SOCIETY OF ARTS.

The eleventh annual exhibition of inventions was opened to the public on Monday last, at the house of the Society of Arts, in the Adelphi.

If we are to have another Great Exhibition in 1861, it is to be hoped that the Society of Arts, who projected it, and who continue to use their most strenuous efforts in organising it, will be rewarded by such a grant from the surplus funds expected to be realised as will enable them to afford better accommodation for these annual exhibitions. The rooms in the house at present belonging to the society are altogether unfitted for the purpose. The locality is central and well chosen; but in the main requisites of light and space, the apartment in which the exhibition takes place is about the worst that could have been selected in any quarter of London.

There is this speciality in an exhibition of inventions, they are not like pictures or statues to be understood and appreciated by merely looking at them. Models of machinery and philosophical instruments require not only to be seen, but handled and put in operation—nay, many require to be taken to pieces, and, as it were, anatomised before they can be fully understood. Now, when half-a-dozen articles are exhibited within the space of one square yard in a dark, crowded room, all that a visitor can do is to look at his catalogue, and glance at the exterior of the mysterious objects before him. What amount of enlightenment he is likely to obtain from the catalogue may be guessed, when we state that a considerable percentage of the entries merely comprise the name of the exhibitor and the article exhibited, while the majority of the detailed explanations or descriptions appended have been supplied by the exhibitors themselves; and we are informed on the first page of the catalogue that the council of the society wish it to be understood that they are not responsible for any of the statements contained in it. The gentlemen employed by the society in getting up and arranging the catalogue have done their utmost to render the descriptions as concise and intelligible as possible; but there were many cases in which an intelligible description was even beyond their capabilities, accustomed as they must needs be with inventive eccentricities of all descriptions. Some of the exhibitors appeared to think that explanation or description was altogether uncalled for, and contented themselves with flinging their articles in at the doors of the society's premises, and leaving them to stand upon their own intrinsic merits, which (confiding mortals that they were) they imagined nobody could be so blind but they must discern them.

Nevertheless, with all these drawbacks, the exhibition is a most interesting and instructive one, and judging from the crowded state of the room on Monday, popular and attractive.

That out of 450 new inventions collected by an indiscriminate appeal to all the patentees of the last twelve months, there would be a good many useless and frivolous articles, is what might be expected; but it would be gross injustice to characterise the generality of the inventions exhibited as either useless or frivolous. Good things are slow of growth, and useful inventions rarely or never start, full grown, from the brain of the inventor, but have to pass through various inchoate stages of development before arriving at maturity. The gestation of important inventions appears to follow the same law as that which prevails among the lower animals—it is prolonged in proportion as the animal rises in the scale of development. An ingenious and eccentric friend of ours, who has been the parent of several successful inventions, is wont to disappear every now and then from his usual haunts, and when accidentally met with and questioned as to his anomalous behaviour, he is accustomed to declare himself occupied with the important and responsible duties of incubation. He has got a new idea, he says, and must sit close in order to hatch it. It is no disparagement to the collection of inventions exhibited at the rooms of the Society of Arts, to say that it contains a good many half-hatched eggs; that is, ideas half worked out, and only requiring more study and attention to bring them to maturity. There is unquestionably, however, a certain proportion of abortive ideas—addled eggs—that no assiduity will ever succeed in converting into chickens. They have originated in confused or mistaken ideas of mechanical laws, and like efforts at perpetual motion machines, they instruct by failure. We believe that every effort a man makes is, when fairly understood, virtually a step forward. Even Beau Brummell's failures, in the well-known story of the starched neckties, was not all a failure—the armful of crumpled linen which his servant was seen bearing from his dressing-room, or æsthetic laboratory, was merely an index of the price, or equivalent he paid for the miraculous tie which so astonished the world in the days of our grandfathers. Peace be with him! The beau was really an inventive genius; it was his unstaggerable impudence, or rather, his self-confidence combined with his perseverance and inventive capacity, which raised him to the dignity of autocrat of fashion.

We were glad to observe that steam engines, railways, and electric telegraphs have not monopolised the attention of inventors, to the exclusion of less imposing but not less important subjects which affect the comfort and convenience of every-day life. There is an unfortunate propensity in inexperienced inventors to aim at improvements only in great things, forgetful that it is much more difficult to suggest anything new concerning what has occupied the exclusive attention of men who have spent a life-time in qualifying themselves for the task, than it would be to improve any of the ordinary small appliances of civilised life, which come more immediately under their notice. The apparent magnitude of the interests concerned in the case of steam engines, locomotives, railways, electric telegraphs, &c., tends to hold out fallacious hopes to the inventor; while, in fact, the fields of enterprise in these directions are more overrun with inventive geniuses of the first class than any others, so that there is infinitely less chance of success to speculative amateurs. At the present day a man who invents an improved pin or needle, an improved candlestick, knife-cleaner, carpet-sweeper, or crinoline suspender or extender is much more likely of arriving at remunerative results than if he spent his time and money in endeavouring to improve the steam engine or the electric telegraph.

We are not sure that the present exhibition of inventions at the rooms of the society adequately represents what has been doing during the past year in the inventive world as affecting the industrial arts and manufactures. For instance, on looking over the patent list for the last twelve months, we observe that in the departments of electric telegraphs and in breech-loading fire-arms there has been a more than usual activity, which is most assuredly not indicated by the samples exhibited at the Adelphi. We believe this defect in the present exhibition to be attributable principally to the confined space at the disposal of the society. Were there more room and more light, inventors of a higher and more practical class would be disposed to send models and specimens, which they are deterred from doing from the uncertainty which prevails as to how they will be seen.

The models are divided into the following classes to facilitate their arrangement:—1st. Engineering, Railway, and Mining Mechanism. 2nd. Machinery and Manufacturing Appliances. 3rd. Naval and Military Appliances. 4th. Philosophical Apparatus, &c. 5th. Agricultural Implements, Machinery, &c. 6th. Building, Sanitary and Domestic Appliances. 7th. Miscellanea. A further subdivision of the above classes is made by such inventions as are represented by samples and models, and those of which drawings only are given.

In the class of engineering, mining, and railway mechanism, the first place is very properly given to contrivances for smoke burning in locomotive and other engines. Those are represented by three models in the lower room and two drawings in the upper room. The first in order is a model by Mr. Peter Brotherhood, of the Railway Works, Chippenham, of a Patent Coal-burning Locomotive Boiler, in which a combustion-chamber is interposed between the fire-box and the tubes. Between this combustion-chamber and the fire-box there is an air-chamber which communicates with both, through a series of tubes, which in common with the air-chamber are surrounded by the water in the boiler. Inside the combustion-chamber, and serving to deflect the current of air which enters through the air-chamber and its connecting tubes from passing directly to the tubes in the body of the boiler, there is a disc of fire-clay which acts as a reservoir or accumulator of heat, and aids in the combustion of the smoke. The idea involved in this invention is a good one, and has in several forms been successfully applied. It is the same principle which induces the chemist to have recourse to a disc of fire-clay on which to place the substance he wishes to analyse by the flame of the blow-pipe. In the common apparatus for inflaming hydrogen gas against a mass of spongey platinum, and in the piece of lime used in the Drummond light, we also find illustrations of the same idea.

Another contrivance for smoke-burning is represented by a model, No. 2, of a locomotive fire-box, by Henry Ashton, of Birkenhead. This consists of a deflecting hood or shield, which deflects the current of air entering by the furnace door down on the incandescent fuel on the grate. This has, we believe, been applied with considerable success.

A Patent Smoke-Consuming Boiler, No. 8, by Price and Dawes, of Cleveland Works, Wolverhampton, is an arrangement by which horizontal return flues are attempted to be got rid of by means of oblique taper tubes placed within the lower half of the circumference of the shell.

Houston's Patent Smoke Consumers are represented by a drawing, 375, of an arrangement in which gas is introduced into the bridge of the boiler furnace and there set fire to, in order to burn the smoke.

Thomas Almond's Smoke-Consuming Furnace is shown in drawing 376; it is a modification of that described under No. 1, where a fire-clay heat accumulator is used to combine the coal gases with the heated air introduced by side apertures into the furnace. It will be seen that there is nothing very novel or striking in the appliances suggested for smoke consumption, while some of the more recent and most promising schemes are not represented at all.

The next series of models have reference to the economical application of heat in the generation of steam. To this end, Robert Armstrong, of South Woolwich, exhibits a boiler with what he calls "double taper shape" generators placed across the current of heat in the main flues. Gwynne's Patent Spiral Heat Diffusers put in an appearance of a rather imposing character. In principle they remind us of the corrugations of the small intestines in the abdominal tubes of animals, but, like them, we imagine that, although excellent absorbents, they would be apt to get impacted by cinders and other *detritus*, to the serious derangement of the animal economy. The object aimed at is, no doubt, a good one: it is to ensure the heated currents of air passing through the tubes giving out all the available heat which they contain. Well authenticated results can alone establish the economic efficiency of this arrangement.

A much more simple and self-evident contrivance for economising heat is that proposed in the patent compressed woollen felt for covering steam boilers and pipes. This felt is composed of the waste woollen refuse from paper-mills, which is converted into a coarse pulp in the ordinary rag engine for paper-making. It is put upon the boiler or steam pipes in a wet or pulp state, and matted together by beating with a flat piece of wood; when dry it forms a solid cake of about an inch thickness, and bears some resemblance to a piece of cork. It is stated to be so efficient a non-conducter of heat, that candles may be laid for weeks upon boilers so protected without causing them to melt. This is decidedly a much more humble, but decidedly a more legitimate application of shoddy than that of making counterfeit broadcloth. The idea of utilising beggars rags and tatters to clothe the steam engine is deserving of all commendation. Left off clothes could not be applied to better purposes. Judging from what we saw of the material, we imagine it would make most luxurious carpets—soft, springy, and warm—and in many respects superior to Kamptulicon. Of other steam generators and economisers we must notice Neville and Dorsett's drawing of a scheme for generating steam, by introducing a small body of water in the form of spray, and heated to near the boiling point in contact with high pressure steam, and a large heating surface of metal, so as to dispense with the boiler and large body of water usually employed. The inventors seem to have overlooked the fact that steam and water are the best accumulators of heat. To employ metal plates for this purpose argues ignorance of the laws of heat, and the conditions under which it can be most safely and economically stored up for working purposes. The high specific and latent heat of steam afford advantages in this respect which no other material we are acquainted with can equal.

There are several varieties of marine engines represented by models and drawings, the object of which is to economise space. A rotary engine, actuated by a jet of steam which impinges on the curved bottoms of the chambers, and imparts a rotary motion to the wheel. Here, sure enough, is one of the addled eggs we have spoken of, which no amount of assiduous incubation will ever make a chicken of.

Having now disposed of the principal inventions which concern the economy of prime movers, we turn to the subsidiary contrivances which ensure their safety: of these pressure-gauges and safety-valves are the most conspicuous. Of pressure-gauges there are several with different forms of flexible discs, some of metal and some of india-rubber, presenting no great or marked feature of novelty, if we except Mann's Safety Registering Apparatus, which, by means of a pencil working on the end of a piston communicating with the boiler marks on a graduated card, moved by clockwork, the varying pressure of the steam at all hours; and also by the interruptions of the pressure in the pipe leading to the indicator, the occasions when the engineman has used his gauge cock is recorded on the card, which thus becomes a species of tell-tale or check upon the engineman.

Peter Jensen's Marine Engine Spring Governor is worthy of notice. It consists of a cylinder placed under the water-level either on one or both sides of the propeller. This cylinder is fitted with a piston, on one side acted upon by the water, whilst the other is counterbalanced by a spring; the piston is connected with the throttle-valve of the engine. The more deeply the propeller of the vessel becomes immersed, the more the pressure on the piston increases. The connection with the throttle-valve is so arranged, that as the pressure on the piston increases, this latter is thrust against the spring opening the throttle-valve, and *vice versa*. We have heard of a rather simpler arrangement invented by one of the engineers of the Peninsular and Oriental Company on the occasion of one of the engines breaking down. It consisted of a pendulous weight which followed the rolling of the vessel: when the wheel in action dipped too much into the sea, full power was not exerted, while, on the other hand, when the paddle was lifted out of the water, the power was checked by means of a connection between the pendulum and the throttle-valve.

Passing over a number of minor contrivances, we come to Joseph Hall's Patent Alterative Slide Valve. This model, we observed, seemed to puzzle most of the visitors: we overheard a party holding an animated discussion upon its merits as a new species of washing machine. The slide has steam ports at each end, covered by flaps which open and shut hinge fashion, by means of a vibrating lever. The object aimed at seems to be to obtain something like the precision of tappet-valves in combination with the slide; but it appears to us to be altogether too complicated for practice, and apt to get out of order by the deposits and incrustations left by priming, which would inevitably stop the working of the flaps, and prevent their being steam-tight.

An elastic piston and plunger metallic packing, by Parkin and Co., of Bridge Foundry, near Sheffield, made by alternate radial slots in opposite directions, and more than opposite depths, is ingenious, but scarcely necessary, when we have so many simple and efficient metallic packings in successful operation, besides, the elastic ring, which we presume is of cast-iron, is needlessly heavy, when a simpler and lighter spring would answer the same purpose.

The patent metallic gland packing, by R. Anderson, of Falkirk, consists of four sections of brass with angular spaces separating them, and pressed forward as they wear by helical springs which envelope them. The multiplicity of parts would form the greatest objection to this otherwise effective arrangement.

