with the other of them. In the improvements in breech chargers having reference to the conversion of the present sporting birding guns—and which are now about to be described—this nipple arrangement is of great service. As heretofore, the caps not being used so strong for these arms as for military purposes, an ordinary cartridge could not be penetrated, but by using a small stud inside what is called the break-off, the end of the cartridge is pierced, and with that, in combination with the above nipple, explosion is secured. The construction of the improved birding gun (which plan is particularly adapted for converting the present ramrod gun into a breech charger) consists simply in using the like screwed or grooved axle as described in the specification of the patent before referred to; but in this case it is affixed to the single or double barrels just at the fore end of the stock, and not running through the bore of the barrel as described in the specification of the said previous patent, but passes into a hole made in a long bar of steel let into the stock at the part now occupied by the ramrod, this steel bar being affixed to the break-off at the head of the gun, and the lock screw running through a hook formed out of it. The lever which moves the grooved axle has a hole in it into which springs a stud; the front of this hole is deeply chamfered so that the finger can press in the stud, and the finger being already in the hole at the time the stud is pressed in, the lever can be immediately moved so as to bring the axle out of the hole in the bar of steel. As described in the former patent, a pin or stud to cause this works in the inclined groove or helical slot. For this gun the patentee simply uses a cartridge of small shot in a case, and the paper containing the powder is affixed to its back with a thread, or may be jointed as in the specification of the former patent. The cartridge for this as well as for the breech-charging rifle will be presently described. The patentee sometimes uses the last mentioned arrangement for breech-charging rifles, but the axle in this case has a flat filed upon its side, upon which the hammer of the rifle rests, and upon motion being given to the lever the round part of the axle keeps the hammer off the nipple until the breech is properly closed. The lever of this rifle, although the same as regards the principle in the working part of the axle as the one already described in the specification of the previous patent, is in this case on the right hand side of the gun, instead of the left, and to make room for the axle the block or stud into which the main spring acts is placed further up towards the narrow end of the lock plate, and the lock plate is then cut away to allow the breech part which receives the axle to be placed just in front of the hammer centre, so that it may rest upon the flat formed on the axle of the lever as before described. For breech-charging cannon the patentee screws a very thick head of wrought iron or other metal in a spherical form or otherwise in the rear of the gun, through which head he passes an axle with an inclined groove in it, and affixes a lever of suitable strength to the axle, using a similar spring stud at the end of the lever, as is described for sporting birding guns; or he makes the lever simply snap over the round of the barrel. In order to ensure the firing of breech charging cannons from the explosion of a percussion cap, he screws into the touch hole a nipple provided with an arm or lever to screw it in and out, and causes the nipple to terminate at bottom in a tube which enters into the cartridge. The improvements in cartridges for breech charges (whether large or small arms), and without which they would practically be of little use, consist in forming the back of the cartridge with a deep recess made grease proof with gum arabic, shellac, cement, or other material suitable for the purpose, and on charging the same with grease, tallow, or other lubricating material, so that when tallow or lubrication of any kind is placed in such recess it will not heat and penetrate to the powder, and at the same time, however soft the tallow or other lubricating material may become in hot climates, in no case will it come in contact with the fingers when the cartridge is being handled for loading, the recess being only partially filled. By this arrangement the patentee is enabled to use a much softer lubrication than usual, which will act equally well in cold as in hot weather, and will not clog the barrel or breech parts. He is also enabled to pack cartridges together without chance from increase of temperature of the lubricating material passing from one cartridge to another. The back of the paper or other material used for enclosing the powder and balls at the recessed parts is formed of a uniform thickness with its sides, and thus he makes a rifle or gun cartridge at its rear, and without the usual process of tying, and obtains a much neater finish at the edges of the recess. Above all, in importance, and which is the most particular object and use of the recess at the rear end of the cartridge or powder part, is, that the lubrication placed therein shall at each explosion be forced into the breech parts of the weapon. From the want of some plan for supplying such lubrication continuously, breech-charging arms, as heretofore used, after firing a few rounds have become fixed, and the arm rendered useless until the breach has been removed and cleaned. Another advantage resulting from this plan is, that should the weapons be left uncleansed or exposed to wet after use, they are effectually prevented rusting until the opportunity occurs of removing the dirt and moisture. Sometimes for ordnance (as the flash of these is so much more powerful), the patentee prefers filling the recess with bees'-wax, or employs a disc of considerable thickness of bees'-wax mixed with tow or other suitable material. The above method of recessing and lubricating are used either at the rear end of the ordinary cartridges or to the particular jointed cartridges described in the specification of the previous patent, before referred to. Another improvement in the construction of cartridges consists, when making them, in gumming or cementing the outside of the paper or other material inclosing the bullet at the front thereof (instead of fixing such bullet to the paper itself, as it has heretofore been the custom). Upon twisting the above paper or other material over the point of the bullet the folds become fixed together by the gum or cement, so that the bullet is firmly secured in, and yet does not adhere to any part of the paper or other material. The advantage of this is that when the bullets are fired they fit the barrel very tightly, and yet immediately after they issue from its nose separate from the paper, and their flight and accuracy of shooting are not impeded.

CLASS 7.—FURNITURE AND CLOTHING.

Including Cooking Utensils, Upholstery, Ornaments, Musical Instruments, Lamps, Manufactured Articles of Dress, &c.

1398. W. C. WILKINS, Long-acre, London, "Lamps."—Dated 21st June, 1858.

In those descriptions of safety lamps in which the flame of the lamp is surrounded by glass, considerable difficulty is experienced in bringing a sufficient supply of air to the flame. To obviate this difficulty the patentee constructs a series of tubular passages through the oil vessel, which communicate at their lower end with the external air, and at their upper ends they terminate near the wick, so that the air which passes into the lamp through these passages comes at once in contact with the flame. This arrangement is also applicable to other lamps. In safety lamps, to avoid danger of explosion, the ends of the passages are covered with wire gauze; or, in place of this arrangement, the oil vessel of the lamp may be surrounded by an external case, round the bottom of which a series of holes are formed for the admission of air. Immediately above these openings the case is provided with a false bottom of wire gauze, and after passing through this the air passes up all round the oil vessel, and enters the body of the lamp.

1401. A. V. NEWTON, Chancery-lane, London, "Spoons and forks."—A communication.—Dated 21st June, 1858.

This invention relates to the application of malleable cast iron for the manufacture of spoons and forks, in place of the copper or brass at present used in the production of these articles in electro-plated ware. The malleable iron is rolled in the same way as in the manufacture of the like articles in copper, but under the influence of a double decarburation to which the cast iron is subjected. By this means an economy is effected in the cost of the articles, the copper being replaced by an innocuous white metal, which presents also the advantage of increased strength.—*Not proceeded with.*

1409. J. A. RAINE, Wells-street, Gray'-inn-road, London, "Collapsible framework for bedsteads, sofas, and other like articles of furniture."—Dated 22nd June, 1858.

This invention consists in the application of a system of cross levers similar to lazy tongs, in such manner that by a single set or system of cross levers on each side of the bedstead or other frame it can be distended or collapsed, and fixed either at full length or in a collapsed state at any intermediate length required.

CLASS 8.—CHEMICAL.

Including Special Chemical and Phamaceutical Preparations, Fuel and Lighting Materials, Preparation and Preservation of Food, Brewing, Tanning, Bleaching, Dyeing, Calico-Printing, Smelting, Glass, Pottery, Cements, Paint, Paper, Manures, &c.

1404. H. DEACON, Widnes Dock, near Warrington, Warwickshire, "Purifying alkaline lees."—Dated 21st June, 1858.

This invention relates to certain improved processes for purifying the liquors or alkaline lees containing alkaline sulphides obtained in the manufacture of alkalies, such as soda and potash or carbonates thereof. The said processes consist, Firstly, in adding hydrated protoxide of iron, or hydrated peroxide, or hydrated magnetic oxide of iron, to such lees at any convenient temperature not exceeding 130 degrees of Fahrenheit's thermometer. Secondly, in separating at any lower temperature than 130 degrees Fahrenheit the precipitate produced in and from such lees, by the reaction at a higher temperature of any salt of iron, except its sulphides, or of any oxide of iron when added thereto; and when the term "salt," or "metallic salt," is used herein the patentee means such compounds of iron, manganese, and zinc, not being sulphides, as are well known to chemists as salts of iron, manganese, and zinc, as chlorides, sulphates, &c. &c.; and of such salts he prefers the basic sesqui-chloride of iron. Thirdly, in adding any salt of iron, or oxide of iron, to such lees in a state of concentration at or near their boiling points, and in subsequently diluting them and separating the precipitate. Fourthly, in exposing the said lees after any salt or oxide of iron, manganese, or zinc has been applied thereto to the action of atmospheric air and agitation. Fifthly, in the prolonged application of temperatures below 130 degrees Fahrenheit to such lees when containing any ferro or ferri cyanides. Sixthly, in the admixture of caustic lime or magnesia to the precipitate produced by any hereinbefore mentioned metallic salt or oxide reacting on such lees, for the purpose of retarding the oxidation of the precipitate during the separation of the alkaline lees therefrom. Seventhly, in roasting such precipitate, when not mixed with lime or magnesia, with an alkaline chloride, so as to produce a corresponding alkaline sulphate, with the view of utilising such precipitate.

1466. HILARY NICHOLAS NISSEN, Mark-lane, London, "Preparing paper for receiving stains, &c."—Dated 29th June, 1858.

This invention applies to that description of paper now ordinarily used in a damp state for taking press copies of letters and other written instruments. It consists in preparing the paper by coating or impregnating it with a solution or other preparation of catechunic acid and iodine, whereby the paper, upon being damped with clear water in the ordinary manner of damping copying paper, will receive a stain from writings written with ordinary writing ink.—*Not proceeded with.*

1432. J. BETTS, Strand, "Obtaining surfaces on which to print maps and other designs."—Dated 25th June, 1858.

The inventor proposes to take a woven or textile fabric or other suitable foundation material, and applies thereon a coating of pigment combined with boiled linseed oil, diluting the oil in case of need with either alcoholic or resinous spirit, as may be preferred. This coating is laid on to the foundation with a brush, and afterwards scraped and rubbed down, or the latter only, and the process repeated until he obtains a smooth, even, and absorbing surface. The occasional assistance of caloric is obtained, if from the state of the atmosphere or other cause he requires it. On the surface so prepared he prints the map or design, finishing the work by sizing and varnishing. The pigments used for white surfaces are carefully prepared zinc, lead, or other whites; but he prefers the former. He adds pigments of various sorts and colours when he requires various tints, and sometimes to improve the body of the composition or coating above described.—*Not proceeded with.*

1505. E. HAEFFELY, Kearsley, "Recovering oxides of manganese from products arising out of the manufacture of chlorine, and in raising commercial manganese to higher oxides."—Dated 3rd July, 1858.

The liquor from the vessels in which chlorine gas is generated is allowed to flow upon lime-stone, or carbonate of lime, or carbonate of baryta; until the free acid contained in it is neutralised, or nearly so. It is then boiled with finely divided limestone or chalk, or carbonate of baryta (the carbonate of lime arising from the manufacture of caustic soda is applicable), and the peroxide of iron held in suspension is separated, either by filtration or subsidence, from the solution from which the manganese is precipitated by free lime. It will be found that boiling greatly accelerates the filtration or the subsidence. When all the manganese has been precipitated, a further quantity of free lime is added, the proportion of which can be ascertained by noticing the quantity required to precipitate the manganese, and then adding as much more. Or in equivalents for every equivalent of manganese there should be two of caustic lime. The precipitate is then boiled and thrown on to a filter, from which the chloride of calcium is permitted to drain. It is washed by water being poured over it, and then transferred to an iron pan to be dried. From this it is removed to a closed or muffle oven, maintained at a low red heat; but even a white heat is found not to be injurious. The contents of the oven are then lixivated with weak hydrochloric acid, or by the refuse liquor from the apparatus for generating the chlorine gas, by which treatment the lime is removed in solution, and the manganese in a high state of oxidation remains. In raising manganese of commerce to higher oxides the manner above described is followed.

1507. RICHARD ARCHIBALD BROOMAN, Fleet-street, London, "Cast steel."—A communication.—Dated 5th July, 1858.

The object of this invention is to produce cast steel from iron of any description in one operation, and the invention consists in cementing in a suitable crucible or furnace fragments of iron or steel of any description by means of a mixture composed of oxide of iron or of manganese, carbon (either plain or hydrogenised, such as resin or soot) and potash, soda, lime, alumina or other alkaline or earthy material in the state of an oxide or of a salt. In order to produce the required reactions between these substances it is necessary to mix them intimately by means of water or some other suitable liquid or solvent, and to spread them as uniformly as possible among the fragments of iron or steel. Or, instead of uniformly spreading the mixture in this manner, the substances may be placed in layers in the crucible or furnace. The carbon impregnated with the oxides and the salts is not affected by the air, but combines intimately with the iron or steel. The combination is favoured by the nascent state of the carbon, and by the electric action set up by the oxides and salts. Instead of employing alkaline or earthy materials in the state of oxides or salts they may be employed for the purposes of this invention in a state of chloride; but then it is necessary to employ hydrogenised and not pure carbon, or an increased quantity of oxide of iron or of manganese to disengage the chlorine. The remainder of the process is conducted as before. The quantities of the various materials used in carrying this invention into effect depend upon the nature of the metals operated upon, and of the product desired. But, as an example, it may be stated that to convert iron or steel of inferior quality into good cast steel, about 3 per cent. of alkaline material, and from $2\frac{1}{2}$ to 3 per cent. of carbon or carbonaceous matter, such as resin or soot.

CLASS 9.—ELECTRICITY.

Including Electric, Magnetic, and Electro-Magnetic Apparatus, Electrical Apparatus, Galvanic Batteries, &c.

1483. C. F. VASSEROT, Essex-street, Strand, London, "Electro-magnetic machines."—A communication.—Dated 2nd July, 1858.

This invention consists in using a cord made either of hemp, cotton, wool, flax, horse-hair, cloth, cane, or any other material capable of being twisted, plaited, or rolled, and offering at the same time resistance and suppleness, and in surrounding the said cord with a wire of copper or any other conducting metal.—*Not proceeded with.*

1491. J. L. CLARK, Haverstock-hill, Middlesex, "Electric telegraph cables or ropes."—Dated 2nd July, 1858.

In order to distinguish one wire from another when coated with gutta-percha, or a compound containing gutta-percha, or with other plastic insulating matter, a projecting rib or ribs, or it may be groove or grooves, are formed longitudinally on or in the coating. By these means, when such coated wires are made up into telegraph cable or ropes, the wires have each their distinguishing marks.

CLASS 10.—MISCELLANEOUS.

Including all Patents not found under the preceding heads.

1282. E. VIGERS, Paddington, London, "Manufacture of bricks and other articles moulded or formed from clays."—Dated 7th June, 1858.

This invention consists in applying a material obtained from a refuse article resulting from the employment of the torbane mineral and such like material in the manufacture of carburetted hydrogen gas. When the torbane mineral has parted with all, or nearly all, the volatile or volatilisable property possessed by it, or therein contained, whilst under the action of heat in a retort for the purpose of distilling gas therefrom, it is withdrawn from the retort, and this refuse is thrown on the waste heap. Now it has been found that this refuse, which is of a black colour, contains generally sufficient carbonaceous matter to enable it to be burnt in heaps in the open air without fuel, after having been ignited, and when it has been subjected to perfect calcination the result is white masses or nodules of a light friable material, which has been chemically determined as "anhydrous silicate of alumina," and the patentee has found that by reducing this material, to a suitably fine powdered condition,

and then intimately mixing it with various kinds or descriptions of clays, he thereby improves the quality of the clay with which it is mixed, and also enables clays which could not heretofore be employed for producing numerous articles economically or perfectly to be easily wrought, perfectly moulded, and capable of being successfully burnt or kilned.

1288. J. C. QUINCE, Crosby-hall-chambers, Bishopsgate, London, "Stoppers for bottles and jars."—Dated 8th June, 1858.

This improved stopper is formed in the interior with a groove or cavity fitting over the top of the bottle or jar, with a plug or solid portion fitting into the mouth of the same. A washer of leather, india-rubber, or other elastic or compressible material, is inserted in the groove or cavity, and fills up the space between the substance of the stopper and the top of the bottle or jar. The exterior of the stopper is also grooved to receive a wire, string, or other means of attachment, to the neck of the bottle or jar, which has a projecting ring formed on it for the purpose of facilitating the tying or fastening of the wire or string.

289. R. A. BROOMAN, Fleet-street, London, "Pipes and tubes."—A communication."—Dated 8th June, 1858.

This invention consists in manufacturing copper tubes and pipes without joint or weld, and either straight or curved, by depositing copper in a galvanic battery over and upon a core of lead or other fusible metal or material capable of being fused or melted by heat, or otherwise reduced or removed. The core may be solid or hollow, and, when hollow, may be allowed to remain in the copper tube or may be removed by melting or otherwise.—*Not proceeded with.*

1295. A. RIGG, sen., and A. RIGG, jun., Chester, "Improvements in apparatus for tipping or upsetting coals, minerals, or other substances, and in brake machinery."—Dated 8th June, 1858.

The improved apparatus consists of a table or framing mounted on axles, on which framing or table the receptacle or wagon containing the material to be upset is held firmly. On the axle there is a brake wheel surrounded by a band which is connected to a lever which moves between fixed guides, on which guides there are ratchet teeth, into which a click on the lever takes, so that the brake can be left in any position on the brake wheel. There are also teeth into which a click enters, so that, after the coals or other substances have been upset, the moveable parts are prevented from returning until the click is released. The receptacle or wagon containing the material to be upset is placed on the framing or table in such position that the centre of gravity is beyond the axles, so that, when the brake is released, the framing and wagon tilt over, and the speed at which they are allowed to tilt is regulated by means of the brake. The framing or table is so weighted that, when all the coal or other substance has been upset, and the click released from the teeth on the brake wheel, the framing table resumes its first position. To the front of the table or framing is fixed a scoop or screen with or without sides, which receives and guides the coal or other substance as it slides or falls to the spot required; or a scoop or screen may be fixed in front of each receptacle or wagon. Brake apparatus constructed as above described is also applicable to other machinery.

1298. D. MOSELEY, Manchester, "Machinery used in the manufacture of vulcanised india-rubber thread."—Dated 4th June, 1858.

In manufacturing vulcanised india-rubber thread it is customary to lap a sheet of vulcanised india-rubber round a roller, the sheet of vulcanised india-rubber passing through a trough containing a solution of shellac, which causes the whole to adhere together while being cut. In the usual mode of operation the sheet of vulcanised india-rubber passes under a rod or roller placed in the trough, and the surplus shellac is removed by an instrument called a "doctor." This invention consists in dispensing with this instrument called a "doctor," and in causing the large roller on which the vulcanised india-rubber is lapped to bear on the roller in the trough containing the solution of shellac, and around which the sheet of india-rubber passes before it is lapped on the large roller. When the sheet of vulcanised india-rubber is being wound on the large roller the surplus quantity of shellac or other cement is squeezed out by the pressure between the lap and the roller in the trough.

1303. C. F. VASSEROT, Essex-street, Strand, London, "Apparatus for measuring and registering the flow of liquids."—A communication.—Dated 9th June, 1858.

This invention consists of two cylinders placed side by side, and two balance beams connected together and placed one above and the other underneath the cylinders. A pipe open at both ends ascends to a certain height in the centre of the cylinders. The liquid is admitted in both cylinders alternately, and when it has filled one of them up to the mouth of the pipe it overflows through it, and falls into a cup placed immediately underneath the lower orifice of the pipe. The cup rests on the lower balance beam. The weight of the liquid it receives overcomes a counterpoise placed above the opposite cylinder, and forces down the balance beams. This movement raises the rod of a valve placed at the bottom of the cylinder, and the liquid which it contained, as well as that in the cup, is then discharged. One end of the axle of the upper balance-beam is furnished with a crank, the rod of which communicates the movement to the wheel work placed outside the apparatus, which is combined to actuate the hands of two indices indicating the number of beam strokes; and as the quantity of water necessary to overcome the counterpoises represents a certain measure, the indices will consequently show the number of pints or quarts which have passed through the apparatus.—*Not proceeded with.*

1304. J. EASTERBROOK, Sheffield, Yorkshire, "Ratchet braces."—Dated 9th June, 1858.

This invention consists in letting into the bow in which the ratchet lever is made to terminate a toothed spherical-sided wheel, which is acted upon by a spring or other pawl let into the lever. The toothed spherical-sided wheel is retained in the bow by a collar secured by screws. The brace thus formed, while it possesses all the advantages of an ordinary ratchet brace, has this superiority, that it can be used in positions where a brace with a straight sided ratchet wheel would be wholly inapplicable.

1308. T. ROBINSON and H. OGDEN, Manchester, Lancashire, "Safety lamps and apparatus connected therewith."—Dated 9th June, 1858.

The object of the first part of this invention is to attach the gauze to the lamp in such a manner that it cannot be removed by any apparatus which the miner usually has at his disposal; and to effect this end in a simple manner the patentee claims, Firstly, the use of two or more fastenings, which must be held back simultaneously to allow the gauze to be removed. Secondly, the use of keys acting by screw threads for unlocking safety lamps, whether one or more fastenings be employed. Thirdly, an apparatus for unlocking, described, whereby two or more keys are made to act simultaneously. Fourthly, the use of enamelled metal reflectors for safety lamps.

1309. J. ROBERTS, Upnor, Kent, "Reflector or cover for gas burners."—Dated 9th June, 1858.

The chief object of this invention is to prevent the accumulation of heat in apartments arising from the combustion of gas. For this purpose the inventor proposes to apply to the metallic reflectors used in connexion with gas burners, or to the covers used for intercepting the smoke of the gas flame, a water chamber, which, being in close proximity to the flame, will take up a great portion of the heat generated, and by transmitting it to the water contained in the chamber give off an aqueous vapour that will effectually keep down the temperature of the apartment. Standing up over the central hole in the reflector is a tube with a closed end, and surrounding this tube is one of larger diameter and somewhat greater length. These tubes are securely brazed to the upper side of the metallic disc reflector, and form an annular water chamber, over the inner periphery of which the heated gases from the flame play, thereby causing a slow evaporation of water contained in the chamber. In cases where a reflector is not required, the suspended cover for collecting the smoke may be made with an annular water chamber, and the required result will be in like manner attained.—*Not proceeded with.*

1314. J. LUIS, Welbeck-street, London, "Alembic wine examiner."—A communication.—Dated 10th June, 1858.

This invention cannot be described without reference to the drawings.—*Not proceeded with.*

1318. T. CHATWIN and C. TAYLOR, Birmingham, Warwickshire, "Screw stocks."—Dated 10th June, 1858.

The improved screw stocks contain three dies situated in the stock nearly in the directions of radii to the axis of the rod or bar on which a screw is to be cut by the said dies. One of the dies is ordinarily stationary, and the other two are made moveable, being capable of a sliding motion so as to approach to and recede from the stationary die. This motion is necessary during the cutting of the screw, and also for the making of screws of different diameters having the same pitch of thread. The patentees claim causing the moveable dies of a screw stock to advance either by the advance of a screw box upon the screwed handle of the stock, or the advance of a screw in the body of the stock. Secondly, causing the several dies of a screw stock to advance simultaneously by the use of a ring encircling the dies, the inclined inner face of the said ring urging the dies forward, when the said ring is made to advance by a screwing motion into the body of the stock.

1320. W. DAVIS, Birmingham, Warwickshire, "Tangs of awls, awl blades, and the stocks or pads for holding the same."—Dated 10th June, 1858.

The object of this invention is to simplify the form of that portion of awls called the tang, by which they are united to the handle. At the same time that the patentee effects this, the awl when finished will be found much stronger at this part than when made in the customary way, and the tangs being of a uniform size the awls may be readily removed or applied to their respective pads or handles, as this part is intended to be formed of a uniform size, according to the character of awl intended to be made. Secondly, in the manner of giving form to such kind of awl blades; and, Thirdly, in the stocks or pads for holding such awls, which stocks or pads are secured to handles turned and finished in the usual way, and the means thus described are also applicable for applying other such like implements to the handle or pad by which they are intended to be used, such as surgical instruments, corkscrew worms, crochet crooks, &c. The improvements cannot well be described without reference to the drawings.

1325. J. GEMMELL, Belfast, Antrim, Ireland, "Starch."—Dated 11th June, 1858.

According to these improvements the grain or vegetable substance used for the manufacture is steeped in water, and otherwise treated in the usual manner. The water and the partially dissolved starchy matters are then passed through sieves to separate the coarser particles therefrom. The stained product is run from the sieves on to an inclined plane, or what is technically termed a runner, and hitherto only used for separating the starch from the "slimes." In this operation the water is run off, and the whole of the amylaceous product is precipitated upon the face of the incline or "runner." The starch is now removed to be dried or otherwise disposed of; the whole operation of what may be termed the wet part of the process being effected in one apparatus. The runners or inclined planes used for the purpose may be modified in construction to suit the object in view, and may be arranged in series so as to carry on the process continuously. By means of this simplification of the manufacture the yield of starch is of uniform quality, the ordinary waste of material is avoided, and time, labour, and plant economised.

1328. G. BARTHOLOMEW, Linlithgow, "Gas meters."—Dated 11th June' 1858.

The object here is to secure uniformity in the measurement of gas, by keeping the surface of the water in the measuring compartments at the same level, although by evaporation or otherwise the water becomes diminished or increased in the case. The patentee claims, the arranging wet or water gas meters so that the drum or measuring chambers acting on suitable index apparatus are made to float in the water or other fluid contained in a case or reservoir, whereby such drum or measuring chambers, whilst such meters are in action, are sustained at a uniform and determined line of immersion in such water or other fluid, whatever may be the height of the water or other fluid in such case or reservoir, and unvarying measurement thereby obtained.