Chadwick and Frost's Patent High Pressure Piston Water Meter is a very ingeniously contrived and compact machine. It has already been described in our pages. With regard to the main requisites of an efficient water meter, accuracy of measurement, and protection from fraud by tampering with the register or working parts, we imagine this to be the very best working meter we have seen. Whether the working parts would continue for any length of time in good order is a question we are not certain about. Experience alone will determine that point.

Proust's Patent Hydro-Syphoid Axle-box, lubricated by a combination of grease, oil, and water. The economy of grease upon this system is stated to be 75 per cent. The axle-box exhibited has been running eighteen months, and is in the same condition as when taken off the wagon on the Paris, Orleans, Tours, and Bordeaux Railway and is stated to have performed 34,788 miles without any additional supply to that which was put into the box at first starting. This precious axle-box is protected by a glass shade, and appears in such a dirty condition that we were afraid to handle it, with the view of investigating the internal arrangements of syphons and water cisterns, &c. If the cold cream mixture of grease, oil, and water, have been as efficacious as stated, it has certainly done something wonderful. We should feel inclined, however, to attach more importance to the manner in which the axle is shut in and protected from the entrance of dust as well as the means taken to prevent the escape and waste of the lubricant.

Alphonse de Brussaut's Patent System of Axle-Boxes, not requiring lubrication. This contrivance was recently described in our pages: it consists of a system of friction rollers, surrounding the axle and retained at certain distances apart by means of elastic bands of vulcanised india-rubber. The advantage of this plan is that it transfers the friction of the large axle to those of the small rollers; it is not true, therefore, as stated in the description, that there is no friction requiring lubrication. The number of parts, too, is an objection.

Wallis and Haslam's Patent Self-Adjusting Spherical Bearings consist in the use of spherical bushes forming a ball and socket-joint with the plummer-block, and capable of adjusting itself to the direction of the shaft passing through it.

Walter Hall's Patent Railway Coupling with Spring Catch. This is a contrivance to supersede the usual ball and lever arrangement, and seems a piece of needless ingenuity; the lever is a convenient means of screwing up the coupling, while the weight of the ball is found a sufficient provision against the unscrewing of the coupling.

John Oxley's Patent Shackle consists of a cylinder of vulcanised india-rubber between the upper and under parts of the shackle, in order to deaden the jar and rattle of the wheels reaching the body of the carriage. As the elasticity of the india-rubber is in this case to be brought into play by compression in place of extension, there is in the sample exhibited too small a body of it to be available with any advantage. There is a spring for the same purpose acting by extension, and patented by Mr. Fowler, of Bucklersbury, which seems in most respects superior to this.

William Wright's Patent Buffer and Draw Spring is composed of a number of disc springs, and acted on by an arrangement of draw levers. We are at a loss to see what advantage is to be gained by the peculiar form of these springs. Circular disc springs have been tried and found defective several years ago; the difference presented by those exhibited is, that the plates are square-shaped, and are strung on a central rod.

W. P. Wilkins' Patent Improved Railway Brakes. In this arrangement the blocks for each wheel are joined by means of right and left-handed screws on a horizontal rod, worked from above by means of an universal joint. It certainly has the advantage of simplicity, and obviates the possibility of the axle or bearings being displaced by an unequal strain on the two sides of the wheel; the objection to it would be the time required to put it into action, and the tendency of the universal joint to get out of order.

Walter Hall's Patent Apparatus for Working Railway Brakes was described in The Engineer of 10th December, 1858. Meakin and Burrell exhibit a Drawing of a Continuous Railway Brake, in which a strong spring is used to take up the slack of a system of ropes and levers by which the brakes are worked.

There are several varieties of railway chairs exhibited, but none calling for special notice. Of the systems of permanent way, Christopher Hill exhibits some modifications, which are not improvements on Mr. B. Adams's Suspended Girder Rail.

James Samuelson's Patent Cup Trough Sleepers are a variation of those patented by Mr. Greaves, with this difference, that Greaves' dish covers were plain, and had an opening at the top to admit the packing. Mr. Samuelson has ornamented his by means of corrugated ribs, and placed the openings on the side; as a friend remarked, Greaves' had a skylight, while Samuelson's has got a dormer window and a scolloped roof. It is really absurd to see such trifles patented.

J. C. Brant exhibits what he calls Patent Argillaceous Railway Sleepers, having cork cushions for the chairs.

Whitworth and Gibson's Patent Improved Compensator and Releasing Railway Signal was shown in operation by means of a nicely finished model, and appeared to attract a good deal of attention; it would, however, be impossible to give an intelligible description of it without a drawing. It was described in this journal with a figure in September last; since then, however, the patentees have effected several improvements. It has been in successful use for some time past on several lines of railway. The object aimed at in this patent is one of the very greatest importance, and every suggestion for a more perfect system of signalling is deserving of notice. The first speciality of this apparatus is what Messrs. Whitworth and Gibson call the Improved Compensator, by which the variations in the length of the signalling wires induced by the alternate expansion and contraction due to changes of atmospheric temperature, are compensated by means of a weight, which is self-acting, in place of the usual adjusting screws. The arm of the working hand lever is attached to a quadrant, over which a short pin-linked chain passes freely in connection with the wire of the signal at one end, and with the balance or compensating weight at the other. The lever, when moved for the purpose of operating on the signal, catches, by means of a hooked pall, into one of the links of the chain, leaving the contraction or expansion of the wire and chain to be compensated by the balance weight.

Passing over R. M. Ordish's Rigid Suspension Bridge for Railway or ordinary Traffic, of which there is a very handsome model, and also Kenny's Patent Balance Rolling Bridge, both of which would require figures to render a description intelligible, we come to

Samuelson's Patent Indestructible Wheels for Streets and Common Roads. These wheels have a cast iron nave, malleable iron spokes disposed in loops, while the tyre is faced with steel. If it be a fact, as stated, that the weight and cost of these wheels are about the same as that of wooden wheels, there are certainly great advantages in an indestructible article over the perishable commodities now in use. There is one drawback, however, to their use, the rigid character of the wheel would transfer the wear and tear from the wheel to the carriage, which on a paved road would soon be shaken to pieces. For agricultural purposes we should imagine them to be well adapted.

Davis' Patent Caoutchouc Carriage Wheels are deserving of special notice. There is a loose tyre exhibited, which is stated to have been a considerable time in use on a Hansom cab. It is slightly frayed at the edges, and has that kind of burr which a dog's foot presents after a hard chase on a rough road. Some envious cabman cut it through, to prevent his too successful rival from taking away his fares. This form of carriage-wheel tyre has in various forms been before the public for the last ten years, but the great difficulty in applying them was found to be in fixing them on the wheels. Mr. Davis has attempted to overcome this difficulty by forming the tyres with an elongated inner rib, which is held in a recess in the rim of the wheel and tightly squeezed up. The first attempt to introduce elastic tyres consisted in using tubes of compressed air, formed of India rubber. These were found to give an exceedingly smooth motion on the roughest road, but were liable to accidents of a rather awkward nature. They occasionally exploded with a report which rather startled the by-passers. Mr. Fowler has endeavoured to form an India-rubber tyre with a combination of strong canvass-web made up with it in concentric layers, as in the strong India-rubber hose used for fire-engines, &c. It was found, however, that although a tyre thus constructed was more easily retained on the wheel, the canvass and rubber began to separate from each by the internal working of the tyre when subjected to hard work on the road. We believe that the general introduction of some form of elastic tyre, similar to that exhibited, is a great desideratum. It would at once do away with the insufferable noise which renders conversation in our public thoroughfares so disagreeable; it would materially diminish the draught of all wheeled vehicles, and effect an immense saving in the wear and tear of carriages and roads, to say nothing of the freedom from jar and rattling, which render a ride, in a wheeled-carriage of almost any description, so disagreeable on the paved streets of London.

Stephen Carey exhibits his Patent Channel Plates of cast iron, about which there is nothing special.

David Joy's Patent Hydraulic Engine for organ blowing is a nicely finished brass model of a water-pressure engine of a simple construction.

James Braby and Son's Patent Wheels and Gearing for Carriages propelled by Steam. This contrivance is intended to enable steam carriages to travel on common roads, and to answer the same purposes as have been aimed at in Boydell's and Bray's Traction Engines. It is decidedly inferior to both of those arrangements. Indeed, it is difficult to see what good purpose it can answer at all. It consists, according to the description of the patentees, of an annular railway or drum, having on its inner circumference a conical circular rail. The driving wheel works within the inner circumference, having a corresponding groove to the rail in the large wheel. Gearing is introduced to give different velocities in travelling, and a crank communicates with the connecting rod of the engine. There is also a model showing the application of the annular railway to carriages propelled by horses. We are credably informed that this particular arrangement was seen at work in New York as far back as 1830, and has been invented and re-invented several times. What earthly good purpose is achieved by it, which an ordinary spoked wheel of the same diameter would not accomplish, we cannot conceive; unless it be that it allows the body of the carriage to be placed lower than would otherwise be possible, without having recourse to a cranked axle, as in Hansom cabs, and in some description of low-hung street carts. This advantage, however, is more than counterbalanced by the friction involved in such a complicated arrangement of wheels within wheels.

Dunn and Co., of Manchester, exhibit drawings of several varieties of Wharf or Pillar Cranes, which will repay inspection; and also a Steam Excavating Machine, which was designed for excavating the Suez Canal.

There are also drawings of Harvey's and Condie's Steam Hammers, and a Patent Steam Rivetting, Punching and Shearing Machine, by D. Cook and Co., of Glasgow.

This exhausts the salient points of the department devoted to engineering, mining, and railway mechanism. We will pass more cursorily over the other departments, noticing only such articles as present some distinctive importance or novelty.

David Service's Patent Apparatus for Producing by one Operation Direct and Reverse Moulds for Casting Printing Surfaces is a new and very interesting contrivance for facilitating the production of ornamental patterns for shawls and other fabrics. The patterns are made up of a certain number of linear markings, disposed symmetrically, so as to constitute designs of a highly complex and ornate character. This is effected by means of a few punches representing simple linear combinations of one or two lines. The symmetrical arrangement of these markings, on the principle of the kaleidoscope, can be made very effective. The way in which the moulds for the compound patterns are made is as follows:—A block of hard wood, in which the mould is to be formed, is placed on a perfectly level metal table, which leaves the under part of the wood exposed; this is placed under an overhanging bracket, carrying a vertical reciprocating slide, to which is attached a tool-holder, with an arrangement for heating the tools by means of gas jets. There is a corresponding bracket and slide underneath the metal plate and block of wood. The two slides are connected together by a mechanical arrangement, so that they are moved simultaneously by means of a treddle. Both tools being heated by the gas jets to a temperature sufficiently high to burn their impress into the wood, the upper and under tools enter the upper and under surfaces of the wood at the same time, and in the same perpendicular direction, so that the marks burnt out of the mould block are directly over each other. By this means a right-hand and left-hand impress of the same pattern are moulded, one on each side of the matrix, into which the type metal is poured in a fluid state to form the required printing surfaces. By placing the upper and under surfaces side by side, a symmetrical double pattern is obtained. The effect can be varied by uniting radial segments, or other portions of the patterns cast. Several examples of the work produced by the machine were exhibited along with it, and showed the perfection with which this double system of carving and casting could be carried on.

An Indian "Churka," or Cotton Gin, was exhibited by the Manchester Cotton Supply Association, with the view of enabling the machinists of this country to obtain a correct notion of the gins at present in use by the natives of India, and to prevent inventors misapplying their ingenuity in the production of costly machines, which the natives are too poor to purchase, too ignorant to understand, and altogether incapable of repairing. The "churka" is certainly a very simple and primitive-looking machine, and presents a singular contrast to the character of the other models exhibited in the society's rooms. It is, however, very effective; and if it could only be made to work more expeditiously, would stand a competition with the most improved forms in use in the western world. It consists of a rude frame of rough wood, supporting an iron axle of about three-fourths of an inch in diameter, having a wooden crank handle at one end and a metal fly-wheel at the other; under this axle there is a wooden roller of about 3 in. in diameter. It is said that no machine yet invented can possibly separate the cotton from the seeds with less injury to the staple than does the "churka."

Peter and Charles Garnett, of Cleckheaton, Yorkshire, exhibit their Patent Spiral-toothed Cotton Gin, in which a band-saw is wound spirally round a metal roller, formed with grooves to receive the saw. The effect of this spiral arrangement of the saw-teeth is, that the fibre is drawn along continuously in the direction of the spiral, and is consequently less apt to be broken. It is stated by the inventors that, with a gin of this description, two persons can produce 200 lb. of cleaned cotton per day. The mystery to us is how the band-saw can be manufactured so as to bend round the rollers in the direction of their width.

William Jamieson exhibits a Patent Cotton Saw Gin, in which circular saws are used with a moveable metallic gride, for regulating the amount of projection in the saw-teeth to suit different qualities of cotton.

Easterbrook and Allcard, of Albert Works, Sheffield, exhibit their Registered Adjustable Vice, which allows the jaws to adapt themselves to any tapered or other shape which the workman may wish to grip. This is effected by means of a ball-and-socket joint to the foot of the front leg. The same firm also exhibit a Patent Ratchet Brace, with globular ratchet wheel, which enables the handle to be worked at any angle, and in places where the straight cylindrical ratchet could not be used.