1339. A. V. NEWTON, Chancery-lane, London, "Machinery for cutting veneers."—A communication.—Dated 12th June, 1858.

This invention consists chiefly in the use of two knives arranged and operated so as to cut the veneer or sheet of wood from opposite sides of a log or block, each knife cutting one-half of the veneer, and so that each knife will make its cut or stroke in the same plane with the other knife, and in a line parallel with the run of the grain, whereby the veneer is less liable to be roughed or broken than when cut in the direction of the length of the log. In order to cut veneers from such woods as are usually used for veneers by the improved machinery forming the subject of the present invention, the log is first to be steamed in a suitable box, by preference, by the use of steam and hot water combined, in order to soften the fibres, unless the log is a very soft or green wood, in which case the steaming will not be required.

1341. J. H. YOUNG, Great College street, Camden-town, Middlesex, "Setting up (composing) and distributing types."—Dated 14th June, 1858.

These improvements in setting up types relate chiefly to the composing machine patented by the patentee in 1840, in which an inclined plane is used for the purpose of collecting the different types as they are required at one particular point; but they are also applicable to the machines in which a moveable belt or belts are used as a collecting medium. The patentee now claims, First, the application of apparatus for obtaining a regulated alternate movement and stoppage to the stepwheel. Secondly, the application of apparatus for obtaining a regulated alternate movement and stoppage of the types upon the inclined plane, in order to insure their being properly taken off. Thirdly, making the steps of the stepwheel moveable. Fourthly, the raising of the types at the termination of the inclined plane of the same, and the regulated action of the pusher so that it may not strike at an improper movement. Fifthly, the application of electro-magnetism for regulating the taking off the types off the inclined plane and their delivery into the receiver. Sixthly, the application of a small auxiliary composing machine, which may be fixed to, or detached from, a larger or other composing machine. Seventhly, the partial covering of the channels down which the types slide on the inclined plane. Eighthly, the application of a groove for small-bodied type in the bed of the channels of the inclined plane used for a larger bodied type. Ninthly, the application of a pusher through the aperture or apertures so constructed in the inclined plane to allow of superfluous types falling off the same. Tenthly, the application of moveable blades to effect the distribution of types by means of their nicks as described.

1342. H. J. DANIELL, Donington-park, Derbyshire, "Process by which the stamp on bankers' cheque is cancelled, and the cheque indelibly and simultaneously crossed."—Dated 14th June, 1858.

The patentee claims the exclusive right to cross bankers' cheques, and cancel the stamp thereof, by excision or perforation thereof.

1343. H. N. S. SHRAPNEL, Medway Manor House, Bradford, Wiltshire, "Preparing iron and other metals or mixtures of metal, and casting the same in moulds."—Dated 14th June, 1858.

In carrying out this invention the iron or other metals or mixture of metals to be used in making the casting is, whilst in the furnace, subjected to a mechanical stirring. It is then run into the mould, and the stirring is kept up by a stirrer in the mould till the iron or other metal or mixtures of metals is set or solidified.—*Not proceeded with.*

1346. J. H. JOHNSON, Lincoln's-inn-fields, London, "Apparatus for breaking or crushing stones for road metal, and other purposes, and for crushing ores and other hard and brittle substances."—A communication.—Dated 14th June, 1858.

This apparatus consists essentially of a pair of vertical jaws, the one being fixed and the other moveable; or, if found desirable, both jaws may be moveable. These jaws have their acting faces corrugated vertically, and such acting faces are made also convergent downwards, one towards the other, so that whilst the space between them at the top where the stones or other hard substances are introduced is sufficiently large to receive them in an unbroken state, the space between the jaws at the bottom is only sufficiently large to allow the fragments to pass through after they have been crushed or broken to the required size. A short but powerful vibration is imparted to one or both of the jaws by any convenient arrangement and combination of powerful levers worked by a crank or excentric on the main shaft. The patentee prefers to employ one moveable jaw only, and to actuate such jaw by a combination of a knee or toggle joint with a powerful lever worked from a crank of short stroke on the main shaft, which may be fitted with a suitable fly wheel and driving pulleys. By the above described form and arrangement of jaws, and the motion of the moveable jaw, when a stone or other hard substance is dropped into the space between the jaws it falls down by its own gravity, until it is arrested by their convergent faces, and the moveable jaw advancing crushes the stone, the fragments of which are then partially liberated by the back stroke of the jaw, effected by a spring for that purpose, and descend by their own gravity further down, when the next stroke of the jaw will crush them still smaller, and so on until the whole of the fragments are sufficiently reduced to pass through the bottom space between the jaws. It is also proposed to combine with this machine a revolving screen to receive the fragments as they fall from the jaws, and separate or sort them into two or more sizes. To prevent the rapid wearing of the jaws, they should be made of hard iron, and be well chilled, and chilled pieces may be inserted into all the working parts of the machine which are subjected to any great strain.

1353. W. P. WILKINS, Ipswich, Suffolk, "Refrigerating apparatus."—Dated 15th June, 1858.

This invention refers principally to refrigerators used for cooling wort, and relates, First, to the method of securing the small tubes within the outer casing or shell which contains the cooling liquor or water. These tubes are fixed and held in the tube plates, but instead of fixing them rigidly thereto the patentee simply slides them through the holes formed to receive them. These tubes are arranged by preference in a circle within a cylindrical outer casing. He cuts from a sheet of india-rubber of sufficient thickness discs of the diameter of the outer casing, and cuts holes corresponding with the positions of the several tubes, and places them on the ends of those tubes which all project through the tube plates sufficiently for the purpose. He then places washers or plates similarly formed with holes to receive the ends of the tubes against such discs or washers of india-rubber, and by means of one or more screw studs and nuts forces the india-rubber against the tube plate, and thereby compresses it around the tubes. By this means the joints are rendered tight, at the same time admitting expansion and contraction to take place without affecting the tightness of the joints and also prevents damage to the refrigerator from expansion or contraction. The tubes thus fitted and fixed are at any time easily removed for repairs or other purposes. Another part of the invention relates to the arrangement of the channels or passages of the water in connexion with suitable cocks, valves, or other parts, whereby the water can be diverted from its ordinary course, and caused to pass through the wort tubes in the opposite direction to that of the course of the wort, whereby those tubes are readily cleaned from sediment, hop leaves, or other obstruction, and otherwise cleaned out. The passage of the wort is of course at the same time suspended through that part opened to the water. A third part of the invention refers to the introduction of a perforated metal disc in the outer chamber to sustain the tubes in the middle of their length (if long). This is similar to the washer used for compressing the india-rubber described, but with the addition of apertures for the passage of the water.

1354. Sir FRANCIS CHARLES KNOWLES, Lovel-hill, Berks, "Manufacture of steel."—Dated 15th June, 1858.

The nature of these improvements is as follows:—As soon as the metal is withdrawn from the converting furnace, in whatever shape it may be, as bars, rods, sheets, plates, &c., the patentee puts it into retorts of proper form and dimensions, but without any charcoal or other carbonaceous matter, and carefully excludes all atmospheric air from such retorts after they are filled with the metal. The retorts with their contents are then heated in the ordinary way of gas retorts for a longer or shorter time, according to the size or thickness of the bars, rods, plates, &c., until the temper or cementation by the carbon shall have become even throughout the mass, and the steel itself almost homogeneous. The bars, &c., must then be drawn out and immediately covered up from the air with the siftings of coke, and allowed to cool gradually in the heap. The patentee treats ingots of steel in the same manner, in order to render them more homogeneous, and to destroy any crystallisation or state of strain in the mass among its molecules. If bars, rods, plates, &c., of steel, after conversion (above all, if the iron from which they are made be itself clean), and after this subsequent process in retorts, be submitted to what is called "washing," heat, and then hammered or rolled, "shear" steel, or steel analogous to it, may be made without any welding process, and will be found to be highly homogeneous and solid. Ingots so treated will be less liable to crack under the hammer.

LIST OF OPEN CONTRACTS

SO FAR AS THEY RELATE TO ENGINEERING OR GENERAL CONTRACTORS' WORK.

RAILWAY WORKS—LONDON AND NORTH WESTERN RAILWAY.—Tenders are invited for the construction of a railway from a point on the Shropshire Canal to Coalport, a distance of 5¾ miles. Plans and specifications on and after 10th Jan. at Messrs. Locke and Errington's, 13, Duke-street, Westminster.—Tenders to 7th February.

COFFER DAM—BIRKENHEAD DOCK WORKS.—Tenders are invited for the construction, maintenance, and removal of a puddled timber coffer dam, at the entrance of the intended deep low water basin at Birkenhead. Plans and specifications at the office of the engineer, at dockyard, Coburg Dock, Liverpool.—Tenders to 22nd January.

BUILDINGS and WORKS—BISHOPSTONE.—Tenders are requested for new buildings and works, on the estate of the Ecclesiastical Commissioners. Plans and specifications at Messrs. Clutton's, Bishopstone, on and after 10th January.—Tenders to 5th February.

GASOMETER—COGGESHALL GAS AND COKE COMPANY.—Tenders are invited for the construction of an iron gasometer and cast iron tank, to hold from 5,000 to 8,000 feet of gas. Specifications with William Doubleday Coggeshall.

CAST IRON PIPES—VICTORIA.—Tenders are invited for cast iron pipes, bends, branches, syphons, &c., for the Geelong Gas Company, Victoria, Specifications with J. Scoltock, 75, Old Broad-street, City, London.—Tenders to 20th January.

BATTERY AND BUILDINGS—SWANSEA.—Tenders will be received for the construction of a battery, and other buildings on the Light House Island, Mumbles, Swansea Bay. Specifications and plans at the Royal Engineer Office, Pembroke Dock.—Tenders to 20th January.

GASHOLDER—EQUITABLE GASLIGHT COMPANY.—Tenders are invited for the erection of a cast or wrought iron gasholder tank, 112 ft. in diameter, and 30 ft. deep, with telescopic gasholder, columns, girders, &c. Particulars of the Company's engineer, at works, Lupus-street, Pimlico.—Tenders to 24th January.

BUILDINGS—BEDFORD.—Tenders are invited for the enlargement of the Grammar School, for the erection of a new school, and making a new road at Bedford. Plans and specifications with Mr. James Horsford, Architect, Bedford—Tenders to 24th January.

DOCK—PENARTH.—Tenders will be received for the construction of a dock at Penarth, and a portion of railway leading thereto. Plans and specifications on and after 24th January, at Mr. Hawkshaw's, 33, Great George-street, Westminster.—Tenders to 12th February.

GOODS AND CATTLE WAGONS—WATERFORD AND LIMERICK RAILWAY.—Tenders will be received for the supply of sixty to seventy wagons. Specifications with Thomas Aimsworth, secretary, at the offices, the Mall, Waterford.—Tenders to 18th January.

RAILWAY WORKS—LIMERICK AND CASTLECONNEL RAILWAY.—Tenders will be received for the construction of the line between Castleconnel and Killaloe. Plans and specifications at the engineer's office, 51, George-street, Limerick.—Tenders to 1st February.

RAILWAY WORKS—PORTPATRICK RAILWAY.—Tenders will be received for the construction of a viaduct over the Ken, and for the construction of upwards of seventeen miles of line. Plans and specifications on and after 21st January, at the engineers, 135, George-street, Edinburgh.—Tenders to 5th February.

THE INDUS STEAMERS.—The difficulty of the want of efficient means of transport on the Indus is likely to be obviated by the success of the corrugated iron tug steamers, built for the Indus Steam Flotilla by Mr. John Hamilton, of Liverpool. One of these vessels was launched and tried a few days since at Liverpool, when her draught was found to be 17 in., and her towing speed five and a-half miles an hour against the tide, or eight and a-half miles in still water, with 450 tons in four barges.

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

(*From our own Correspondent.*)

The Quarterly Meetings: *Wolverhampton and Birmingham: Prices confirmed: Cause of Dissatisfaction* — Pig Iron: *Increasing Firmness*—Insolvent Ironmasters: *In re Riley: T. H. Pemberton*—The Coal Trade: *Renewed Agitation by the Men*—Bootmaking Machinery at Stafford—Hollow Fencing—Youthful Engine Tenters Again: *Shocking Death of One*—Mechanics and Mining in South Staffordshire: *Shocking Results: Inattention by an Overlooker: The Testimony of the Government Inspector: Pit Chains*—Serious Disputes in the Glass Trade—Midland Institute—Birmingham Gas Company and their Consumers—The Proposed Bridge at Burton-upon-Trent: *To be Opposed by the Magistracy of Derbyshire and Staffordshire*—Exports of Iron from Liverpool with its Average Price in 1857 and 1858 — The American Iron Trade—*The Proposed Tariff: Spread of the American Trade*—The Mountain of Iron.