D. C. Phillipson and Co., of Manchester, exhibit drawings of two Improved Foundry Appliances, one consisting of a core bar to be used without hay or strawbands. The core is made up of longitudinal sections, hinged at one extremity to an end plate, so that each section can be made to fall inwards and allow the core to be removed. The same firm also exhibit a drawing of Schmidt's Patent Ladles for Casting Metals, which consists in pouring the metal from the lower part of the ladle, leaving the scum undisturbed on the surface; in fact, decanting it.

C. W. Siemens, of John-street, Adelphi, exhibits a Patent Regenerating Refrigerator. The machine consists of an upright cylinder of copper, divided into several concentric compartments, the whole being surrounded by an iron case, between which and the copper cylinder is interposed a quantity of some non-conducting substance. The refrigeration is effected by means of dissolving crystallised chloride of calcium in the first or central chamber. This solution rises up between the double walls of the annular cavity surrounding the dissolving chamber, cooling the water in these two closed annular chambers to 32 deg. of Fah. This cooled water re-acts upon the solution in the central chamber, and takes up 30 deg. of its heat as it enters. The mass of half-dissolved crystals thus cooled down to start with, will, when completely dissolved, sink to 30 deg. below the freezing point of water. The cooling power of the chloride of calcium is thus, as it were, doubled, so that conical copper tubes inserted in the central chamber, and containing fresh water, have their contents rapidly converted into ice. The salt employed may be recovered by evaporation, either with fuel or by the heat of the sun's rays in a warm climate, where such refrigerators are most required. The inventor states that average expenditure of fuel employed in recovering the salt amounts to about 1 lb. of coal for each pound of ice. The idea of this invention seems to be taken from that of the Calorometer, used by Dulong and Petite in their experiments to determine the specific heat of different bodies. We have known ice sell in Calcutta at 6d. and 8d. per pound; so that if Mr. Siemens can enable our countrymen in India to manufacture ice at the rate of 1 lb. of coal, he will receive many blessings, and we hope substantial recompense, for his clever invention.

Peak, Frean, and Co., of Dockhead, exhibit their Patent Machinery for Making Ærated Bread, in which carbonic acid is forced under pressure into the water used in mixing the flour, so as to supersede the use of yeast, which tends more or less to deteriorate the bread. A figure of the machine is to be seen in several bakers' shop-windows in town, and requires little explanation. There is a strong oblong cylindrical vessel for making soda-water, to be passed into another strong closed globular vessel, to be mixed up with the flour by means of revolving arms, driven by machinery from without.

John Miller, of the Edgeware-road, exhibits a Machine for Kneading Doughs and Cutting them into Regular Portions for Making Loaves. It consists of a sloping platform, which delivers the dough into a pair of steel rollers, working horizontally at the end of it. The rolled sheet of dough then falls upon an endless web, where it is cut by a stamp into the exact portions required to form loaves.

Porquerée's Patent Self-registering Machine, exhibited by Messrs. Burgess and Key, of Newgate-street, scarcely admits of description without the aid of a figure. Suffice it to say, that the constant weight, which is used on a combination of steelyards, is a cylinder, with a progressive series of figures cut in relief upon it, and disposed spirally from one end to the other. This cylinder is moved backwards and forwards by means of a handle, with a pinion working in a rack on the steelyard. When the object to be weighed has been accurately poised, by turning round this handle, and shifting the position of the cylinder on the steelyard, the same motion rotates the cylinder, and brings the requisite number on the spiral coil opposite a piece of paper, which, by a suitable cam motion, is pressed against the numeral types, so as to print the weight balanced.

In the Department of Naval and Military Appliances the following articles are deserving of notice:—Edward Manico's Permanent Groin, for the sea coast. It consists of an arrangement of hollow iron vessels, each a yard cube, and filled with stones.

E. K. Calver, R.N., Admiralty Surveyor, exhibits a Wave Screen, formed of a series of perpendicular piles driven into the ground at the bottom of the sea, and reaching some distance above high-water. They are braced together at the top by a gangway, and are supported on one side by slanting buttress piles, which join the uprights about high-water mark. Spaces are left between the piles for the volume of the water to pass through after the force of the wave has been partially broken by the screen. There is thus sufficient protection afforded to vessels anchored under its defence, while the depth of water is maintained by the broken waves, which pass through the screen, preventing deposits of sand or shingle, such as are apt to take place in rear of a solid breakwater.

The same idea has recently been under discussion in the pages of this journal, in allusion to Mr. Scott's paper read before the Institute of Civil Engineers. We also gave illustrations of Mr. Calver's screen, and Mr. Burns' system of circular piers of brick masonry and concrete, with intervening spaces, which allowed the broken water to pass through between them.

Robert Griffiths exhibits a handsome model of his Patent Improved Screw Propeller. This is an arrangement by which the blades of the screw, which are flat, circular discs, can be flattened or adjusted to any desired pitch by means of toothed sectors on the fan seats gearing into a wheel on the shaft. The toothed sectors are bedded into the spherical boss which terminates the screw-shaft, and are flush with it.

Thomas Spiller exhibits what he calls a Vertical Propeller, the action of which is described by the inventor as being very much like the tail of a whale, dolphin, or porpoise. Its motion is vertical, the propeller assuming in its ascent and descent through the water an angle which may be made to vary with the speed of the vessel. It is adapted for an auxiliary to sailing vessels, as it presents no impediment to the vessel's motion through the water when under sail. This advantage we concede to it; but we are at a loss to understand how, as the inventor states, it is capable of giving a much greater propelling force in 7 ft. of water as the screw gives in 27 ft. The upward motion of the propeller would, we imagine, be apt to throw the water into the air, without obtaining any adequate propelling force. If some arrangement of this kind could be made to act horizontally, in place of vertically, it might be made available for shallow water navigation in the manner of the Chinese sculls, which are constructed so as to give all the advantages of a screw of variable pitch, capable of being efficiently worked in shallow water.

There is a fine model of the Life-boat of the Royal National Life-boat Institution, designed by Mr. James Peak, master shipwright in her Majesty's dockyard, Devonport. This boat has been so frequently described elsewhere, that we need say very little about it here.

Captain Thomas Kisbee, R.N., exhibits an Apparatus for Saving Lives from Stranded Vessels, constructed from materials in all cases at hand on board ship. It consists in throwing a line from the vessel to the shore by means of a rocket. This line is made fast by the people on shore, and a traveller, guided by it, is made to pull the shipwrecked sailors on shore, supported by life-buoys, through the surf.

Gresham's Patent Record Buoy is a hollow iron case, with a water-tight cover, capable of containing books or treasure, so as to preserve them in cases of shipwreck. The speciality of the invention, however, consists in the use of a silvered globe attached to the top of the buoy, which by the reflection of the sun's rays in all directions enables it to be seen and recognised at great distances.

James Taylor and Co., of Britannia Works, Birkenhead, exhibit a very beautiful and highly finished model of their Patent Double Cylinder Steam Winch, which is worked by means of two steam cylinders bolted to the frames. A small boiler is placed in any convenient part of the ship, and the steam pipes leading to the winch are usually carried immediately under the deck, with a branch leading to the different holds, so that, in case of fire, it can be used as a fire extinguisher.

Joseph Maudslay, of Westminster-road, Lambeth, exhibits a model of his Patent Breech-loading Gun. This invention consists in forming the gun with a horizontal chamber in the breech, within which is placed a breech-piece, which rotates on an axis placed in its hinder part, so that it can be moved out of the line of the bore, and present the powder chamber to the outside, when it is required to load it.

Henry Revely, of Poole, Dorsetshire, exhibits a Rocket Gun, in which the projectile takes the shape of a rude short cannon with the bore cast in it. The projectile is fired from a wrought iron pin loosely fitting the bore. It is, in fact, using the recoil to project the cannon in place of the projectile, which is of large size and fixed to a heavy carriage. It is difficult to see how there can be, as stated by the inventor, an increase of dynamic power obtained by this arrangement—unless, indeed, we accept the loudness of the explosion as indicating the relative dynamic power; for we are informed that "the report of a one-inch rocket gun is quite equal to that of a six-pounder fired in the usual manner, and a small charge is thus made to do the work of a larger, the form of the projectile being such as to secure its generally going head-first into the target!"

Captain Norton exhibits his Wooden Liquid-fire Rifle Shell, in which the combustible liquid is supposed to be charged just before being used. The shell, on striking, is split open by a wedge-shaped plug, which closes the mouth of it. Each fragment of the shell thus becomes a separate fire-brand, not to be extinguished even by water. Captain Norton's Jacketed Rifle Bullet is simply a leaden bullet covered with paper, intended, we presume, to assist the bullet in assuming the form of the rifle grooves; although it is waggishly stated in the catalogue that the object is to prevent the oxidising of the lead, and the poisoning of the wounds inflicted on the enemy! This is about the last refinement in fire-arms we expected ever to hear of.

In the department devoted to philosophical apparatus, unquestionably the most interesting article exhibited is Professor Hughes' Patent Roman-type Printing Telegraph. It would be difficult to give a detailed description of this instrument without a figure; we can only state, therefore, that the speciality of Professor Hughes' instrument consists, not in the mere printing of messages by means of roman type, but in the economical arrangements by which this process is accomplished. The main peculiarities of the system are the use of a weighted spring, by regulating the vibrations of which a perfectly synchronous movement is obtained in a system of clockwork moved by weights at the two extremities of the wire. These springs are regulated so as to produce the same musical tone—a peculiarly ingenious arrangement first employed, we believe, by Professor Wheatstone in an instrument called the Metrophone. Professor Hughes has applied this principle to his instrument with rare felicity. Having thus established a synchronous movement at each end of the wire, the next step is to employ regulated portions of it to record themselves. This is effected in a very ingenious manner by measuring out portions of an electric current, of greater or less duration, which are made to indicate different letters of the alphabet. But in place of using a number of distinct waves for this purpose, as was the custom in the step-by-step system in use on several of the continental telegraphs, Professor Hughes only uses one wave for each letter, distinguishing the waves by their comparative length or duration. We lately gave a report of the paper read before the Society of Arts on Professor Hughes' printing telegraph and self-repairing cable, in our number of the 2nd of April, to which we must refer our readers.

We witnessed the self-restoring process of the cable, when incisions were made in the gutta-percha tube enveloping the semi-viscid fluid. Professor Hughes informs us that the idea was first suggested to his mind by the reparatory or healing process in the animal economy. If the covering of a nerve is injured, there exudes a species of lymph, which coagulates, and in time hardens into the same tissue as existed before the rupture. Nothing can be more beautiful than the rapidity and certainty with which the healing process is effected in the cable exhibited. We believe that the semi-viscid fluid is a preparation from petroleum, or one of those hydro-carbons obtained from fossil vegetation, and which of late years have been utilised for so many economic purposes. Mr. Hughes has several other preparations—some twenty or thirty of them, we believe—which he says all possess the same property of hardening when brought in contact with water.

Several other telegraphic cables are exhibited, but none calling for special notice.

Wentworth L. Scott exhibits his Self-registering Maximum Thermometer for Deep-sea Observations. The inventor of this highly ingenious instrument recently received the silver medal of the Society of Arts. We can merely state the principle upon which it is constructed, without attempting a description. The instrument is so arranged that any rise of temperature in the mercury in the bulb causes it to overflow from the curved extremity of the stem into a closed reservoir surrounding the top. Upon cooling the mercury to the same point at which it stood before the observation was made, the deficiency is recorded by that which has overflowed from the open beak of the stem into the reservoir when the maximum temperature was reached. The instrument is so graduated that if it were cooled to 0 deg. Fah., the level of the mercury would precisely indicate the highest temperature to which it had been exposed; but if the observation were made at the atmospheric temperature, the mercury would stand as much higher in the tube, *i. e.*, lower in the scale, as the temperature of the air was above 0 deg. Fah.; therefore, to ascertain the maximum temperature, it is only necessary to add to the degree at which the mercury stands the temperature at the time the observation is made.

Dr. Page's Revolving Armature consists in the use of uncovered wire for the electric magnet, which the inventor assures us is not only cheaper, but allows of the introduction of a greater amount of wire in the same space. We should like to see the results, if any.

H. Swaisland, of Great Sutton-street, Clerkenwell, exhibits a very neat Box Sextant, with Compass attached.

Henry Johnstone, of Crutched Friars, a Patent Apparatus for Drawing Geometric Curves.

T. Edmund Anscombe, of Westbourne-street, Pimlico, exhibits a Patent Apparatus for Taking Accurate Views. This is a very ingenious contrivance, and will be useful in teaching perspective.

G. W. Scott, of Old Compton-street, Soho, exhibits a Lay Figure for the Use of Artists, made in wicker-work.

E. Agneni, of Queen's-square, exhibits a New Species of Art Decoration on Mirrors. This consists in painting figures on the back of the glass, and before the silvering is applied. The effect is very successful, making the figures stand out in very bold relief. The way of putting the paintings on the glass is, we believe, as follows:—It is first painted on paper prepared with gum-arabic and glue. When dry, the picture is laid face-downwards on the glass, which has previously been smeared with drying oil. The back is then moistened with water and left to soak. After a little, the paper is removed, leaving the film of paint constituting the picture adhering to the glass. Mr. Agneni's style of decoration is extensively used in Italy, and, judging from the sample exhibited, is likely to find favour in this country.