The current quarterly meetings of the Ironmaster's Association commenced on Wednesday at Wolverhampton, and were continued yesterday at Birmingham. At both places there was a good attendance of both members of the trade and consumers. The trade resolved to adopt the recommendation of the preliminary meeting, and continue the prices as they have ruled in the past quarter. On every hand an improvement upon last quarter was reported. It was not, however, such as to justify an advance. Nevertheless, Lord Ward's agent has sent out circulars announcing a rise of 10s. The proceeding is occasioning much dissatisfaction in the trade, especially as his lordship's iron has in the past few weeks been selling at 5s. under the list price, at which terms it is understood the make for some time has been sold. At the same time the masters are not without expectation that if the present steady improvement should continue, they may be able, by the end of the quarter, to require another 10s. per ton.

Pigs continue very firm, and prices at our last week's quotation, on which terms the few sales of yesterday and Wednesday were effected. We say few, because the makers will not sell large quantities even at those rates, unless their circumstances compel them to part with their commodity at once.

In re Riley and Riley, of Bilston, ironmasters, was a case which came again before the Birmingham Bankruptcy Court on Friday. On the last occasion of this case being heard, the examination of the bankrupt, Mr. W. T. Riley, was adjourned *sine die*. The decision of Mr. Registrar Waterfield on that occasion has since been appealed against, and the Lords Justices decided that the bankrupt should again come before this court, which he did this morning. Mr. Knight appeared on behalf of the assignees to oppose; and Mr. John Smith, with Mr. Edwin Wright, on behalf of the bankrupt. On the last occasion the examination was adjourned *sine die*, on the ground that the accounts filed were not satisfactory, and that better accounts could be furnished. A point then arose as to what was termed an arbitrary balance as struck on the 31st of December, 1856; and Mr. Knight now examined the bankrupt, who said that on the 20th of September, 1856, it appeared he had paid away more than he had received by £24,000. When he joined his father the book showed £79,000 overpaid. He began the present cash-book in October, 1854, without reference to his father's books. In February, 1855, the accounts appeared to have been overpaid £14,000, and in July £25,000. That balance was carried forward till October, 1858, when Mr. Snow came and commenced a new cash-book. He said he was perfectly unable to explain this state of the accounts. After hearing the learned gentlemen on both sides the commissioner allowed the bankrupt to pass his last examination.

A meeting of the creditors of Mr. T. H. Pemberton, of Deepfields Ironworks, near Wolverhampton, was held, on Tuesday, at the offices of Mr. E. J. Hayes, solicitor; Philip Williams, Esq., in the chair. The meeting had been convened by the inspectors, Mr. W. Hopkins and Mr. Carmi Rollason, for the purpose of obtaining from the creditors an authority to extend the time previously agreed on for payment of the respective dividends, the period at which it had been arranged that the second dividend should be paid being near at hand. It was explained at the meeting that the extension of time asked for was rendered necessary, through the required expenditure which had been incurred in opening the collieries in connexion with the estate, and the inspectors showed that there was a great probability that, by the creditors agreeing to defer the payments, as suggested, they would ultimately receive 20s. in the pound; whilst if the estate were now realised they could not possibly do so, as a valuable property would have to be sold at a great sacrifice. After some desultory conversation further time was given for payment of the dividends.

Coal is in good demand at remunerative prices. The question of wages has begun to be re-agitated W. H. Miller, the secretary to the South Staffordshire Coal Miners' Association, has distributed an address among the colliers, inviting them to a series of meetings to be held in different parts of the district. The first of these meetings was held on Thursday evening, in the Temperance Hall, Oldbury; it was attended by upwards of 200 persons, and was presided over by Joseph Linney, who said that the time was come for the masters to complete their promise, and increase the colliers wages. John M'Caffery spoke next, maintaining that not only had the time arrived when they had been promised an advance, but there could be no doubt that the masters were now in a position to give them more wages. Already, without being solicited, one or more masters about Wednesbury had intimated to their men (in the thin coal seams) that in about another week their wages would be raised 6d. a-day. He should recommend that steps be taken to obtain a rise of 6d. or 1s. throughout the whole district. After hearing Miller it was resolved that at a future meeting a deputation should be appointed to wait upon the masters, or some other steps taken to obtain an advance of 6d. a-day; and that if this increase was not given, then that the men would strike for a rise of 1s. a-day.

In the hardware and general manufacturing trades of Birmingham, Wolverhampton, and their districts, there is a tolerably steady trade; except, however, in some few fancy branches, and in railway coach trade. In Birmingham there is scarcely so much doing as there was a few weeks since. Such as it is, however, is most encouraging, as showing that shopkeepers at home are now disposed to give out what is known as shelf orders, otherwise to order for stock. There are no large contracts under execution in any branch, except that of the saddlery at Walsall, where some good Government orders are being executed.

The metal market continues in a very uneasy state. Both tin and also copper have gone up since our last. The rise did not, however, take the trade by surprise. On Saturday the price of tin was advanced 3s. per cwt., making common blocks 123s. 6d.; refined ditto, 133s. 6d. per cwt. On Tuesday an advance of one halfpenny per pound took place in the price of copper, making tough cake and tile £112 10s., and best selected £115 10s. per ton.

Several manufacturers in Stafford are busily engaged in fitting up rooms for machines, several of which are now in the town, and will in the course of a few weeks be in active operation.

Mr. Baylis, of Wolverhampton, proposes to form one rail of the fence, or hurdle, of tubing, and to connect the hurdles with union joints. By this means a stronger fencing is obtained, and facilities are provided for conveying water or other fluid for the purposes of irrigation, or for the use of cattle. At the Smithfield show Mr. Baylis exhibited this fencing and obtained numerous orders.

On Monday afternoon a boy of fourteen years, named Woolescroft, who had been employed as engine tenter at the Rough Hey Colliery, Darlaston Green, was killed whilst at his employ. He had placed the working of the engine in the hands of a second person, and proceeded himself, whilst the engine was in motion, to lubricate certain of its parts from a considerable elevation. The poor lad was thus engaged when he fell in the machinery. The engine was stopped before it had gone half a turn after the accident; but it was too late—the boy was dead. The injuries he had received were chiefly about the back. Some severe animadversions upon the employment of mere children to discharge so important a duty as the working of a colliery steam engine were made a few days ago, it will be remembered, by the Willenhall magistrates. Instances of negligent working of pits in South Staffordshire continue to come to light. The Wolverhampton coroner is now investigating the cause of the death of three men who lost their lives at the Osier Beds Colliery, in consequence of the breaking of the chain, on the 29th of December. H. G. Longridge, Esq., inspector of mines, again attended the inquest, and gave evidence as to the state in which he found the pit chain and pulley and other machinery to which it had been attached. He deposed that on the 1st instant he examined the winding chain and found two long links attached to the broken end, but the middle link was missing. He directed it to be sought for. It was now produced by Mr. Williams, the ground bailiff. Witness required two short pieces to be cut off the chain where the break took place, which, with the piece of chain where the break had occurred, were also produced. He went on to state:—I am inclined to believe that the cause of the breaking of the chain was, that it fell off the pulley to the north side, and got jammed edgeways between the axle bearing and the pulley. The sudden drop and jerk would account for the breaking of the chain. The holding-down iron strap, which was taken off in my presence, after examining the framework, &c., I have required to be produced. The engine ends of the broken chain had pulled away, and broken off a portion of the pulley axle carriage. In its present state I find the pulley to be out of the vertical position; but this is possibly attributable to the pull of the engine when the chain was joined. I cannot conceive any reason for the chain riding or climbing the pulley, except it has previously been out of the vertical position. I have examined the iron of which the chain is made, and produce some pieces of links which I had broken to test it. It appears remarkable that although the long part of the link has a most excellent appearance and fibre, the part where the connecting link is joined presents a crystalline form. It is to this circumstance that I attribute the accident; but I cannot account for the chain getting off the pulley, which is 3¼ in. in the "trod." I consider the chain has fallen off the pulley, and jammed edge up between the carriage and pulley, thereby throwing the strain on the upper link, which broke, and the others followed. There are four chains worked off one engine, and by one engine man, leading to different shafts in various directions, and at considerable distances, which I consider productive of danger, though customary in this district. The remarkable fact of the change in the nature of iron from a fibrous to a crystallised form, when placed in similar circumstances to those to which these chains are exposed, appears to require more consideration than has hitherto been given to it, and must always be productive of danger in case of any sudden jerk, no matter how excellent the links may have originally been. The portion of the chain near the engine, which did not go down the pit, appeared to me to be longer in the links on what would be the lower side of the chain when it dropped off the pulley. In reply to questions from the jury Mr. Longridge said that the form of the chain was as good as possible, if chains must be used, but he thought the slipping out of a piece of "blocking" (the wedges which keep the links separate) might have thrown the chain out of gear. He thought the chain a safe one for work, supposing it did not get off the pulley, and was not subjected to violent jerks.

John Wilkes, the engine man, stated that it was the duty of the field engineer to examine the chains three times a week, but in the week before the accident he only examined the chain at the pit in question once. Witness had heard complaints that the pit frame was out of the vertical position, and nine days before the accident the chain had broken, all the links of one row having given way.

A juryman mentioned a report that three men from Bilston had left the pit on account of the state of the pulley frames.

John Deakin, the butty, deposed that he had drawn the attention of the pit carpenters to the state of the pit frame, but they said they could not alter it. He also complained to the ground bailiff, who descended the pit with him, but the chain worked well in the shaft. The pit frame was not altered, and it was now working in the same condition as when the accident occurred. A late banksman, John Fereday, had complained to him that the chain did not run properly over the pulley. Fereday had left his service without notice, but witness did not summon him before the magistrates, not considering it worth while.

Mr. Williams, the ground bailiff, deposed that on the complaint of the butty he had sent Coleman, the head carpenter, to set the pit-frame right, and that Coleman had reported to him that it had been done. When he went down with the butty he found the chain to work perpendicularly in the shaft, the skip keeping quite clear. In his opinion the chain had been dragged off through the practice of pulling the skip to the side of the shaft at the top, and thus caused the accident. This practice had once nearly cost him his life, and for it he had discharged several men. He was now having the flanges which confined the chain to the pulley made higher at all the pits. The pit-frame was not out of perpendicular now.

The jury thought Mr. Williams had given his evidence in a very proper manner. After some consideration a verdict of "Accidental death" was returned; but the jury wished the coroner to rebuke the ground bailiff and the butty for not having manifested a greater anxiety in getting the pit-frame placed in a proper position. This was accordingly done.

A serious conflict is now being waged with much bitterness on each side between the flint-glass makers and their employers. The former are determined by their union to regulate the number of apprentices that their masters receive; whilst the latter are uniting to prevent the union from being other than a provident society. The strife is general throughout the country, is already acccompanied by a partial, and is expected to be attended by a universal lock-out.

An annual meeting of the members of the Birmingham Midland Institute has been held. Lords Ward, Hatherton, and Lyttleton, and Sir F. Scott, were present. A notice of the proceedings must stand over until next week.

The Birmingham Gas Company are getting themselves into a difficulty. To compete with the Walsall Commissioners they have brought their main to that town, and reduced their price to a point considerably below the Birmingham scale. This, however, does not seem to be known by a correspondent to a Birmingham paper, who writes:—"Why the inhabitants of Birmingham should pay 4s. per 1,000 for gas, while our friends at Walsall only pay 3s. 4d., I cannot conceive. I suggest we memorialise the Corporation of Walsall to extend their mains to Birmingham, and I doubt not they will find us good customers. The companies here are very certain not to reduce until pressure from the public is brought to bear upon them. It was only by a threat to establish another company, aided by our most excellent member, W. Scholefield, Esq., that they reduced to 4s. I trust the people of Walsall will support their representatives in their spirited attempt to supply them with cheap gas, and prevent an odious monopoly from companies who have threatened to introduce their gas."