Several varieties of Fountain Pens are exhibited by J. Risdale, of Stoke Newington-green, and Moseley and Son, of Covent-garden. We imagine there is annually some four or five of these fountain pens invented and patented. The idea of supplying pens with self-acting fountains appears to us to be a needless one for several reasons. In the first place, the operation of dipping the pen in the ink-bottle is so simple, and from habit becomes so easy, as almost to become instinctive. In the second place, as all fluid inks contain solid matter in suspension, which is sure, sooner or later, to be deposited in the bottom and sides of the containing vessel, all the contrivances for supplying ink to the pen in time get choked up and out of order; while the constant oozing of the ink, when not required, is a fertile source of annoyance. Almost all the plans we have seen attempted consist of vulcanised tubes to hold the ink, which is pressed out by the fingers when required. The great obstacle to success is that heat expands the air left in the fountain, and, consequently, forces the ink to flow when it is not required. The only successful application of the fountain principle was that of the glass pen, with a bulb at the writing end, which was formed of a capillary tube, through which the ink flowed to the paper in writing. But even in this case the capillary orifice was continually getting stopped up by deposits from the ink.

Abraham Pope, of the Edgeware-road, exhibits a System of Tangible Arithmetic for the Blind, contrived by the Rev. William Taylor, F.R.S. The contrivance consists of a sort of board of gutta-percha, half an inch thick, and of a convenient size, the smallest being 3½ in. wide and 7 in. long. It contains twenty-eight octagonal holes, in which square pegs are to be placed to represent numbers, &c. The pegs are made with two small projections at one end, while at the other end the projection continues the whole width of the peg. These projections, which are about one-tenth of an inch high, serve to show which end of the peg is uppermost and its position in the hole. By this means, sixteen distinct characters can be indicated, including the ten numerals and the algebraical symbols.

Some very beautiful specimens of Geographical Modelling and Maps in Relief in Papier-Maché Plaster, were exhibited by John Brion, of Devonshire-street, Hammersmith. These maps were impressed by means of the hydraulic press, and afford a favourable example of what may be effected in this direction.

Thomas E. Dexter, of the Royal Military Asylum, Chelsea, exhibits a Portable Museum of Natural Substances. This is a most meritorious application of common-sense to educational purposes. Nothing can well be more dry and uninteresting than to read about the qualities of natural substances, whilst seeing and handling them is at once a source of pleasure and instruction. Even pictures of things or diagrams are inferior to the articles themselves.

The Society of Arts' Prize Writing Case, for which a prize of £20 was awarded, together with the Society's Silver Medal, to Parkins and Gotto, of Oxford-street, is a neat and conveniently arranged cover of glazed oil-cloth, for holding pens, note-paper, and envelopes, but not ink. It is admirably adapted for the use of soldiers, sailors, and travellers generally. The price, 1s. 6d., puts it within the reach of all classes. The Society of Arts deserve great credit for initiating this system of obtaining artistic and literary requisites at low prices and of the best materials for popular use. Their mathematical instruments and colour boxes are decidedly the best and cheapest things of the kind to be had.

J. D. Morrison, of South Charlotte-street, Edinburgh, exhibits some beautiful Apparatus for the Painless Application of Cold, Electricity and Heat as Remedial Agents, and for Producing Local Anæsthesia.

Dr. Alison Scott exhibits his Spymoscopes, Cardial and Arterial, for Indicating the Pulsations of the Heart and Arteries. These instruments are made by extending a diaphragm of vulcanised india-rubber over the bell-shaped mouth of a glass tube, which contains a coloured fluid; on being applied to the region of the body, where the pulsations can be felt, the extent of the motion is indicated by the rise of the fluid in the tube, which becomes sensitive through the elastic diaphragm.

INSTITUTION OF CIVIL ENGINEERS.

April 12, 1859.

JOSEPH LOCKE, Esq., M.P., President, in the Chair.

THE whole of the evening was occupied by the discussion of Mr. McMaster's Paper, "On the Permanent Way of the Madras Railway."

It was remarked that, for India and other similar countries, the ordinary chair and sleeper road was not yet ascertained to be the best that could be adopted. In such cases it was desirable to aim at obtaining the smallest number of pieces, simplicity of parts, and avoiding complicated fittings. The arrangements should be made with a view to guard against peculation, as well as to the best mechanical construction, for the natives were apt to steal fishing plates and bolts. It was contended that the single-headed rail, fixed directly upon the sleepers, and with a sufficiently broad flange to prevent injury to them, was preferable. This form of rail had been extensively used in Germany, and in the United States of America, and the application of the "fish" rendered the joints much more secure, and the surface more uniform. It was urged that the quality of the materials and the machinery to be sent to India and other distant places should be carefully attended to, as the heavy charges for freight and shipment formed a large portion of the expense. In this view it was thought that the double-headed rail, first introduced by the president, provided it was so laid as to be capable of being reversed, possessed great advantages. It was believed that rails weighing 60 lb. to the yard, to which an additional hammering had been given during the process of manufacture, would answer well for lines where very high speeds were not essential, and that their use would be attended with economy.

Allusion was made to a system of enabling the double-headed rail to be used without chairs. This was by suspending the rails between a pair of longitudinal balks, contoured to the rail channels. The rail and timbers were bolted together by flat bolts, 3 ft. apart. The joints of the rails were connected, by brackets of angle iron, to a cross tie of timber. By this plan a thinner web could be used, and therefore a deeper rail for a given weight. When it was wished to reverse the rail, it was not necessary to disconnect the rails and the timbers, but merely to take out the joint bolts. It was believed that this system would induce economy, as no chairs were used, and less timber and ballast would be required than on an ordinary cross-sleeper road. A length of 150 yards of this way had been laid for six months on the main Cambridge line, at Stratford, where the ballast was bad and the traffic great. The timber used was only cross-sleepers cut down the middle. It made a good road, and there was a perceptible difference in passing on to it from the other portions of the line.

It had been stated, that the compressed keys were liable to shrink in hot climates, and that some, which had been allowed to remain on the sea coast in India, had swollen so much as to be unfit for use. On the Lisbon and Santarem Railway an oaken key, 10 in. in length, and slightly tapered, had been substituted; and this plan was about to be tried on the Madras Railway. The employment of an iron key, with a thin cushion of wood between it and the chair, the timber being cut across the grain, was suggested as an alternative. In defence of compressed keys it was remarked, that what had been stated was scarcely so much the necessary cause of the defect of the key, as the way in which the keys were used. Twenty million of these fastenings had been supplied for the railways in India, or sufficient to lay 2,200 miles of road, and no complaint had ever been made until quite recently. The author of the paper had said that the compressed keys lasted better than those which were unprepared, and it was also believed that the loss from premature expansion had been inappreciable during the period of three or four years during which they had been used on the Madras Railway. But being aware that the amount of dry heat to which they would be subjected, with iron on both sides of them, might have a tendency to cause even compressed keys to shrink, until they were thoroughly saturated with moisture, they had lately been made larger than usual, so as to receive a greater degree of compression. It was understood that hundreds of casks of keys had been lying exposed to the heat of the sun for months after their delivery in India, and until the staves of the casks opened. If there had been any expansion of the tightly packed keys the casks would have burst. It was maintained that with proper care they would have remained without fault.

It was thought that one of the main points arising out of the paper was, whether it was desirable to construct permanent way in India with timber, or with iron sleepers. As the cost of renewal, irrespective of ordinary maintenance, amounted, on lines in this country, to £100 per mile per annum, of which sum about 37 per cent. was for the renewal of the rails, and 63 per cent. for the substructure, attention had been directed to the use of cast iron for sleepers, which had been proposed and tried in many different forms. In Egypt, Greaves's spheroidal cast iron sleeper, with the chair cast upon it, had been found best suited to the soil and climate. There was little or no ballast on the course of the line, so that it would have been difficult to have found a foundation for the ordinary sleeper. Trough sleepers of cast-iron, in which the rail was suspended between linings or cushions of timber, so that, in the case of the double-headed rail, the lower table was not injured, and the rail could therefore be reversed, had been in use for nine years on the Eastern Counties, and for two years on the South-Eastern and the Midland Railways. In the latter case they were laid near to the Derby station, where they were subject to a traffic of 550 engines, 2,400 wagons, and 120 carriages, every twenty-four hours. A modification of these two forms, which might be denominated the "cup-trough," had recently been proposed, in which the chair was entirely dispensed with, so that there were no projecting parts liable to fracture. Tie-rods passed through the neutral axis of the rail, with square washers, of unequal thickness, placed in the side channels, secured both the angle and the gauge. This form of sleeper was stated to be applicable to any ordinary section of rail, without alteration of pattern, was said to be inexpensive in manufacture, and to be easily maintained, as it was packed through dormer holes at the sides, which were believed to afford greater facility than holes at or near the top. For shipment they could be stowed into one another, and save space. It was assumed that the first cost of a substructure on this system would amount to £910 per mile of single way, and on the ordinary system to £551 per mile, taking the cross sleepers at 4s. each, and the chairs at £4 10s. per ton. But it was contended that the timber sleepers would require to be renewed twice in twenty-one years; for although the timber might be rendered chemically durable, the destruction would go on nevertheless, and when the time arrived for the renewal, the timber would be valueless, whilst the cast iron would be worth two-thirds of its original value. It had been estimated that the saving, by the use of iron, would amount to £1,058 per mile, of single line, in a period of twenty-one years, after allowing interest for the original outlay in both cases.

In regard to the durability of timber sleepers, it was asserted that, when properly creosoted, they lasted much longer than would be inferred from the comparison just made. Scotch fir sleepers, laid on the Eastern Counties in 1841, had remained perfect to the present time, not one having been removed on account of decay. Between the years 1840 and 1842, creosoted sleepers had been laid on the Manchester and Crewe, which were still sound; and, indeed, in re-laying the line with heavier rails two years back, some sleepers that had been in wear sixteen years were employed. The sleepers for the East Indian Railway were weighed previously to being placed in, and when taken out of the cylinder, in which they remained twenty-four hours under a pressure of 124 lb. to the inch, in order that 10 lb. of creosote per cubic foot might be forced into them. Some triangular creosoted timbers, which had been sent to India, had shown symptoms of decay, due, it was believed, to their being of hard wood, and to the form not being the best for the purpose, as the angles were liable to be damaged, and thus expose the uncreosoted portion of the wood. Timber should be stacked and properly seasoned before being creosoted, and it had been found that heart-wood was not so easily creosoted as young sappy wood, as it was impossible to make it absorb the necessary quantity to preserve it thoroughly. In the latter case, after a few years, the creosote set into a solid bituminous mass; but only the thin and volatile portions entered heart-wood, and these were liable to evaporate quickly when the sleepers were used in a hot climate. Specimens of sleepers which had been "Burnettised" in 1841, and laid at that time on the Eastern Counties Railway, were shown to be quite sound at the present time. With respect to unprepared wood, instances were given of the sleepers having been said to have lasted many years, but the evidence was not conclusive. It was stated, that good sound larch sleepers were in some cases preferable to Scotch fir that had been creosoted, and that it would last equally long. It was observed, that it was impossible to subscribe to the principle which had been advocated, that wood of the lowest quality, or young timber full of sap, and which sucked up a large quantity of creosote oil, should be selected for use, because it was favourable for creosoting. It was believed that the best results would be obtained, when the utmost care was taken in selecting the woods. A good result was tolerably certain under these circumstances; and in corroboration it was mentioned, that timber laid in 1835, some of which was Kyanised, although the preparation merely entered to the depth of one-tenth of an inch, and some of which was unprepared, had lasted till the present time. St. John's yellow pine had been proved to be one of the most durable woods, both for railway sleepers and marine works. At the Liverpool and the Sunderland Docks there were instances of its being quite fresh after being in use twenty years.

With regard to marine works it was said, that the worm would not touch timber which was creosoted to the depth of two or three inches around the pile. When, however, this coat was cut through, the worm would penetrate into the heart-wood; but when it reached the creosoted portion, it was stopped by the objectionable nature of that material. This had been proved to be the case at Lowestoft, where the creosote was found to be generally a preservative against the ravages of the worm. In all cases the timber should be cut for framing before being creosoted. It was remarked that, although in general creosoting doubled the duration of timber, yet the creosoted piles of the pier at Leith showed symptoms of being attacked by the worm. An instance was also mentioned of the worm penetrating a balk of creosoted Memel at Scrabster, Caithness, and having eaten through the blackened portion, although the pile had been in the sea for less than six months. To this it was replied, that the discoloration of the wood afforded no correct test of the timber having been properly creosoted; and it was suggested whether the work of destruction might not have commenced before the balk was creosoted, as there was hardly a log from Memel which was not more or less penetrated by some kind of worm. Kyanising was asserted to have no effect, as the corrosive sublimate combined with the sap of the wood, and formed a substance which was not poisonous, and could be eaten by the worms with impunity.

It was thought that sufficient stress had not been laid on the importance of utilising, as far as possible, the resources of the country in which the works were being carried out. In Ceylon, for instance, there were forests of almost interminable extent, which might be made available. Eighteen different samples of timber had been examined, at least nine of which were applicable for railway sleepers, in situations where they would be exposed to extreme variations of atmosphere and weather. The drainage of railways in tropical climates was a matter of the utmost importance, as the ballast was liable to be carried away by the heavy periodical rains. In reply it was intimated that the necessity for sending out timber sleepers to India arose from the circumstance that the supply there could not be relied on. There was great difficulty in determining the precise value and quality of woods in foreign countries, especially when such practices were carried on as steeping the wood in order to deceive, as had been the case in Madras.

In closing the discussion, the great diversity of opinion that still prevailed on this subject was commented upon. Every one appeared to think his own plan the best, and naturally preferred to be guided by his own experience, rather than by that of others. As to the question of the durability of timber, whether prepared or not, and if prepared, then by what process, few persons were able to obtain reliable data as far back as twenty or thirty years. The Minutes of the Institution would contain a variety of opinions on this subject, but it was doubted whether the question could be solved, or whether there could ever be universal agreement as to what was the best system of permanent way to be used under all conditions.

After the meeting, Mr. Curtis explained a system of axle boxes, in which, by centrifugal action, the oil was constantly thrown over the upper side of the axle, and descending slowly upon the axle, was returned again to the oil chamber. As soon as it had passed the axle, a piece of thin porous flannel, placed at the bottom of the oil chamber, was found in practice to answer as a filter to receive the parts of the metal, or other residuum, resulting from the working of the boxes. These boxes were now at work on eight railways in England and on one in France. They had been in use for upwards of eighteen months; in some cases they had run for two months without any oil being applied, but the ordinary practice was to introduce about a wine glassful of oil to each box once a week.

RAILWAY SPEED.—The following is said to be a correct calculation of the speed in a given time on the railways of different countries:—England, main speed, 36; express, 60; maximum, 82. Germany, main speed, 36; express, 58; maximum, 76. United States, main speed, 43; express, 86; maximum, 100. France, main speed, 40; express, 72; maximum, 86. It should be borne in mind that in the United States there are lines of the length of 8,800 miles, the stations on which are at great distances from each other.—*Mining Journal.* [More blunders could not well have been made in the same space.]

SCOTTISH MATTERS.

IF the state of the traffic on the railways of a nation may be regarded as a satisfactory test of its condition, "Scottish matters" are in a sound and healthy state. The late weekly return from the twelve principal lines of Scotland exhibits a net increase of £1627 as compared with the corresponding period of last year. The comparison extends over 1087 miles, and the average receipts per mile were £40 18s. 4d.

Viscount Duncan, the member for Forfarshire, has received the following important letter from Sir John Lawrence, the distinguished governor of the Punjaub, on the cultivation of flax in that part of India,—a subject which has of late attracted a good deal of attention in commercial circles:—

"My Dear Lord Duncan,—I beg to return the papers received with your note of yesterday. I suggest that the 'Flax Supply Association' devote a portion of the money which has been collected by it, to sending out to the Punjaub some one well acquainted with the culture and preparation of flax for exportation. Such a person could go out, collect all the information necessary, and return within six months. The cost of such a mission need not exceed from £700 to £800; and if the agent left England early in October, he would have all the fine cold weather in India before him for travelling about and seeing the country. The reports of Government officers alone would scarcely satisfy the Association, or the manufacturers and traders interested in the production of flax. These officers have heavy duties which fully occupy their time and attention; and, moreover, cannot well know the precise data which would be required of them. Nevertheless, their great knowledge and personal influence would be very useful to the agent from England, and these would, I am sure, be cheerfully rendered.

"Much of the land in the Punjaub is, I believe, well suited for the growth of flax; and there is nothing in the landed tenures, nor in the prejudices of the people, to prevent an abundant supply being furnished. On the contrary, the gain to the agriculturists of a certain market for a valuable product would be fully appreciated.

"On the other hand, there can be no doubt that the people require some instruction as to the proper mode of cultivation of flax for the English market; and they ought also to obtain some security that the crops which they raised would find a ready sale at a remunerative price. If, then, the Flax Association were satisfied with the report of its agent, I would then recommend that it establish a regular agency in the Punjaub, which would manage a small model farm, and thus show the people practically the best mode of cultivating flax. This agency would, with advantage, make advances to a moderate extent for similar cultivation, and buy all the good flax available for exportation. After a few years, when the agriculturists learnt the benefits to be derived from such produce, the system of advances might cease. JOHN LAWRENCE.

"16, Montague-square, London, 16th April, 1859."

PUBLIC WORKS IN SOUTH AUSTRALIA.—The sum of £1,500 has been voted for a colonial observatory. In reference to the scheme now being carried out for supplying Adelaide with water, we, *Adelaide Observer*, find that during the year the works at the reservoir have made steady progress towards completion. The basin of the reservoir, which is to be greatly altered, has been enlarged, so as to contain in all 160 millions of gallons of water as a reserve against seasons of drought, and a cottage has been erected as a residence for the party in charge of the reservoir hereafter. The contract for the river weir has been completed, but when the work came to be tested, at the commencement of the rainy season, it was found so faulty as to be ultimately condemned, and it is now intended to erect a smaller weir at a fresh site, of somewhat different construction, further up the stream. The defects in this structure led to the resignation of the engineer, and the carrying out of the works generally is now in the hands of his successor, Mr. England. The water-pipes, under Messrs. Philip Levi and Co.'s contract, are fast being delivered; about one-third of the entire quantity ordered are now landed, and the remainder are probably shipped, or ready for shipment. The rate of breakage on the pipes has hitherto been higher than was expected. The cartage of the 21-in. pipes to the line of the main has been commenced, and the line is in a great measure ready for the laying of the pipes. The attention of the board has been directed to the relative advantages of lead and iron house service-piping, and we believe they have come to the conclusion that it is desirable to use iron service-piping wherever it can be conveniently applied.

DESTRUCTIVE EFFECTS OF RED LEAD UPON IRON.—Mr. Robert Lamont, who was, a few months back, requested by the managers of one of the largest steam-packet companies in the kingdom to make a report on the merits of certain compositions used to a large extent in Liverpool for the preservation of iron ships, and to prevent fouling on the bottoms of such vessels, has come to the conclusion, so far as regards the use of red lead, or paints containing lead, quite at variance with the popular notion upon the subject, by declaring the use of that pigment for coating iron vessels to be the most pernicious. And in this hypothesis he is confirmed by the opinion of Mr. Nathan Mercer, F.C.S., who, after inspecting the iron ship William Fairbairn, the plates of which were coated with red lead prior to her late voyage to Calcutta, observes that the extent to which the iron had been corroded could not fail to attract the attention of the most superficial observer. On a close inspection he found the red lead coating covered with blisters, from each of which, on being opened, a clear fluid escaped, and left exposed on the surface of the iron a number of brilliantly shining crystals of metallic lead. Mr. Mercer says each blister is, in fact, a galvanic battery in miniature, and that, as wherever there is electrical there must also be chemical action, the corrosion is easily accounted for. This action, he says, will continue as long as any red lead remains, and is necessarily at the expense of the iron. He also points out that the "sweat," so well known to every person interested in iron ships, is not, as is generally supposed, salt water, but a solution of chloride of iron manufactured in the blisters. Mr. Mercer considers this sweating is due in a great degree to the use of red lead paint in immediate contact with iron; and he recommends, therefore, that it should never be used as a coating for sea-going vessels, unless special precautions are taken to prevent its coming into direct contact with the iron.—*Liverpool Albion.*

SOUTHAMPTON WATERWORKS.—At the last meeting of the Southampton Town Council, a report was read from Mr. Summers, giving a detailed description of the means taken to ascertain the power of the engines at Mansbridge. The report spoke highly of the merits of Mr. Manwaring, the engineer, and said that the indicated power of the two engines ranged from 75½ horses, at nine strokes, and 15 lb. pressure in the boilers, to 104 horses, at twelve strokes, and 23 lb. pressure. The effective power available for working the pumps was about 80 per cent. of their indicated power. The application of the indicator to the engines had been useful in pointing out a better adjustment of the steam valves than was possible without its employment. It has also clearly shown the advantages of increased pressure of steam in the boilers, combined with higher degrees of expansion in the cylinders, and fitted to the pumps it has established the cause of the increased shock on the pump valves, when working at the higher rates of speed. The consumption of the small Welsh coal, at nine strokes, was 2·385 per cwt. per hour, varying to 3·151 cwt. per hour at twelve strokes per minute, and per indicated horse power per hour 3·635 lb., varying to 3·19 lb. of coal. When Hartley coal was used the consumption was about 8 per cent. greater. The quantity of water discharged per hour by the two pumps varied from 57,144 gallons, at nine strokes per minute, to 73,457 gallons at twelve strokes, and the loss in the pumps was considerably greater at twelve strokes than at nine. He strongly recommended that an additional engine be fitted at Mansbridge; because, if an accident should occur to disable the present engines, the town might be left without water supply; also, because there was not at present any possibility of stopping the engines for a general overhaul and repair, which must necessarily be required before long, as they have been working for five and a half years, and part of this time night and day.

CLARK, BRAITHWAITE, AND PREECE'S IMPROVEMENTS IN TELEGRAPH CABLES.

Patent dated 30th August, 1858.

This invention, by Josiah Latimer Clark, of Adelaide-road, Frederick Braithwaite, of Bridge-street, Westminster, and G. E. Preece, of Bernard-street, refers, first, to improvements upon an invention for which letters patent were granted to J. L. Clark, the 20th December, 1853, for the use of asphalte and other similar dielectric substances placed around the insulated wires of submarine and subterranean telegraph cables, in order to lessen the induction and consequent retardation of electric currents. These improvements consist in the means of more effectually applying and supporting the said non-inductive coating, and for this purpose the wire or wires already insulated with gutta-percha or other ordinary insulating material are covered with a coating of hemp or other fibrous material which has been highly desiccated and deprived of all moisture, and then saturated with a hot mixture of turpentine, rosin, pitch, tar, asphalte, oil, or other similar well-known substances, such saturation being completed by passing the said materials through or placing them in air-tight vessels, from which the air is exhausted before the admission of the non-conducting mixture, and into which the air or the mixture can afterwards be injected under pressure. The insulated wires are surrounded with this perfectly saturated mixture of fibrous and non-conducting material, which may either be laid on in a mass, or preferably in the form of strands coiled around the wires, either with or without an admixture of iron wires, and the cable thus formed is again saturated with the mixture by placing it in or passing it through an air-tight vessel, and submitting it as before to the influence of a vacuum and subsequent pressure. The wires thus become surrounded with a perfectly non-inductive material, and are at the same time preserved from decay and injury.

FIG. 1.

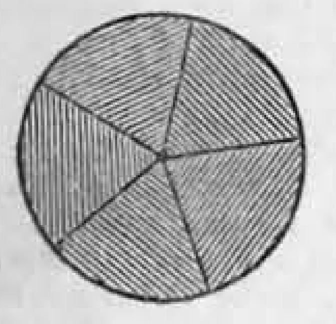


FIG. 2.

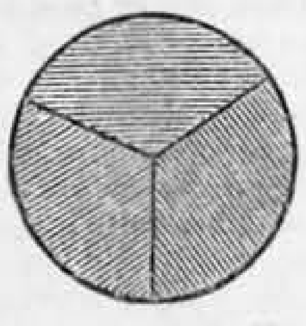
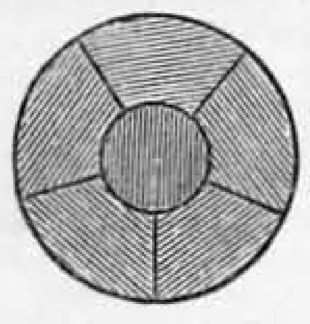


FIG. 3.



The manner in which the patentees carry this part of their invention into effect is as follows:—They take a single wire or a suitable number of conducting wires, which it is preferred to have insulated with caoutchouc on account of its capability of withstanding an elevated temperature. They lay or twist them into a bundle, and pass them through a vessel of melted pitch, asphalte, marine glue, gutta-percha, or other similar and well-known insulating materials or mixtures, and as they emerge from the melted mixture they cover them with a suitable number of strands of rope yarn or other fibrous material which have been thoroughly saturated with the mixture by previous immersion, and which pass through the hot melted mixture in the same manner as the conducting wires, and at the same time, as soon as they emerge from the pitch, they are slightly twisted together by an ordinary rope-making machine, or plaited or braided, and they are then covered by a set of clean yarns, or by flat bands wound in the opposite direction, so as to enable them to be handled. The substances which are preferred to be used for these purposes are common pitch or pitch and gutta-percha.

When gutta-percha covered wire is employed, which will not admit of the application of so high a temperature as caoutchouc covered wire, pitch in a nearly cold state is used, and having laid up the conducting wires and the saturated hemp yarns together, the whole is placed into or passed through an air-tight vessel, from which the air is exhausted, and the semi-fluid, pitch, or mixture then admitted. Pressure is then applied to drive the pitch into every cavity, and the rope is then withdrawn and covered with hemp strands, as before described. Such ropes or cables as described may be either laid or drawn into underground tubes in the usual manner, or may be covered with iron wires to form submarine cables.

The invention consists, secondly, in a method of preserving submarine or other iron telegraph cables from decay, by surrounding the iron or steel wires with a compound of pitch, tar, asphalte, or other similar well-known preservative materials retained upon and around the cable by strands or flat bands of hemp or other fibrous material, saturated with the preservative substance or mixture, and plaited or braided round the cable, or coiled around the cable in such manner as either to envelope it completely, or to form a worming in the interstices between the wires.