The Marquis of Anglesea proposes to go to Parliament for powers to build a new bridge over the Trent at Burton, and to borrow for that purpose £30,000 on mortgage. The following are the principal conditions of that application:—The Marquis of Anglesey's estate to pay £520 per annum for forty years; in consideration of which the liability of the Marquis to repair the old bridge is extinguished. This appears to be a permanent liability under a grant from the Crown estates to the first Lord Paget—the county of Stafford to pay £520 per annum for forty years. The county of Derby to make the like payment of £520 per annum for forty years. The county of Stafford and the county of Derby to make such further occasional payments as the bridge commissioners shall require. The matter came before the Derbyshire magistrates at the last quarter sessions. Mr. Richardson, of Burton, as the solicitor of the Marquis of Anglesey, explained that the Marquis did not shrink from repairing and maintaining the present bridge; but it having been built for pack-horses, it was no longer adapted to the requirements of the town, and a new bridge was absolutely necessary. He believed he might say that £5,000 would buy up the obligation of the Marquis, in addition to which the noble lord was prepared to give another £5,000, making £10,000 of the whole required. A motion of Lord Waterpark to appoint a committee to meet the Marquis gave place to an amendment instructing the clerk of the peace to oppose the bill. In speaking to the amendment, Mr. Cantrell, a magistrate, owned that the bridge was the most dangerous one in England; but the county of Derby was not bound to repair it, nor were they justified in bearing part of the expense of building another bridge. The Marquis of Anglesey, who owned the greater part of Burton, had land either letting at an enormous rent or selling at an enormous price in consequence of the improvement of the town; but whilst he derived the benefit from the increase of the town he sought to throw the burden of the new bridge upon the two counties of Derby and Stafford. The Marquis proposed to give one-third; but if the estimate was exceeded the counties would have to bear the loss and pay for all future repairs. If the Marquis wished to have a new bridge let him build it under the inspection of the two county surveyors, and then it would become a county bridge by law. When the subject was brought before the Staffordshire magistrates, Mr. Twemlow (the late chairman of Quarter Sessions) said the late Mr. Trubshaw, the county surveyor, had estimated the cost of a bridge at £12,500, but by the plan proposed, which was to repay the cost in forty years, the cost to this county would be £20,800, and the whole cost of the bridge £62,400. Mr. Twemlow proposed that the clerk of the peace should be instructed to oppose the bill in Parliament. The Lord-Lieutenant said he understood that the whole cost of the bridge would be about £20,000, the sum Mr. Twemlow had mentioned included a sinking fund. He suggested that a committee should be appointed to meet a committee of the Derbyshire magistrates and the agent of the Marquis of Anglesey on the subject. There were also two railway companies concerned in it. In the course of the conversation which followed, it was stated that the Marquis of Anglesey was liable to keep the bridge in repair, but not to widen it. Eventually it was decided that the bill should be opposed by the Clerk of the Peace for Staffordshire, and also that committees respectively of the Staffordshire and Derbyshire magistrates should meet upon the matter.

QUANTITY AND AVERAGE VALUE PER TON OF THE IRON EXPORTED FROM LIVERPOOL IN 1857 AND 1858.

The most interesting of the many trade circulars that come into South Staffordshire at this period of the year is that of Mr. Frederick Robinson, metal factor, of Liverpool. Of the last circular that Mr. Robinson has sent out we make the following condensation:—

Exports of Iron from Liverpool, 1857 and 1858.

1857 to	Bars. Tons.	Rods. Tons.	Hoops. Tons.	Sheets. Tons.	Plates. Tons.	Pigs. Tons.	Rails. Tons.	Total Iron. Tons.
United States.	63,597	4,553	8,784	12.636	3,360	9.483	27,930	130,343
East Indies ..	19,530	3,272	1,874	4,977	442	607	19,981	50,683
W. Indies and S. America; European and Mediterranean ports; China, Australia, Africa	49,433	6,079	11,437	11,722	7,936	6,177	13,595	106,382
	132,563	13,904	22,095	29,335	11,738	16,267	61,506	287,408

1858 to	Bars.	Rods.	Hoops.	Sheets.	Plates.	Pigs.	Rails.	Total Iron.
United States.	54,067	2,821	9,062	8,011	1.105	16,940	2,653	94,650
East Indies ..	22,267	3,813	2,220	5,161	2,151	1,038	19,253	55,903
W. Indies and S. America; European and Mediterranean ports; China, Australia, Africa	53,696	9,340	12,116	11,420	5,551	10,894	12,039	115,065
	130,030	15,974	23 398	24,592	8,807	28,872	33.945	265,618

Total Exports from Liverpool to all parts, 1857 to 1858.

	Bars.	Rods.	Hoops.	Sheets.	Plates.	Pigs.	Rails.	Total Iron.
1857....	132,563	13,904	22,095	29,335	11,738	16,267	61,506	287,408
1858....	130,030	15,974	23,398	24 592	8,807	28,872	33,945	265,618

Prices of Iron Free on Board, in Liverpool, 1857 and 1858.

Description.	1857. Highest. Per ton.	1857. Lowest. Per ton.	1857. Average. Per ton.	1858. Highest Per ton.	1858. Lowest. Per ton.	1858. Average Per ton.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Merchant bars	8 7 6	6 10 0	7 15 9	7 2 6	6 5 0	6 12 5
Staffordshire rails ..	8 12 6	7 15 0	8 4 9	7 17 6	7 0 0	7 7 9
No. 1, Scotch pigs, G.M.B.	4 6 6	3 0 0	4 0 0	3 7 0	2 18 0	3 1 4

Comparative Statement of Scotch Pig and Malleable Iron, &c., 1857 to 1858.

	1857.		1858.
Stock in Scotland in Dec. 31st.. ..	190,000 tons.	....	340,000 tons.
Furnaces in blast ,, ,, ...	123 ,,	....	131 ,,
Make of malleable iron in Scotland..	100,000 ,,	....	90,000 ,,
Average price of bars in Glasgow for the year	£8 10s.	....	£7 10s.

THE AMERICAN IRON TRADE.

The New York correspondent of a Birmingham paper thus writes n his last letter:—"The President's Message will reach you before this, though my previous letters must have prepared your readers to expect so much of it as relates to the tariff. On the subject of a reivision of the tariff with a view to increased protection, there is a difference of opinion between Mr. Buchanan and the Secretary of the Treasury. The former, warned by the admonitory voice of Pennsylvania in her recent election, is anxious, while increasing the revenue, to favour specially the iron interest, and to this end recommends the levying of specific instead of *ad valorem* duties. The iron men in effect require no higher protection than this change would afford them. The fluctuation and uncertainty of protection under the present system is the evil of which they chiefly complain, being in fact a discrimination against them, as well as offering opportunity for false invoices. Thus: if iron bars should be worth 50 dollars per ton at our piers, a duty of 30 per cent. added would make their value in the market 65 dollars, at which price American iron would in a year or two supersede the imported article entirely (except perhaps some Norway and Russian brands), and in that case the revenue now derived from the import of iron would cease. But suppose the supply to be so far in excess of the demand as to reduce the price of foreign bars to 30 dollars, the addition of an *ad valorem* duty to this would only raise the duty to 39 dollars, and American works would be compelled to cease their operations until the surplus stock of England was worked off, paying a reduced duty to the Custom House. Now a specific duty of so much per ton, charged upon every ton of iron imported, would, while yielding more revenue, have preserved an equal mean of price, so that in a given number of years its cost to the consumer would have been no more than the average between the two extremes. Such is the reasoning of the iron men here, and their arguments are now endorsed by the President. Mr. Cobb's opinions are entirely opposed to those of his chief.

The adaptation of his recommendation would increase the duty on iron, and articles of Birmingham manufacture, to 25 per cent., an advance of 1 per cent. on the present rates. What course will be

pursued by Congress can now only be mere matter of conjecture, and will doubtless be influenced in a great degree by extrinsic circumstances and secret appliances; for my own part I incline to the opinion that Mr. Cobb's advice will be followed. But in spite of a tariff regarded as extremely adverse, the iron interests of the country are decidedly improving, especially in Pennsylvania. The Phœnixville Company, which at this time last year was suspended and idle, is now consuming 3,000 tons of coal weekly, and other companies along the Reading Railroad route have resumed operations, the whole causing an increase in the demand for coal of 12,000 tons weekly.

"In a former letter I alluded to the impetus recently given to the iron trade of Missouri, by the discovery of extensive coal beds in Illinois, and the completion of a railroad from the mines to the Ohio River, by which the coal is transported cheaply to Missouri. The ore now being worked in this last state is obtained from the celebrated 'Pilot Knob,' or iron mountain of Missouri. It is represented as a huge iron cone, rising from a plain, and surrounded by mountains on every side; its base being almost a perfect circle, and its top terminating in an apex, like a sugar-loaf. Its height is about 550 ft., and its summit about 1,470 ft. above tide water. The iron mountain covers a space of 500 acres, and by a careful calculation it is estimated to contain 220,000,000 tons of iron ore above the base, the ore yielding 65 per cent. of pure metal. It is now seriously resolved to convert this remarkable projection into a merchantable commodity, and several capitalists have commenced the work in earnest. As a consequence of the active development of the resources of Missouri (due chiefly to German immigration), and as a corollary of the triumph of anti-slavery principles in Kansas, a numerous party, principally composed of the working men of that State who are opposed to slavery, has lately sprung into existence, and is steadily increasing in number. They find their chances of employment becoming lessened by the competition of slave artisans, and the day is not far distant when Missouri will be a free State. They came very near electing an abolition candidate for Congress at the last election; indeed, they claim to have been only defeated by fraudulent voting; and their candidate, Mr. Blair, is now in Washington to contest the seat at present filled by his opponent. The advance of manufactures in Missouri will tend to bring about abolition, as slave labour after all cannot be made profitable in skilled occupations, and already, every week, slaves are being sold in Missouri to go further south.

NOTES FROM THE NORTHERN AND EASTERN COUNTIES.

(*From our own Correspondent.*)

STATE OF TRADE: *The Cleveland Iron District: The Sickle and the Reaping Machine: The Wear, &c.*—COLLIERY ACCIDENTS: *Details and Inquests: Paper before the Manchester Geological Society* — RAILWAY ACCOMMODATION AT KNARESBOROUGH AND HARROGATE — STATE OF THE BRIDGEWATER CANAL—THE ART TREASURES EXHIBITION—GAS AT MANCHESTER —WORKING MEN'S "COLLEGES:" *Manchester, Salford, and Ancoats*—GROWTH OF FLAX IN INDIA—COMMENCEMENT OF AN IMPORTANT RAILWAY VIADUCT — THE AMALGAMATED SOCIETY OF ENGINEERS — REPORT ON SUNDERLAND HARBOUR—SUNDERLAND DOCK: *Proposed Terms of Sale*—LIVERPOOL MATTERS: *Retirement of Capt. Bevis, Admiralty Agent: The Mercantile Marine: Customs' Duties at the Port: Proceedings of Local Bodies: Home Education (a Word in Season)*— NORTHERN ITEMS: *Jarrow Dock: Architectural Association: The Havelock Memorial at Sunderland: The Tyne Piers: A Year's Bankruptcies*—CAMBRIDGE AND BEDFORD RAILWAY—COUNTY SURVEYORS: *Norfolk and Northumberland*—THE NORFOLK ESTUARY UNDERTAKING — OXFORD MIDDLE CLASS EXAMINATIONS — CHELMSFORD WATER SUPPLY—GAS: *Boston and Louth*—THE NENE VALLEY DRAINAGE — STEAM ENGINE FOR THE NORFOLK LUNATIC ASYLUM — BUILDING COLLECTANEA.

THE iron trade of the Cleveland district appears to be in a satisfactory condition. Of sixty-five furnaces fifty-eight are in blast, and only seven out. During the past year there was considerable depression, as appears from the following data:—

	In.	Out.	Total.
Furnaces on November 1st, 1857	55	7	62
,, January 1st, 1858	44	18	62
,, April 1st, 1858	43	20	63
,, July 1st, 1858	45	18	63
,, October 1st, 1858	53	12	65

There are, it is said, indications of progressive improvement in trade. Several new furnaces are also in course of construction, viz., two at Eston, by the Clay Lane Company; one at Cargo Fleet, by the Tees Iron Company; and two at Middlesbrough, by Messrs. Snowdon and Hopkins. The sickle forgers of Hackenthorpe, Masborough, &c., have been endeavouring to enforce a demand for an advance of 10 per cent. The manufacturers allege that the wages they have paid are from 20 to 30 per cent. above those given in other places. The reaping machines, meanwhile, are gaining ground, and the manufacturers are said to be fully employed. The trustees, under an assignment made by the late proprietors of the West Staveley and Silkstone Collieries have proposed a composition of 1s. in the pound to the creditors, provided all agree to accept that amount, and sign a release. Most of the trade reports of the week are of a cheerful character. The shipping trade of the Wear is a little better, freights having ranged a little higher, both foreign and coasting, from the port of Sunderland. Several fine vessels have been launched from the yards on the Wear—one, the Newcastle, is a splendid frigate-built ship of 2,000 tons, destined for the East India troop and passenger trade.

The inquest on the bodies of the two boys killed a few days since by an explosion of fire-damp in the Tunnel Pit, belonging to Messrs. J. Taylor and Son, of Shevington—not Sleevington, as misprinted last week—was held on Friday. The evidence showed that immediately after the explosion some fire was found in the mouth of the level of George Fairhurst (a collier to whom the deceased acted as drawers), but none in the place where the boys were when it took place. Two stoppages were blown down. The explosion was not loud. The bodies of the deceased were not burned; they were suffocated by the after-damp. The explosion was occasioned by a quantity of gas igniting which was lurking in a sink or vacuum caused by the fall of roof, the colliers employed in that part of the mine being allowed to work with the tops off their safety lamps. There was very little gas in the pit, and the usual precautions were not required. The pit had been examined on the morning of the explosion, and no gas was then found. It was shown by the evidence of Mr. Peter Higson, the inspector, that both the manager and underlooker had been cautioned by him against allowing the men to use naked candles, and that he had, in September last, given to the manager a written notice; but as it was doubtful whether Fairhurst had not gone to the fault with his naked candle away from his own workings, the jury returned a verdict of "Accidental death," but requested the coroner to censure the manager and underlooker for not obeying the orders of the inspector. Fairhurst is not expected to survive.