The manner in which this part of the invention is carried into effect is as follows:—The cable, as fast as it leaves the covering machine, is caused to pass through a vessel of common tar, and is led up vertically through a pipe in the centre of a cauldron or tank, and passing through is carried up from the bottom thereof. The cauldron is kept revolving at a convenient speed, and contains a quantity of the pitch or preserving material or mixture in a melted state, kept hot by heat applied in any convenient manner. The cauldron also contains several reels of spun yarn well saturated with the pitch. The reels revolve loosely on horizontal axes, and are wholly or partially immersed in the melted pitch; the yarns as they are unwound off these bobbins pass up over suitable guides, and are wound spirally, or are plaited or braided in a hot state around the cable. Sometimes the wires and the saturated fibrous materials are laid up together and with the same machine; in such cases the iron or steel wires are led through the closing nozzle of the covering machine at the same time, the iron wires a little in advance of the hempen yarns, so that they may close round the core first, and then become completely enveloped by the outer protecting yarns.

Thirdly, the invention consists in a method of preserving iron cables from decay, by intermingling among them one or more wires of zinc in place of iron, whereby the iron is kept in an electro-negative condition, and thereby preserved from oxydation or decay.

The fourth part of the invention consists in a new method of joining the iron wires and the conducting wires of submarine and other telegraphs. A right-handed thread or screw is formed on the end of one of the wires, and a left-handed thread on the end of the other wire to be united to it; the two ends are then inserted in a screwed ferule or collar cut with corresponding right and left threads, and by screwing it up the two ends are drawn into contact, and form a secure joint. Sometimes, and especially with small wires, the ends are not screwed, but are simply introduced into a plain ferule or collar, when by pressure or by the blows of a hammer both the ferule and the ends of the wires are flattened about the centre, so that the ends of the wires cannot be drawn out of the collar.

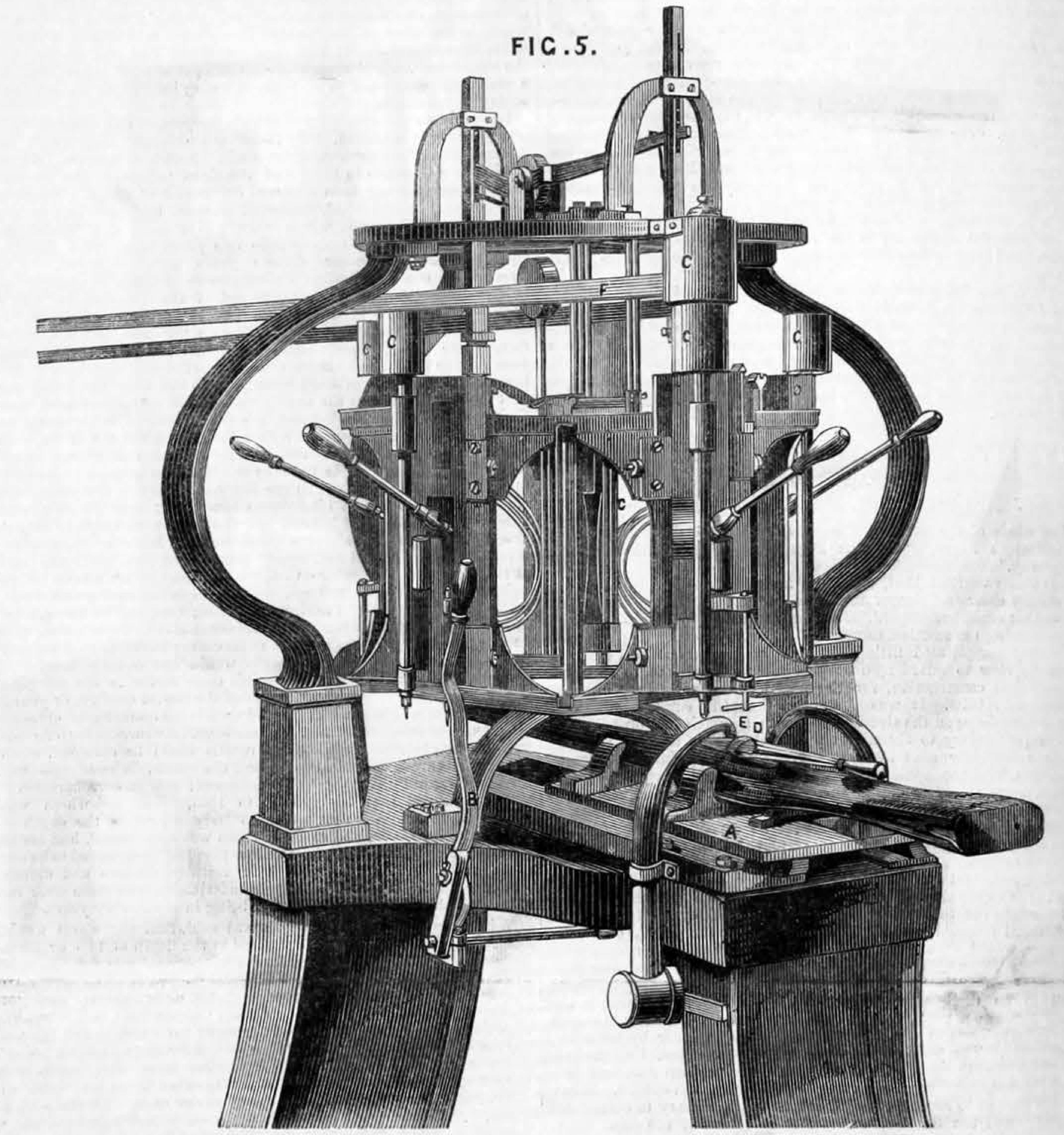
Lastly, the invention consists in forming the conducting wires of submarine cables in the manner hereafter set forth. It has been heretofore customary to lay up several small copper wires together into one spiral strand, so that any faulty place in a wire might not by its fracture destroy the continuity of the whole cable, and render it useless. But such compound strands have the disadvantage that their sectional area is not so great in proportion to the surface exposed to induction as in solid wires, and also their effective length, measured along the spiral, is commonly greater by about 12 per cent. or 15 per cent. than the actual length of the cable itself. Both these causes combined tend very seriously to retard the transmission of the current, and to increase the amount of induction, and thereby to render their use objectionable. The improvement consists in building up a solid conducting wire in segments, so that any defect or breakage in a single segment will not endanger the continuity of the whole cable, and for this object the circular section of the wire is divided into five segments, by five divisions, in the form of radii, and the wires are drawn through templates, of such a form as to give each wire a similar section to that of one of the segments. Five of these wires are then laid together, so as to form a single round wire equal in conductive power to a solid wire. The shape may be further improved by passing the whole through a template, or between small grooved rollers, to close the segments tightly together. In joining such wires together each segment must break joint with the next, and the ends of the two segments be united to each other and to the neighbouring segments by a blow-pipe and fine or silver solder. The joint may be further secured, if thought necessary, by wrapping a small wire round it spirally in the usual manner, and soldering the ends. In some cases the spiral wrapping is extended along the whole length of a conducting wire, so as to ensure continuity in case of fracture.

Fig. 1 represents on an enlarged scale the section of a wire formed of five segments, and Fig. 2 one composed of three segments; Fig. 3 represents a solid central core surrounded by five segmental outer cones.

ROYAL SMALL ARMS FACTORY, ENFIELD.

PART III.

FIG. 5.



In our last paper upon this subject we described certain processes upon the stock of the gun, and left it in a partly-finished state; it will be remembered that the last effect produced was to complete the butt-end with its holes and recess. The next process which we have to describe is the preparing of the peculiar shaped recess required for bedding the lock in its place. The slightest inspection will at once show the obstacles in the way of producing this effect; but as all the corners are circular in form, it lessens the difficulty most considerably.

DESCRIPTION OF THE MACHINE FOR BEDDING THE LOCK IN THE STOCK.

Fig. 5 shows a perspective view of this machine. To all appearance this is the most complicated of all the machines in the factory, but this arises merely from its cutting spindles being five in number, and, of course, all the gearing connected with them being repeated that number of times. In the first place the stock is fixed in position upon the sliding plate A; this is effected by the barrel groove being pressed by means of a clip up against a form made to fit the breech end, and screwed to two brackets, as shown. The plate A is moved backwards and forwards, at will, by means of the handle B, which works a pinion running in a rack underneath it. The five upright spindles C C C C C, with their handles, slides, and tools, are retained in their upper position by means of ring springs of steel, some of which will be seen in the engraving behind the slides. To the right of the stock the mould D will be seen, an exact counterpart of the recess to be formed. Each of the five spindle shafts is provided with a pin, one of which, E, is shown in position. By depressing the slide the revolving tool is brought down to the work, and the pin into the form or mould; the movements or tracing round being given by means of the handles.

The frame which bears the five spindles revolves on a centre shaft, so that any of their numbers can be brought to bear. The strap F, when not required, runs upon a loose pulley G, which will be seen above, surrounded by a guard. This arrangement enables it to be slipped over any one of the five pulleys, as they are, one by one, brought into position; and the lifting and lowering is self-acting.

The first process which is performed by the spindle, shown in position in the engraving, is that of cutting the recess from the lock-plate. It will be seen that the guide-pin in this case is armed with a cross-bar, which, on the tool being brought down to the cut, secures the proper depth, and yet allows it to travel all over the top surface of the mould. The second process is that of cutting the holes in which the heads of the screws are bedded. The third spindle is brought forward for the purpose of cutting the hole for the tang of the sear (see Fig. 2, No. 6). The fourth cutter is for roughing out the holes for the main spring; and the fifth is fitted with a very small tool, adapted for cutting out the small semi-circular corners into which No. 4 cannot go. The stock in this machine being placed in a horizontal position, the hole as it is made, and also the mould, is likely to be filled up with the chips or cuttings which are made; these are blown away by means of a small fan placed at the back of the machine, having two mouthpieces depressed, so as to cause a stream of air to play upon the work; these are shown by the letters H H.

The cutters used in this machine are shaped like augers, having a cutting lip or side as well as a foot; this enables the wood to be cleared away by a horizontal movement; and the tools being slightly eccentric with their shanks, as their side edges wear away they can be brought forward again to the required radius.

We will now pass on to consider the machine used for cutting the holes and recesses for letting in or bedding the trigger guard, which is shown by Fig. 2, B.

This machine is for making the required screw holes, and also for forming a recess into which is inserted a stop to keep the ramrod from working its way into the wood, when it is replaced after being used. Fig. 6 shows a perspective view of the machine for bedding the guard in the stock.

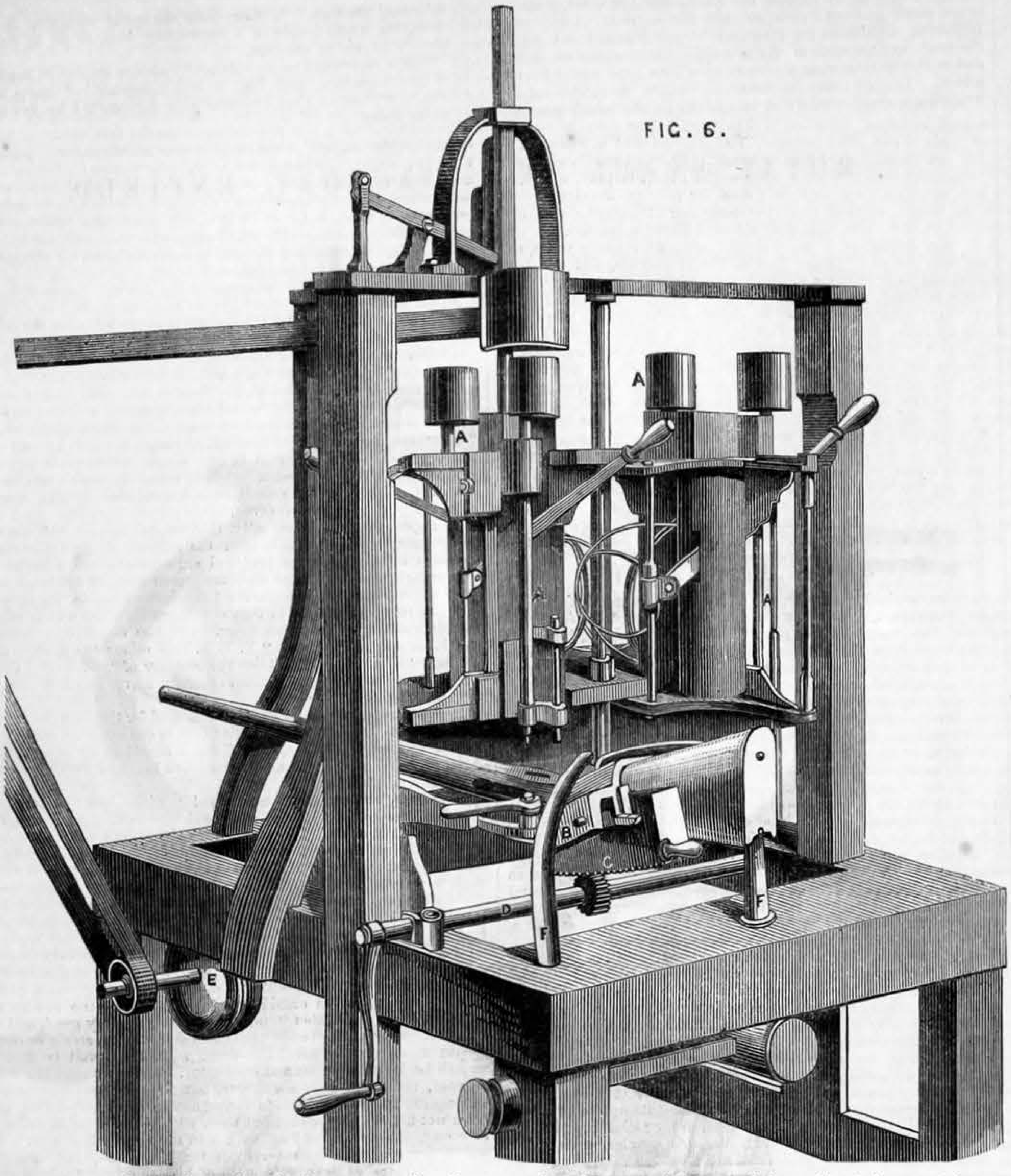
This machine consists of a square bed or frame of iron, standing upon four legs, and having a cast iron bracket rising from each side, and connected above by means of a horizontal bar, which steadies a centre spindle, on which revolves the frame that carries the four cutting tool spindles A A A A; these spindles, with their fittings, are in effect the same as those described as belonging to the machine for bedding the lock in the stock, and are provided with guide-pins in a similar manner, the levers having a vertical and horizontal motion; a similar arrangement has also been adopted as regards the driving-strap, which will be seen running horizontally above, and which can be brought down over any of the pulleys required, as soon as they are in position. It will be seen that the stock, in this case, is secured in a vertical position, and is clipped in the manner before described. The frame, or carriage to which it is fixed, rests upon two bars of irregular form, one of which can be seen and is marked with the letter B; the carriage is fitted with a rack C, which plays in a pinion fitted on the end of the spindle D, which, it will be seen, has a handle, whereby to impart motion to the cradle or carriage.