A fearful colliery accident—resulting in the loss of seven lives—occurred last week at the Agecroft Colliery, Pendlebury. The cage in which the men ascend from the pit is raised with great velocity by means of a high pressure steam engine. A string attached to the axle of the wheel communicates with the engine-house, and rings an alarm bell when the cage is within about sixty yards from the mouth of the pit, as a signal to the engineer to slacken speed and use caution. By some means this contrivance appears to have got out of order, and on the present occasion the alarm bell did not sound. The engineer consequently did not check the speed of the engine until the cage was very nearly at the top of the shaft; he then became aware that something was wrong, and looking towards the pit saw the cage had arrived close to the top. He made a desperate effort to apply the brake and stop the engine, but it was too late. The cage struck the beam with great violence, instantly snapping the wire rope, and the unfortunate men were precipitated to the bottom of the pit, a depth of between 200 and 300 yards. They were, of course, all killed on the spot. The cage was attached to the wire rope by four iron rods. These, on striking against the head at the top of the shaft, snapped at the first joint. The evidence at the inquest resulted in a verdict of "Accidental death" being found by the jury. Elias Booth, the engineman, was called and examined, but was not sworn. He said that in consequence of the drum having been altered and made larger, the cage came up one stroke of the engine earlier, and he gave directions to Roe, a joiner, to make such an alteration in the length of the strap attached to the indicator as would cause the bell to ring when the cage was sixty yards from the pit's mouth, as before. On the present occasion the bell did not ring, and that was the cause of the accident. The bell never deceived him before, all the time he had been at the colliery.

At the Ruabon petty sessions, Mr. J. Jukes, owner of the Erllwydd Colliery, near Pant, has been summoned for neglecting to provide an indicator and brake to the engine, and a steam gauge to the boiler, at his works, as required by the 6th and 7th general rules of the Coal Mines Inspection Act. The defendant was finded 40s. and costs in each case.

The colliery explosion at Bickershaw, which was noticed in last week's ENGINEER, has resulted in the death of Robert Barrow, one of the four miners who were burnt. The others, it is stated, will recover. At an inquest held on the sufferer the jury returned a verdict of "Accidental death."

To the members of the Manchester Geological Society Mr. Joseph Dickenson, Inspector of Coal Mines, has read a paper on "The Pressure of Fire-damp in Coal Measures." Mr. Dickenson noticed instances which had come under his own observation where it was evident, from the effects, that the fire-damp had existed in a state of great pressure. In May, 1852, at a colliery in South Wales, where sixty-five persons were killed, the gas had burnt down the roof, leaving a large hole above like a chimney, the top of which could not be reached with a long rod. Another instance in which great pressure of gas in coal manifested itself was in the Wigan five-feet, on the 30th of January, 1855. The floor of the pit, in one part, was blown up by it, leaving a deep hole. From this the gas issued until the 17th of February. These sudden outbursts, even where gas was not expected, showed the necessity of constant care with the safety lamps, and of efficient ventilation. Mr. Dickenson, after enumerating other instances, quoted some remarks from a paper upon the subject by Thomas John Taylor, who related that at the Piercy Mine, under the river Tyne, a shaft was sunk to the depth of 320 yards, and the workings extended in different directions. From some cause the workings were suspended, but pipes were laid to the extreme rise, to take away the air. The pipes, however, became over-flooded, and the fire-damp accumulated to such an extent that its pressure raised the water 19½ fathoms high, then burst its way through. This was equal to a pressure of about 4½ atmospheres, or more than 60 lb. to the square in. It was well known that in the north of England there was an issue from a large goaf which was burnt on the surface, and lighted the country round for a considerable disance, giving out at first 95 cubic ft. of fire-damp per minute; it afterwards decreased to 70; subsequently it was recorded as 34 ft., and was now declining. At Mr. Ryland's colliery, at Wigan, the damp was conveyed and employed to light the smiths' shops with. In one perforation through the seam, he (Mr. Dickenson) found it give out 10 cubic ft. per minute. Whenever a roof was noticed to bag the pressure of gas should be suspected and guarded against. At the conclusion a vote of thanks was accorded to Mr. Dickenson for his paper, and some discussion took place upon it. All concurred that high pressure, in certain cases, existed.

A public meeting has been held at Knaresborough for the purpose of considering what steps shall be adopted in order to prevent the present railway accommodation being removed by the projected line of the North Eastern Railway Company through the centre of Harrogate and its Stray. The proposed line was stigmatised, in the course of other attacks upon it, as a bad one in its junctions, gradients, and curves; and it was alleged that it would cost £100,000 or £150,000 without any probable increase in the traffic. It was resolved that a deputation should wait upon the directors of the North Eastern Company, and lay the mems. of the meeting before them. Of course there is another side to the question, as the proposed line has received the approval of the North Eastern directors and shareholders. The Harrogate Improvement Commissioners have also, by seven to two votes, expressed their approval of the line.

At the last meeting of the Manchester City Council, Mr. Councillor Haworth called attention to the impure condition of the Bridgewater Canal. Formerly Hulme put its sewerage into the canal, but now it was diverted into the tunnel at Knott Mill; and he believed that an excellent remedy might now be applied, by using the discharge water (for condensation purposes) at Woodhead. It would only be necessary to introduce dam-boards, of 4 ft., at Stretford, and the lift would only be 15 ft. Mr. Councillor Bowker said he believed the Bridgewater trustees would be ready to deal with the matter. He thought Mr. Haworth's plan was practicable. After observations from other gentlemen on the serious nature of the nuisance, it was decided to refer the subject to the General Purposes Committee.

The committee of the Manchester Exhibition of Art Treasures have presented to the corporation of the city a bust of his Royal Highness Prince Albert (by Mr. M. Noble). The council have accepted the bust with pleasure as "a memorial of the constant interest manifested, and marked patronage and support rendered by his Royal Highness the Prince Consort, in order to secure the succes of an exhibition which will ever be memorable." The report of the committee for conducting the Exhibition states that the receipts from all sources amounted to £110,588, and that the balance in hand is £304 14s. 4d. Out of this sum a few small debts have still to be liquidated, so that the Exhibition has barely paid its way.

The Manchester City Council propose to further extend their gas-works, and at the last meeting Mr. Councillor Curtis expressed an opinion that the receipts were not making a proportionate advance. Within the last few years (he said) the receipts had not varied more than £5,000. There had been an extension costing £34,000, and now they were asked for £39,000 more. If they were only to increase their production of gas at the rate of £5,000 in three years, and expend £30,000 or £40,000 each year, it would be necessary, he thought, to give full information on the subject. Mr. Councillor M'Dougall said the gas committee had appointed two competent engineers to report upon meters, and to make a full and fair investigation of the subject. With regard to the remarks of Mr. Curtis respecting the receipts, the first cause of the diminution was a fall in the consumption, last year, to the extent of £1,700, by the manufactories and mills not being fully employed. Then there had been a charge of £5,400 more on account of the increased price of cannel, the full effect of which had not yet been felt. When there was a less demand for gas there was also a less demand for coke, and they had to sell it cheaper. These causes produced a diminution of gas profits. The proceedings of the gas committee were confirmed.

At a meeting of the originators, members, and friends of the Salford Working Men's College it was stated, a day or two since, that the number of working men who have already joined the institution is 190. Some of the students have become members of two or more classes; the names on the several registers number 283, and the average attendance has been 193, or 69 per cent. In consequence of the increase of students the council now require an increase in their staff of fourteen gratuitous teachers. Extended accommodation is required, and the council are exerting themselves to obtain more commodious premises. A large house and premises on the Oakfield estate, near the Peel Park, is considered suitable for the purpose. The amount required for the purchase of this building is £1,800. Reports have also been presented during the last few days from the kindred colleges of Manchester and Ancoats. With regard to the first-named institution the report stated that in the first term the whole number of students entered was 231; in the second term, 195; and in the third, 163. In the first two terms the members of the Mechanics' Institution were admitted without fee. Hence, in the first term, 151, or two-thirds of the whole, were members of the Mechanics' Institution; and in the second term the members of this class were 126, or five-eighths of the whole. In the third term some slight fee from members of the Mechanics' Institution was required, and in consequence, in the term just closed, only seventy-one, or less than one half, were derived from this source. The actual attendance in class throughout the year was more than 65 per cent., a proportion quite as high as was expected. The proportion of students from the class of operatives had been steadily rising, and was now one-third of the whole. An examination is to be held at the end of June, and prizes and certificates awarded. The total income from donations and fees during the year had amounted to £99 5s. 2d., and the total expenditure to £95 19s. 6d. The report from the Ancoats College stated that in Ancoats there was a population of 76,896 persons, and in the district there were large cotton mills, dye-works, &c, which brought together vast masses of labourers. The college was opened on the 27th of January, 1857, and the students were divided into two sections. From January to May, 1857, the register showed that 382 persons, between the ages of fifteen and forty, had joined the college. During the summer a gymnastic class had been the means of keeping the members of the college together to some extent, but since the commencement of the present session 154 members only had been enrolled. This might be accounted for owing to the scarcity of work last winter on the one hand, which deprived the operatives of the means of paying the fees; and, on the other, by the fact that this winter they had been working overtime.

At a meeting of the executive committee of the Leeds Chamber of Commerce, on Friday evening, the best means of promoting the growth of flax in India—a question to which public attention has recently been called—was among the topics discussed. The subject will also be brought forward at the next general meeting of the members of the chamber.

The first stone of the Dillican viaduct, on the Lime Valley Railway at Low Gill, was laid last week. Before the stone was laid, the engineer, Mr. J. E. Errington (of the firm of Locke and Errington), delivered an address, stating that the occasion was one of much importance, inasmuch as the work about to be commenced was of great magnitude, consisting of a viaduct of eleven arches, of 45 ft. span, more than 100 ft. in height, and containing about 400,000 cubic feet of masonry. The stone was laid by Mr. W. A. F. Saunders, the chairman of the board of directors, who was presented by Mr. Buxton, the contractor, with a silver trowel of elaborate workmanship, and a beautiful silver-mounted mallet. The chairman, after laying the stone, delivered an appropriate speech, in which he congratulated himself and brother directors on having got a contractor who bore a very high character for energy and perseverance, and he had no doubt this character would be fully sustained in the execution of this gigantic undertaking. He then alluded to the men, giving them some wholesome advice on their conduct, and stating it was the intention of the directors, assisted by the contractor, to establish a reading-room, which should be supplied with papers and periodicals for the use of the men, and that arrangements had been made for the delivery of a lecture on the Sabbath. Mr. Buxton, in thanking the chairman for his good wishes, assured him that nothing should be wanting on his part to insure good order, and to assist the directors in carrying out any plan for the improvement of the men. Convivial dinners for both masters and men wound up the day.

Some of the branches of the Amalgamated Society of Engineers, Machinists, Millwrights, Smiths, and Pattern-makers, have been holding their annual social meetings during the last few days. The funds of the general society are stated to amount to £40,000, and the number of members is reported to be 15,000.

Messrs. Stevenson, C.E., of Edinburgh, have presented an important report to the River Wear Commissioners with regard to certain improvements in Sunderland Harbour. Messrs. Stevenson observe, in the course of their remarks:—"We have carefully inspected the whole of the quays of Sunderland Harbour, from the bridge downwards, for the purpose of enabling us, in conjunction with Mr. Meik, the engineer to the Wear Commission, to consider the practicability and expense of deepening the lower part of the harbour, in accordance with the views of the Royal Commissioners on Harbours of Refuge, as expressed during the investigation held by them at Sunderland. . . . . In laying out the channel to be deepened on the Wear, we consider it best to keep the channel in the upper part of the river on the north side, so as to avoid interfering with the numerous slipways and docks which are situated on the south side. After reaching the lower ferry, the deep channel will pass most naturally to the south side. The proposed new quay, from the bridge to the lower ferry, will have a most beneficial effect on the currents, while it will afford a large increase of accommodation." Messrs. Stevenson sum up the results of the proposed plan by observing:—"It will add fifty-two acres of deep water area for vessels to bring up in, while the facilities afforded by the extended and improved quay room will be very considerable. It is, however, to the increased accommodation for vessels frequenting either the dock or river that the proposed improvements owe their chief value and importance, for it is almost impossible to overrate the advantage, in such a port as Sunderland, of obtaining a place of shelter into which the ordinary class of coasting vessels may run at low water." They estimate the expense as follows:—

		£	s.	d.
160 ft.	sheet piling for protecting North Pierhead	1,280	0	0
155 yards	timber work for protecting inner end of North Pier	4,262	10	0
150 yards	timber quay at Commissioners' Quay	4,140	0	0
530 yards	timber quay on south side of river above Commissioners' Quay	17,490	0	0
900 yards	timber quay on north side of river from Folly-end to Bridge	29,700	0	0
	Removing quay on north side of river at Ferry-stairs ..	566	0	0
11,762 yards	of excavation of rock in bed of harbour	5,881	0	0
448,865 yards	dredging	14,962	3	4
		£78,281	13	4
	Add 10 per cent. for incidents ..	7,828	6	8
		£86,110	0	0

The engineer (Mr. Meik) has been directed to prepare an estimate of the cost of deepening the river from the bridge to some distance above the staithes, and to submit the same to the next meeting of the commission. The further consideration of Messrs. Stevenson's report is deferred.

The directors of the Sunderland Dock Company have informed the River Wear Commissioners, that they are prepared to sell the dock on the following terms:—The commissioners to pay on the original shares for the years ending

June, 1860 and 1861	3	per cent.
,, 1862 ,, 1863	3½	,,
,, 1864 ,, 1865	4	,,
,, 1866 ,, 1867	4½	,,

And, in the event of the shipment of coals in the dock exceeding 650,000 chaldrons in any year after 1867, then five per cent. in perpetuity. The four per cent. preference shares to participate in the increased dividend; above that amount the same as the original shares. The five per cent. preference stock to be paid that amount. The commissioners to have power to pay off all description of shares at par. The subject will be further discussed by the Wear commissioners on the 19th inst.

As regards Liverpool matters it may be stated that Captain Bevis, R.N., after a connexion of twenty years with the port as Admiralty packet and transport agent, is about to retire from that office. Some of the principal owners of ships and steamers have commenced a subscription for a testimonial. At the last monthly meeting of the Liverpool Mercantile Marine Service Association it was reported that the Conway, a 20-gun frigate, now lying at Devonport, has been substituted by the Lords of the Admiralty for the Vestal, which was at first intended to be appropriated by them for the purpose of the school-ship in connexion with the association; and that the Conway will be fitted up by the Admiralty in the necessary details, and moored in the Mersey. Captain Anderson, in the course of some observations bearing upon the schoolship, said, the education of boys for the sea would be a great advantage in every point of view, and prevent many of those difficulties which too frequently occur on shipboard. He suggested that testimonials or diplomas should be given to seamen for good conduct, and that in connexion with the proposed school they should also have a school on shore. Captain Reed spoke in commendation of the proposed school system, which

he thought would go far to remove many of the evils now complained of, and raise the moral standard of seamen. He also suggested for consideration whether the school system might not be extended to vessels at sea, conceiving that it might be so adapted as not to interfere with the ordinary discipline. The receipts at the Liverpool Custom House varied very little in 1858, as compared with the previous year. In 1858 the amount received was £3,628,400 against £3,627,455 in 1857. At a meeting of the Toxteth Park commissioners a letter was read from Mr. Newlands, the borough engineer, requesting that his position in relation to the board should be clearly defined. It appears that an altercation had taken place relative to the duties of the engineer, who is not a salaried servant of the board, but has, on one occasion, received a present of £100 in acknowledgment of the very valuable services he had rendered. A resolution was carried by 6 to 4, regretting that Mr. Newlands should have any reason to complain, and requesting him to continue his professional assistance. At the last meeting of the Birkenhead commissioners a report was read showing that the number of buildings constructed or altered in the township was, in 1849, 47; in 1850, 65; in 1851, 77; in 1852, 47; in 1853 29; in 1854, 35; in 1855, 83; in 1856, 261; 1857, 215; and in 1858, 251, making a total, in ten years, of 1,090. At the monthly meeting of the Wallasey commissioners, the ferry committee submitted a lengthy report, detailing negotiations with Messrs. Coulborn for the purchase of the Seacombe, Egremont, and New Brighton Ferries. Mr. Rudd, the late manager of the Woodside Ferry, had estimated the annual working expenses of the three ferries, with six boats, at £10,468. The boats and plant, he stated, he was unable to value, Messrs. Coulborn having declined to give him authority to do so, but he considered six new boats suitable for these ferries could then be built for £33,000 After an interview with Messrs. Coulborn, the committee had recommended an offer to be made to Messrs. Coulborn of £30,000 for the purchase of their interest in the Egremont and New Brighton Ferries, the lease of Seacombe being also transferred to the board, the purchase-money to be payable one-half in cash, and the remainder by the mortgage of the board, bearing interest at five per cent. for a period of ten years, and the boats to be taken by the board at a valuation, and to be paid for in like manner. The recommendation of the committee having been approved by the board at its last meeting, the offer was made, but rejected by Messrs. Coulborn. Further attempts at negotiation proving fruitless, the committee observed in their report, "the only course is to give Messrs. Coulborn notice, in writing, under section 38 of the Wallasey Improvement Act, 1858, requiring them to signify whether or not they are willing to treat with the local board for a fall of their interest in the said ferries, and to proceed to have the consideration to be paid and the terms and conditions of such purchase settled, in case of difference, by arbitration, as provided by the Act." It was resolved that this should be done. According to the estimates of the finance committee of the Birkenhead commissioners, the Birkenhead Ferry revenue for the year ending April next will amount to £24,466; the gross expenditure is calculated at £16,766. A rather noticeable paper on "Home Education considered with Particular Reference to the Training of Mechanics or Operatives' Children," has been read before the Historic Society by Mr. Hugh Shimmin. The paper urged that, notwithstanding the advance of intellectual training at school, the training at home was becoming less effective or more neglected. Schools were now expected to do everything, and the parents rested satisfied by the merely handing their children over to the school teacher. The home training of the last generation was contrasted with what was seen now, and the distinguishing features of the time were illustrated by the increase of intemperance amongst females, the rage for public amusements, and the inordinate love of dress. Facts in support of the views advanced were adduced, and the evils resulting from the neglect of home training were shown in the degeneracy of female servants, and the depravity which so much abounded amongst the working-classes. In noticing the rage for amusements as one of the distinguishing peculiarities of the day, Mr. Shimmin said it was expected that men might be fiddled into morality and sung into religion.

In the north a few matters of interest are reported. The first cargo of coals was shipped in Jarrow Dock yesterday week. The cofferdam having been sufficiently cut away, a large river barge, belonging to Messrs. Losh, Wilson, and Bell, in the tow of a steamer, was passed into the gates in the forenoon, and locked into the dock. The barge was towed to the further end of the dock, and hauled under one of the spouts. A train of one hundred wagons of small coals was waiting above, and being run down, three at a time, along the self-acting incline to the top of the spout, were discharged into it, and thence into the barge. At three o'clock the barge was towed out again in the presence of a great number of people, and amidst loud cheering, &c. There are now 23 ft. of water in the sill of the dock, and 14 ft. water in the channel, which is being dredged to 25 ft. The more formal and complete opening of the dock will take place in a few weeks. A "Northern Architectural Association" has been formed, and already numbers twenty-six members. The committee for promoting the erection of a memorial in honour of the late General Havelock, at Sunderland, have agreed to invite artists to send in designs on or before the 7th of February. The monument is to be erected in the Mowbray Park, and the cost is not to exceed £1,500. The promenade on the north pier at Tynemouth is to be thrown open to the public in a few months. A few days ago a blasting operation took place at the Trow Rocks at Shields. Upwards of 22 cwt. of powder was used on the occasion, and a large quantity of rock was removed for the Tyne piers. The number of bankruptcies gazetted in the Newcastle district in 1858 was fifty-nine; in seven previous years the average was thirty-six. The district bank stoppage and liquidation has probably had something to do with this.

At a meeting of the Cambridge town council the Parliamentary committee reported that they had considered the notices of an intended application to Parliament for the Bedford and Cambridge Railway, and desired the council to express to the directors their opinion that the erection of a new passenger station near the town was necessary, the present Eastern Counties station being too far distant, ill-arranged, and inconvenient. [This point is well put.] The committee also observed that it was desirable to construct a bridge over the railway where it crossed the Trumpington-road—a suggestion to which the committee of directors have acceded.

There has been a good deal of grumbling among the Norfolk county magistrates with reference to an excess on the estimates delivered by the county surveyor, Mr. J. Brown, for certain extensive works which have been for some time in progress at the county lunatic asylum. The county surveyor admits that there has been an excess of £3,214 10s. on estimates of £19,925; but states that an advance in building materials took place, that labour was scarce, and that some alterations and deviations were made in the plans. The committee of justices, in whose hands the management of the asylum is placed, will not admit that Mr. Brown has altogether satisfactorily explained the discrepancies between the estimates and expenditure, although it is generally conceded that the works have been well executed. A long debate took place at the sessions held on Friday, and a committee was appointed to take into consideration the duties and emoluments of the office of county surveyor. It was further agreed that Mr. Brown should be reappointed at Easter for six months only, and that at the expiration of that time the office should be considered open, with a new salary and under new conditions. The salary attached to the office has been the enormous sum of—£60 per annum! advanced a few years since to £75, and three per cent. upon all works above £500. The magistrates appear now to have come to the conclusion that a higher salary must be paid than they have accorded to Mr. Brown, who has been in office twenty years. A somewhat similar question has been discussed by the Northumberland magistrates, in consequence of the necessity of appointing a successor, in the office of surveyor of county bridges and buildings, to the late Mr. H. Welch, who died on the 21st of December last. From a statement submitted by Mr. Elliott, deputy clerk, as drawn up by Mr. Dickson, clerk of the peace, it appeared that Mr. Welch was appointed county bridge surveyor in 1831, at a salary of £400, and that in 1839 he was also appointed surveyor of county buildings, at a further salary of £200, making for the two offices £600, Mr. Welch at the same time not being precluded from chamber practice; and his services were described as having been very valuable and efficient. The office of bridge surveyor was explained to be one ordered by statute, but not necessarily required to be connected with that of surveyor of county buildings. By Act of Parliament, bridge surveyors had all the powers of surveyors of highways. The applications would be numerous, and to give ample opportunity it was recommended that the matter should be left open until the sessions at which the appointment was made. It was further suggested that, until the Easter sessions, when the vacancy would require to be filled, the services of Mr. Welch's foreman should be retained. Mr. Hodgson Hinde moved that it was expedient to confine the duties of the bridge surveyor to be appointed to the superintendence of bridges only, as originally committed to Mr. Welch, on the ground that many civil engineers, who would be most efficient superintendents of county bridges, might be incompetent to superintend the architectural works of the county. It might then be a question whether they would employ a county architect with the remaining £200 a year, or leave it open to appoint architects for particular buildings as they were required. Sir Matthew White Ridley, Bart, thought that if they appointed two persons, with a divided responsibility, it would introduce confusion; besides, it was unnecessary so to do, as he considered that gentlemen might be found quite competent to undertake the duties combined. He moved, therefore, an amendment, that the offices of bridge surveyor and county architect be confined to one officer, whose duties should be defined by a committee. Mr. Hugh Taylor seconded the amendment, remarking that they would get one good officers for £600 a year, whereas, if they divided this sum between two officers, they would get but indifferent ones. The amendment was carried by ten to four. On the motion of Sir M. W. Ridley the committee to define the duties was appointed, and it was agreed that they should present a report to the adjourned sessions, in February, with a view to the appointment being made at the Easter sessions.

The Lynn town council have declined to pay the last call of the Norfolk Estuary Company for one-third of the £5,476, on the ground that the certificate was not in conformity with the Estuary Act, the works claimed for not being of such a nature (it is alleged) as would render the claim valid.

Steps are being taken to secure the benefit of the Oxford Middle Class Examinations for the eastern counties, and to select Ipswich as a centre. A meeting was held with this object on Monday.

Mr. F. Chancellor, surveyor to the Chelmsford Local Board of Health, has just presented an elaborate report on the water supply of that town. The population of Chelmsford amounts to about 8,000 persons, living in 1,600 houses, of which 1,200 are connected with the water mains of the Board of Health. The consumption is estimated at 95,000 gallons per day at present, but Mr. Chancellor considers—looking at the demand in other towns—twenty-five gallons per head a safe basis, so that when all the houses in the town are connected with the mains he estimates 200,000 gallons per day will be required. The country round Chelmsford is destitute of springs of sufficient calibre to meet this requirement; and after a very careful consideration, Mr. Chancellor arrives at the conclusion that an artificial lake containing 1¾ acres (described as abounding in springs, and containing 2,500,000 gallons), at the foot of the railway embankment on the north side of the town, would be the best source of supply. This lake was formed during the construction of the railway, and as the water is of a better quality than that obtained from other sources, Mr. Chancellor proposes to conduct it by means of iron conduit pipes to a filtering tank to be constructed in the Board of Health yard. Mr. Chancellor further developes his views as follows:—"The end of the pipe in the lake will be 4 ft. below the surface, and will be protected by a perforated cage to prevent the admission of leaves, and other coarse matter. The filtering tank will have a filtering area of 1,800 superficial feet, which would be capable of filtering 100 gallons per minute; and the tank would hold, when full, 80,000 gallons of filtered water. The filtering medium would consist of 'Ransome's Filtering Slabs,' which, although more expensive at first, are easily cleansed, and thereby effect a large annual saving. I might observe, in passing, that these slabs have been used at the Southampton Waterworks, and, in answer to a note, I have received a very satisfactory reply upon the subject from the engineer to the works. The filtered water would then be conveyed by a short pipe into a well about 25 ft. deep, outside the present engine-house, in which would be placed a three-throw pump, which might be made up of portions of our old pumps. By means of sluice cocks at the proper points, the water could be immediately brought into the pump-well. From the pumps, I propose to lay down a 10-in. main direct to the reservoir at the top of Long Stumps, without any branch therefrom, save one with a stop cock to connect this new main with the old main in the Board of Health yard; and thus the water would be pumped up into the reservoir direct." Mr. Chancellor, after going into further details in reference to the mode of working the supply, states that he proposes to erect a water-tower about 80 ft. high at the works. The board have expressed themselves much indebted to Mr. Chancellor for his report, and have agreed to defer the matter in order that the levels of the lake and also of the river may be taken, that the water in the river may be tested, and that other inquiries may be made.