The first spindle being placed in position, and fixed by a self-acting stop, the tool is brought into contact with the work by means of its handle, and a forward motion to curve, imparted by the side handle just described, finishing the first process—that of making the recess for the guard; the second tool is then brought into play, which makes the recesses for the bosses; the third forms the screw holes, and the fourth the deep recess required for the trigger, and also the one for the ramrod stop. This machine, too, is fitted with a small fan, as shown by E: and it has also two blowing nozzles for clearing the work, F F. Having cut out all the complicated figures required for bedding the lock and guard, and made a bed for the butt-plate, the next process is to finish down the long fore end, so as to make it exactly of the right size to receive the three bands which are used for fixing or clipping the barrels to the stock, and also the nose-cap; these three bands are delineated in Fig. 1, Nos. 6, 7, and 8. This is done in a very simple and effective machine, which is called the band machine.

DESCRIPTION OF BAND MACHINE.

This machine consists of a low frame, which is fitted with a form made so as to fit the barrel groove, and not to project so far forward as to interfere with the cut. This form is connected with cams, which are of similar shape to the bands, but on a larger scale. This form is made so as to revolve in two bearings, and is fitted with a wooden hand-wheel at one end, so that it can be turned round at pleasure. The stock to be operated upon is pushed in through the cams, and screwed tightly down upon the form, so that it can be turned concentrically with the cam. Revolving cutter-blocks are provided of the required width, to cut the band and the recess for the nose-piece; these cutter-blocks can be brought forward at will to their work; they are hung upon vibrating levers, weighted so as to cause them to lie away from the work, and fitted with treddles, so that on application of the foot of the operator they can be advanced at pleasure. All being ready, and the stock fixed in its place, the blocks are brought forward, and the man, having his hands still at

FIG. 6.



liberty, can turn the wheel round gradually, so as to give the required feed. This machine is not made self-acting for two reasons: in the first place, the whole process is done so quickly that it would be a waste of time to have it so; and the other is, that the surface to be cut being of irregular thickness, it is better to be able to regulate the feed at will. Having formed the three spots for the bands, and fashioned the end to receive the nose-cap, the fore end of the stock has to be finished to shape by rounding the parts between the bands. To effect this, it has to be fixed in another machine, called the machine for cutting away the wood between the bands.

DESCRIPTION OF MACHINE FOR CUTTING AWAY THE WOOD BETWEEN THE BANDS.

This machine is similar, in many respects, to the one just described, consisting of a barrel mould, to which the stock is clipped, and having vibrating cutters to follow a form. As the amount of timber to be taken away is large, and the surface to be operated upon extensive, the length between each band is finished by two cutter blocks—one placed in front and one behind the stock. The front and back pair are alternately brought into action, and the whole length smoothed down and finished by the rotating motion given by the aid of the hand-wheel. This does away with much of the vibration which the stock would otherwise be endued with were the whole length of the cut taken at one time. All the tools and cutter-blocks of these machines run at very high velocities, and the surfaces which they leave are very good indeed; in fact, a slight friction with a piece of glasspaper, placed upon a cork rubber, is all that is required, after the machine is complete, to leave a surface so smooth that nothing more requires to be done to them before they are handed over to the assembler. It may also be as well to mention here that the parts on which the bands fit are, if anything, a little larger than the rest of the fore end.

BELLANGER'S CAOUTCHOUC SOCKS OR CLOGS.

Patent dated 3rd September, 1858.

This invention, by J. M. Bellanger, of 41, Rue de Trevise, Paris, relates to an improved mode of constructing caoutchouc socks, or, as they are usually termed in England, goloshes. The improvement consists in the use of metallic springs, which are constructed and placed between the soles of the goloshes in manner hereinafter mentioned.

FIG. 1.

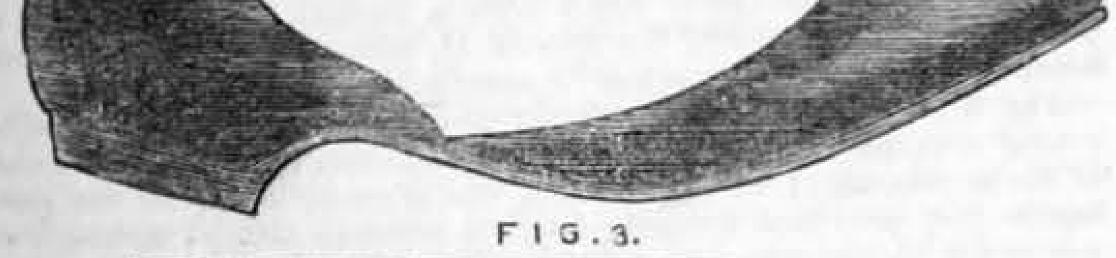
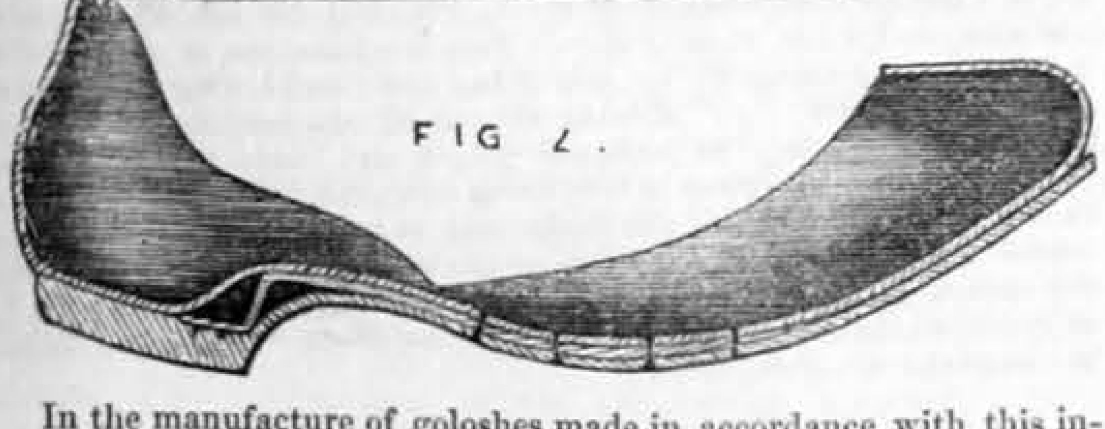


FIG. 3.

FIG. 2.



In the manufacture of goloshes made in accordance with this invention, lasts made expressly for that purpose must be used, such lasts being very much arched or curved, in order that the goloshes which are formed thereon may retain the same shape when removed. The golosh having been formed, and while still on the last, but before the outer sole is attached, a spring of tempered steel or other suitable metal is placed longitudinally upon the bottom of the golosh, the outer sole being then laid over such spring and the latter secured between the two soles by means of nails rivetted or driven in whilst the golosh is on the last, or otherwise secured by means of some analogous contrivance. The spring may be made of one piece of metal, or in two or more pieces if considered desirable, so as to possess a jointed character.

Goloshes constructed as herein described are held firmly on the foot by means of the said springs, which yield to the pressure of the feet so as to allow the latter to enter the goloshes, the free action of the feet in walking being in no degree interfered with, whilst the use of straps or other fastenings is altogether dispensed with and rendered unnecessary. In order to remove the goloshes from the feet, it is only necessary to press against a small metallic stud which is inserted in the heels and projecting therefrom about the eighth of an inch, when the goloshes will be readily removed.

Fig. 1 represents a golosh constructed according to this invention, and showing the external shape; Fig. 2 represents a golosh in section, showing the spring inserted and secured between the soles; Fig. 3 is a plan view of the spring with the holes which are to be used for fastening the same.

The Red Sea.—It may not be generally known that England has lately made a fresh but peaceful acquisition in the Red Sea, in the purchase of the little island of Kamakan, which belonged to a neighbouring Sheik, rejoicing in the name of Habesch-el-Sambara. It lies to the north of Perim, in 50 deg. north latitude, on the Arabian side of the Red Sea, and contains a safe and commodious harbour, the entrance to which is protected by coral reefs, leaving only an intricate narrow channel for ships to enter by.—*China Telegraph.*

Coal.—M. de Carnal, one of the greatest owners of coal mines in Prussia, in a statistical work on coal digging, states that the quantity of coal dug in 1857 amounted to 125,000,000 tons, a mass which, piled up 6 ft. high, would cover a geographical square mile. The lands from which the coal is procured may be estimated at 8,000 square miles, and the mean depth of the beds of coal at about 31 ft. The mass of coal then known to exist would form a cube of ten miles. If we compare this enormous bulk of coal with the quantity annually consumed, we may confidently affirm that there is enough to last for 36,000 years. The calculation of 31 ft. for the mean depth of the beds is perhaps too low, for the coal-fields of Liége extend to 55 ft., those of Staffordshire to 151 ft., and those of Ruhr to 134 ft. The coal dug in 1857 amounted in value to £37,500,000 sterling, a sum far beyond that realised by the digging of the precious metals. In England some calculations have been made with regard to the yield of coal in our own country, according to which the coal-fields of Great Britain yield 63,000,000 tons of coal per year. A better idea of the immense commerce of England could not be obtained than by stating the fact that at Manchester and its environs a motive steam power equal to 1,200,000 horses is constantly maintained, to support which there are consumed 30,000 tons of coal per day, or 9,500,000 a year. In the manufacture of salt alone, about 3,000 tons are consumed per day, or 950,000 a year. The Transatlantic steamers from Liverpool and other ports consume 700,000 tons per year, and the manufacture of gas absorbs at least 10,000,000 of tons per year. The export of coal from England reached in 1858, 6,078,000 tons. It is estimated that England alone could furnish enough coal for the consumption of the whole of Europe for the space of 4,000 years.—*Bulletin.*

BASTABLE'S APPARATUS FOR THE PRODUCTION OF LIGHT.

Patent dated 14th September, 1858.

This invention, a communication to A. H. J. Bastable, of Belgrave Works, Pimlico, relates to apparatus employed in the production of light in which jets of ignited gas (ordinarily a mixture of oxygen and hydrogen) are projected against a surface of lime or other suitable material, to which a slow motion is given.

Fig. 1 is a side view of part of the apparatus. Fig. 2 is a plan of the same, with the parts above the line 1, 1, Fig. 1, removed. The apparatus shown is intended for three equidistant jets. *a* is the table of the apparatus, having a circular hole through it at the centre, and three holes arranged round the central hole, and at equal distances from it and from each other. In the central hole the case *b* for the lime is fixed; it is a tube of copper made to the form of the pieces of lime to be used with it, and having the collar b^1 fixed on it, the projecting flange of which rests on the upper surface of the table, whilst its lower end passes through the hole, and receives a nut b^2, by which it is secured. The case *b* it will be seen is made in two parts, one below and the other above the points where the jets strike, and the two parts of the case are connected by wires or strips b^3 of platinum; but this complete division of the case is only rendered necessary when the lamp is required to illuminate the space all round the lamp. In Fig. 3, *c* is the lime within the case, and formed into a piece of suitable shape and convenient length. As shown, it rests at the bottom on a rod *d*, which is caused to rise gradually at a slow and regular speed by clockwork, or when mercury is employed to raise the lime, then the case is bent up into a U form at its lower end, or a separate U formed tube may be attached to it, and the mercury being allowed to run from a reservoir in a stream regulated by a stop-cock into one leg of this U formed tube, causes the lime in the other leg to rise, floating on the surface of the mercury. The upper end of the case should be continued up to a sufficient height to contain the lime which rises while the lamp is in use, or else a bowl may be placed at the top or back of the case, to receive the lime as it rises above it.

FIG. 1.