The Boston Gas Company propose an addition to their works of a large gasholder, exhauster, &c. Mr. R. P. Spice has received instructions to prepare the plans and estimates. The Louth Gas Company have advanced their charge for lighting the public lamps 5s. per annum on each lamp.

Yet again Wisbeach and the river Nene. At the last meeting of the Wisbeach town council a committee, appointed Dec. 3rd, to take into further consideration the state of the river Nene and the works of the Nene Valley Drainage and Navigation Improvement Commissioners, stated that after making inquiries they unanimously recommended Mr. Thomas Page, of Middle Scotland-yard, as the engineer to consult with the corporation upon the state of the river. A very protracted discussion upon this point resulted in the adoption of the report of the committee, and an order to invite Mr. Page to confer with the corporation upon the state of the river. On the motion of Alderman Watson an order was also made for proceedings to be taken (at the expiration of the time specified in a notice to the Nene Valley Commissioners to remove the dams) before the magistrates, with a view to the immediate removal of the obstructions in the river.

Under the supervision of Mr. Naylor, C.E., a 6-horse engine has been placed in the Norfolk Lunatic Asylum. The boiler will also supply steam for the laundry, cooking, heating, &c.

At Bury (Lancashire) it is stated that the original estimate for the new workhouse was £5,000, and that positively more than £20,000 has been expended! The Rochdale town council have agreed to take half an acre of land at a rental of 1½d. per yard, for the purpose of erecting another gasometer 100 ft. in diameter. At a meeting of the Manchester city council last week, Mr. Alderman Goadsby stated that, as the new Smithfield Market Hall was on the point of completion it was the wish of the markets committee that every member of the council would see it, and say how far their views had been carried out. One reason for this was, that the committee proposed to ask permission of the council to erect a similar market in London-road, as it would be a great accommodation to a large number of inhabitants in that locality.—The vexed question of the Manchester post-office seems in a fair way of settlement, although the gale goes down with a heavy ground swell. At the last meeting of the city council Mr. Alderman Heywood moved, "That inasmuch as the post-office authorities have decided to erect a new post-office on the site of the Queen's Theatre, and other properties adjoining, this council authorises the mayor to communicate to the Postmaster-general the willingness of the corporation to afford every assistance in the furtherance of the bill through Parliament, and in arranging with the owners and occupiers interested in the properties which are required to be purchased." Mr. Councillor Green did not see why the Government should have had to spend £70,000 of the public money upon a site, when the council could have sold them one which would have answered all the purpose for £20,000. Mr. Councillor Cottrell considered it was £50,000 of the public money thrown away. The resolution was passed, with two or three dissentients.

SHAW AND THOMPSON'S SCOTCH IRON MARKET REPORT FOR 1858.

The state of the Scotch pig iron trade during the past year has been such as might have been expected after the severe crisis of 1857. The price has been unusually steady—speculation has been less keen, and produced small variations in price—foreign shipments have considerably decreased, and local consumption has fallen from 312,000 tons to 275,000 tons. At the beginning of the year a speculation for a rise was commenced in Liverpool, and in the months of January, February, and March, the price gradually advanced from 52s. to 60s. per ton; but it soon became evident that the rise was premature, and that the trade had been too violently shaken during the crisis of last year to recover so rapidly. The result was, that before the end of April the price had receded to 52s.—the figure at which the advance began, and since then quotations have ranged between 52s. and 56s. per ton for mixed numbers warrants.

It was anticipated by some, that iron would have declined at some time during the year to the prices which ruled after the panic of 1848; but such calculations have been erroneous, and it is now generally admitted that since then the cost of producing iron has increased fully 12s. per ton, making the present price quite as unremunerative to the makers as it was at the time we have referred to.

The average price this year is 54s. 6d. per ton, showing the great depreciation of 14s. 6d. per ton as compared with last year—the average of which was 69s. per ton.

We have given above, various statistics of the trade—the most noteworthy of which is, the addition to our stock this year of nearly 150,000 tons, making the total stock 337,000 tons. Another fact claiming attention is, that notwithstanding the continuance of low prices, there are to-day 131 furnaces in blast against 123 same day last year; and there are five new furnaces in course of erection.

Nothing will show better the lifelessness of our market during the past year than the statement that the extreme fluctuations have only been 8s. per ton, whilst in the previous year the price varied 35s. per ton.

Regarding the prospects for next year, the present state of trade is not very encouraging. Orders for spring shipments are as yet apparently not very extensive; and in our own district, although some of the consumers are very busily employed, the majority have very few orders, and some are almost altogether idle. With a continually increasing stock, and the anticipation of at best only a very gradual revival of trade, we cannot look forward to much higher prices for 1859 than we have had this year; nor do we expect that for a year or two yet we shall have that vigorous activity of trade which characterised the few years previous to 1857.

The closing quotations to-day are for mixed numbers warrants 54s. 6d. per ton, and for No. 1 and 3, G.M.B., 53s. 3d. per ton.

Shaw and Thomson.

Glasgow, Dec. 31, 1858.

PRICES CURRENT OF METALS.

British Metals are quoted Free on Board; Foreign in Bond.—Extra sizes are charged for at the rates agreed by the trade. Brokerage is not charged for buying except on Foreign Tin.

		£ s. d.	Dis. p. ct.
IRON, English Bar and Bolt:—			
in London	prtn	7 0 0	3
in Wales	"	6 0 0	"
in Liverpool	"	6 10 0	"
Staffordshire Bars	"	8 0 0	1½
Delivr. into boatsawrks: Sheet, Sngl.	"	9 10 0	"
Dbl.	"	11 0 0	"
Hoop	"	9 0 0	"
Rod, round (Nom. rates)	"	8 0 0	"
Nail Rod, sq.	"	9 0 0	"
SHIPPING IRON, Staffordsh. Bars	"	8 0 0	2½
Sheet, Single	"	9 10 0	"
Double	"	11 0 0	"
Hoop	"	9 0 0	"
Rod, Round (Delivered in last qr. day Liverpool 10s. per ton less, for favourite brands.)	"	8 0 0	"
Nail Rod, Square	"	9 0 0	"
IRON, Rails, in Wales, cash	"	7 0 0	nett
" " 6 months	"	7 2 6	"
in Staffordshire	"	7 0 0	"
Railway Chairs, in Wales	"	4 5 0	"
" in Clyde	"	4 5 0	"
Pig No. 1, in Clyde	"	2 12 9	
3-5ths No. 1 & 2-5ths No. 3	"	2 13 3	"
No. 1, in Wales	"	0 0 0	"
No. 1, in Tyne and Tees	"	—	"
Ditto, Forge	"	—	"
Staffordshire Forge Pig (all Mine), at the Works, L. W., nom.		3 10 0	"
Welsh Forge Pig (all Mine), at the Port.	"	0 0 0	"
Acadian Pig, Charcoal	"	8 15 0	"
Scotch Pig, No. 1, in London	"	3 10 0	"

		£ s. d.	Dis. p. ct.
IRON, Swedish, Indian assortments	prtn	13	0 2½
Russian C C N D	" "	17 0 0	"
STEEL, Swedish Keg, nom.	"	20 0 0	"
Ditto Rolled	"	18 0 0	"
Faggot	"	22 0 0	"
SPELTER, on the spot	"	23 0 0	net
To arrive	"	23 0 0	"
ZINC, in sheets	"	30 0 0	1½
COPPER, Tile, 14 to 28 lb.	"	112 10 0	"
Tough Cake	"	112 10 0	"
Sheathing and Bolts	pr lb.	0 0 12½	"
Sheet	"	0 0 12¾	"
Bottoms	"	0 1 1	"
Old	"	0 0 11½	"
Yellow Metal	"	0 0 10½	"
South American, nom.	prtn	—	2½
Russian	"	—	2½
LEAD, British Pig	"	22 15 0	"
Spanish	"	22 0 0	"
W. B. at Newcastle	"		
Sheet	"	23 15 0	"
TIN, English Block, nom.	"	126 0 0	"
Bar " "	"	127 0 0	"
Refined " "	"	133 0 0	"
Foreign Banca	"	130 0 0	net
Straits	"	129 0 0	"
TIN PLATES, Charcoal, IC	pr box	1 13 0	3
Ditto IX	"	1 19 0	"
Coke, IC	"	1 6 0	"
Ditto IX	"	1 12 0	"
Do. at Newport, 1s. pr box less		—	"
Do. at L'pool, 6d.	"	—	"
CANADA, Plates	prtn	3 0 0	2½
QUICKSILVER	pr lb	0 2 0	1½

The new year has opened very favourably in the metal market, the prices of most descriptions having advanced, with prospects of greater activity than it has exhibited during the major portion of the past year.

Rails and other descriptions of iron are confidently expected to advance somewhat towards the close of this month.

Scotch Pig Iron is not quite so firm, the quotations for mixed numbers, G.M.B. close at 53s. 3d. for cash, and 54s. 6d. three months open. The shipments for the week ending the 12th inst. were 4,500 tons against 7,000 tons the corresponding date last year.

Spelter has declined during the last few days to £23, at which a few parcels have changed hands. Market closes rather dull.

Copper.—The English smelters announced an advance of ¼d. per pound on the 11th inst., at which the market is very firm, and a similar rise before long is not improbable.

Lead.—An improvement having taken place in the demand for this article, prices are quoted 10s. higher.

Tin.—An advance also took place in tin on the 7th inst. of £3 per ton on common. Banca and Straits have participated in this advance and cannot be had under £130 and £129 respectively.

Tin Plates. Some makers have raised the price 6d. per box in consequence of the advance in Tin; those who have made no alteration as yet are expected to join the movement shortly.

January 14th, 1859.

MOATE and CO., Brokers,
65, Old Broad-street, London.

TIMBER.

	1858. £ s.	£ s.	1859. £ s.	£ s.
per load—				
Teak	10 0	11 0	10 0	13 0
Quebec, red pine	3 5	4 0	3 10	4 0
yellow pine	3 0	3 15	3 5	3 15
St. John's, N.B., yel	5 0	6 0	5 0	6 0
Quebec, oak, white	5 0	6 0	6 0	6 10
birch	3 10	4 0	4 0	0 0
elm	3 10	4 10	5 0	5 10
Dantzic, oak	3 10	5 10	6 0	7 0
fir	2 15	4 0	2 17	4 0
Memel, fir	3 5	4 5	3 5	4 5
Riga	3 15	0 0	3 15	0 0
Swedish	2 12	2 17	2 10	2 15
Masts, Quebec rd pine	6 0	8 0	6 0	8 0
yl pine	5 0	7 0	5 0	7 0
Lathwood, Dantzic fm	6 0	6 10	7 0	9 0
Memel	0 0	0 0	0 0	0 0
St. Peters.	8 0	8 10	9 0	0 0
Deals, per C. 12 ft. by 3 by 9 in.				
Quebec, white spruce	15 10	18 10	15 0	19 0
red pine	0 0	0 0	0 0	0 0
St. John, white spruce	14 0	16 10	14 10	16 10

	1858. £ s.	£ s.	1859. £ s.	£ s.
per load—				
Yel. pine, per reduced C.				
Canada, 1st quality	17 0	19 0	18 0	20 0
2nd do	10 0	10 10	10 10	11 0
Archangel, yellow	14 0	15 0	15 0	15 10
St. Petersburg, yel	11 0	12 10	10 0	12 10
Finland	9 0	10 10	9 0	12 0
Memel	10 0	15 0	10 0	16 0
Gothenburg, yellow	9 10	12 0	9 0	12 0
white	9 0	11 0	10 0	11 0
Gefle, yellow, 14 ft.	11 10	12 10	21 0	23 0
Soderhamn	11 0	12 10	0 0	0 0
Christiania, per C. 12 ft. by 3 by 9 in. yellow	20 0	27 0	22 0	28 0
Deck Plank, Dnts. per 40 ft. 3 in.	0 15	1 10	1 0	1 10
Staves, per standard M				
Quebec, pipe	60 0	70 0	80 0	0 0
puncheon	20 0	22 0	20 0	22 0
Baltic, crown pipe	180 0	190 0	155 0	160 0

Exhibition in 1861.—The Society of Arts has addressed circulars to all the members in town and country, requesting to have their suggestions as to the best mode of carrying out the proposed Exhibition in 1861. Many valuable ideas will, doubtless, thus be elicited.