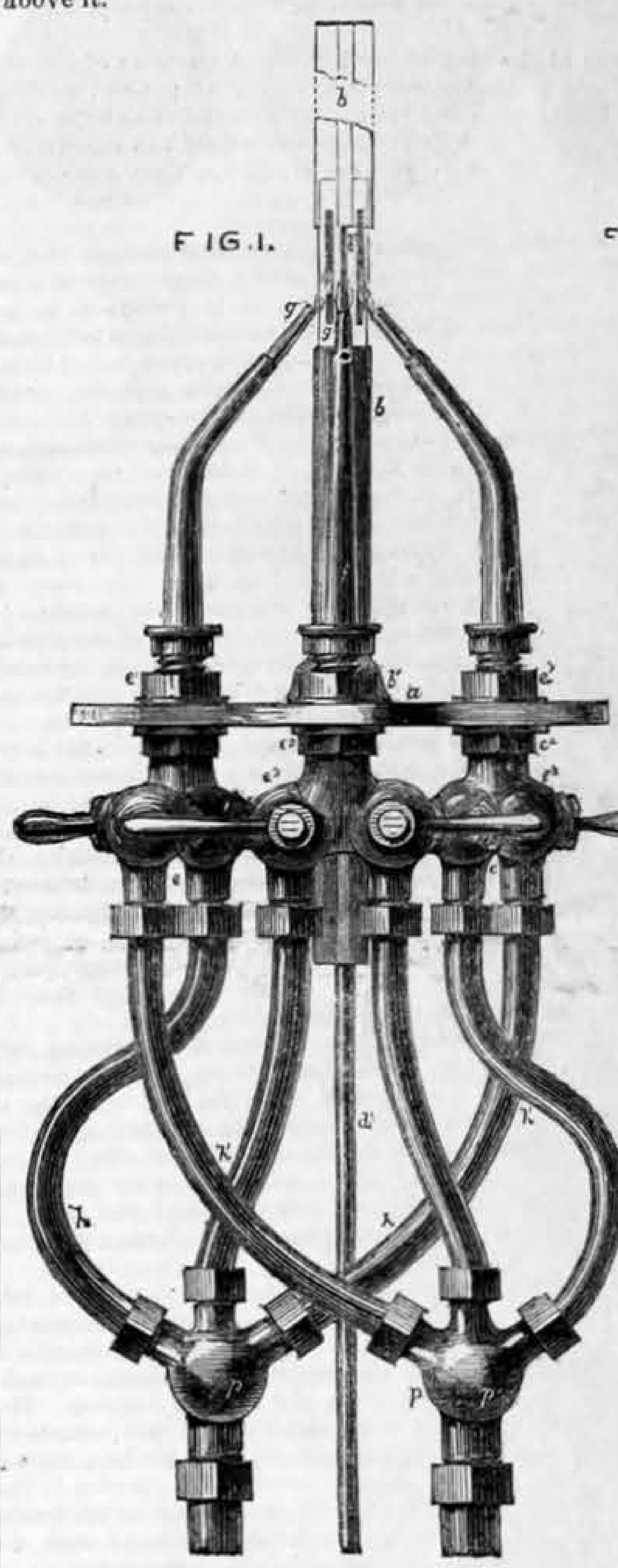


FIG. 2.

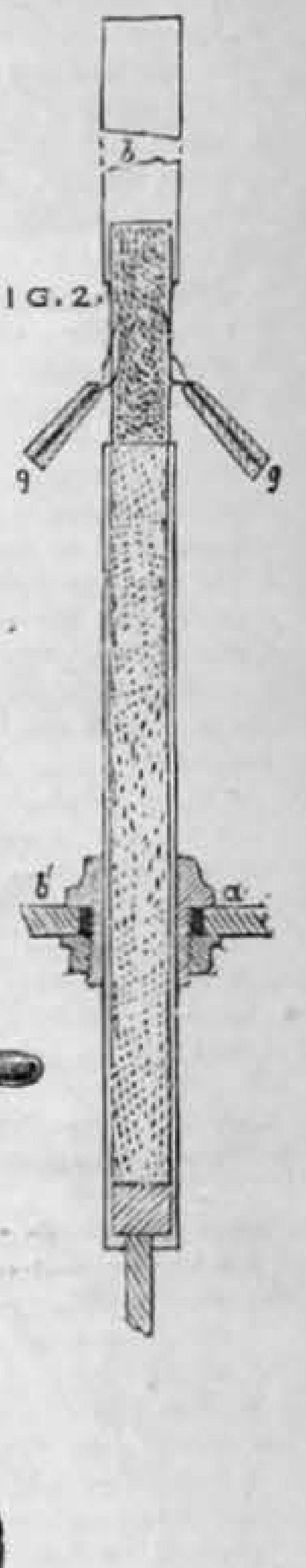


FIG. 3.

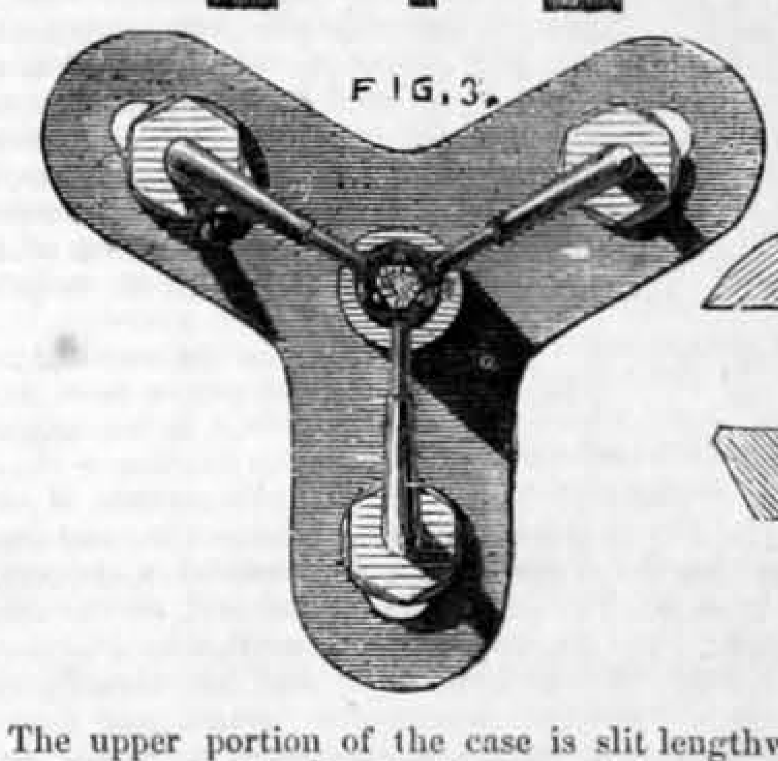
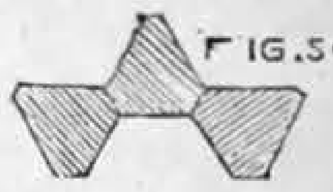


FIG. 4.

FIG. 5.



The upper portion of the case is slit lengthwise to admit of the free passage of the lime in its expanded or decrepitated state when it has passed the flame, or a flat spring may be attached to the back of the case so as to press the lime against the front of the tube, and thus to preserve the distance between the jets and the surface of the lime. In cases where a supply of lime is required for a lengthened period, it may be attached to the surface of a cylinder having a spiral groove cut on its surface to receive it, and to which the lime may be securely fastened by any convenient mode. This cylinder, so charged with lime, is made to revolve on its axis, at the same time that its axis receives a progressive movement in the direction of the length of the cylinder; by these means a supply may be provided for many days' consumption. For the supply of the gases *e*, *e*, are branch pieces, the upper ends of which are screwed and project up through the holes in the table *a*; they are each furnished with two nuts e^1, e^2, which bear respectively against the upper and under surfaces of the table; the pieces are thus secured to the table, and can be adjusted vertically as may be required by making the holes in the table slotted; the distances of the pieces *e*, *e*, from the centre of the table can be regulated at pleasure; *f*, *f*, are bent pipes screwed on to the upper ends of the pieces *e*, *e*, and furnished at their ends with metal nipples or tips *g*, *g*, of platinum. The gas is caused to pass through wire gauze in the branch pieces *e*, *e*, such as will render the apparatus secure from explosion and as heretofore employed. In each of the branch pieces *e*, or attached thereto, are two stop-cocks e^3, e^3, to regulate, independently the one of the other, the quantities of the two gases employed as they pass to the jet. The two gases are led to the pieces *e* by six pipes *h*, *h*, *h*¹, *h*¹, two to each jet; the pipes *h*, *h*, all communicate with the union piece *p*, and the pipes *h*¹, *h*¹, with the corresponding piece *p*¹, and the pieces *p* and *p*¹ are connected with flexible or other convenient gasholders, such as have been heretofore employed, and which contain the gases to be used.

In cases where it is found convenient to apply the gases in a compressed state, a uniform discharge or supply to the jets from the containing vessels or gasholders may be effected by a clock movement and escape valve of suitable construction, which shall permit the required quantities of the gases to pass to the jets, the area of such valve aperture constantly varying as the pressure decreases in the gasholder.

The gases usually employed are oxygen and hydrogen, but for this latter coal gas or carburetted hydrogen may be substituted with advantage where it can be procured. As it is desirable that the lime should not be exposed to the action of the atmosphere, which would speedily render it unfit for use, it may be kept (after it has been shaped) in a glass or earthen jar, close stopped, or in a box lined with tin foil or other impermeable lining, or the lime may be coated with an unctuous material, such as glycerine, linseed, or other oil, which, by closing the surface pores, prevents the absorption of moisture, and improves the illuminating quality of the lime.

LETTERS TO THE EDITOR.

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

A NEW THEORY OF DYNAMIC QUANTITY AND INTENSITY.

Sir,—In The Engineer of 3rd December last, you said, in reply to a correspondent, "The relation of quantity to intensity is very little understood at present, but our electricians are making great advancements towards acquiring a proper knowledge of these properties of the electric current."

As this subject lies at the root of the important question of induction in submarine and underground wires, which at present excites so much interest, I have been led (in consequence of the recent discussions on that question, in which I took some part,) to reconsider the whole matter very carefully; and the result has been a series of conclusions and new views on the subject, as unexpected to myself as they will be startling, I believe, to the majority of your readers, and to the scientific world in general. They amount, in short, to a totally new theory of dynamic quantity and intensity—a theory which not only renders the whole subject so clear and plain as to be level to the humblest capacity, but which perfectly accords in all its parts, and leads to the same results in every case, as Ohm's law. It renders clear and obvious the kind of battery arrangement, as to size and number of pairs, that is suited for any particular circuit; it explains in the most simple manner the exact relation that exists between the static and dynamic elements of a current; and, lastly, it completely overturns the commonly accepted doctrine, that an increase in the size of the battery-plates increases only the quantity, and an increase in the number of plates only the intensity of the current.

I undertake to demonstrate in the most conclusive manner, and without any assistance from Ohm's law, or the use of any mathematical formulæ, that an increase in the size of the plates, and an increase in the number of plates, operate in precisely the same manner; that in the one case, as well as in the other, we simply increase the relative quantity of electricity thrown into current; and that if practically, with the circuits commonly used, we cannot obtain the same intensity with one pair as with a hundred pairs, although we should increase the size of the one pair a hundred or a thousand fold, this simply arises from the fact that for any given thickness and conductivity of the connecting wire there is a maximum limit, at and beyond which any increase in the size of the plates produces no effect whatever, but that practically there is no limit to the additional quantity that may be thrown into current by increasing the number of plates.

Lastly, I shall show that the word intensity, as commonly used by electricians in this country (though not in France or Germany), has no proper meaning whatever, except as expressive of an erroneous opinion which was once held by Dr. Faraday regarding the nature and velocity of the electric current, and which I strongly suspect that great man has now abandoned.

When these new views occurred to me, they appeared so striking in themselves, so important in their results, and so widely at variance, not only with the received modes of expression, but also with the common ideas upon the subject, that I anxiously doubted my own judgment, and, therefore, resolved not to publish them until I should test them by Ohm's law in some of its most important deductions. This operation, though not yet concluded, I have already carried so far with such complete success as has surprised and gratified me beyond measure at every step, and has left not a shadow of doubt in my own mind as to the substantial truth of the theory, and the value of the new light which it is calculated to throw on the nature and mode of action of the electric current.

It is now too late in the week either for me to attempt, or for you, Sir, to afford space for anything like a detailed exposition of what, I think, I may venture to call the new doctrine; but if you are disposed to allow me a couple of columns, or perhaps a full page, I shall send you an article, with diagrams, in time for next week's impression, which, I think, will deprive you of any excuse for replying to correspondents in future, that the nature of the relation of dynamic quantity to intensity is very little understood by electricians—while fully confirming, at the same time, the truth of the statement when it was made by you, and even as generally applicable at the present moment.

Glasgow, 27th April, 1859. George Blair, M.A.

PUDDLED STEEL.

Sir,—The article on "Puddled Steel" in The Engineer of the 8th inst., and the late specifications of three patents for manufacturing that article, induce me to send you a few remarks, which may perhaps contribute to make the properties of puddled steel better known than at present. In the first place I will ask—What is puddled steel? Secondly, How is it made? And, thirdly, Where is it made? And reply to these questions by stating, first, that puddled steel (so called) is a strong malleable iron, with a fine granular fracture, containing a greater percentage of carbon than soft malleable iron of a fibrous fracture. Secondly, puddled steel is made by smelting pig iron in a puddling furnace with a slag composed of oxide of iron, silex, and other ingredients; and by boiling and stirring it, the impurities are washed out, until the thus purified iron agglutinates under the slag, at which time it is so-called puddled steel; if, however, the agglutinated mass is raised above the slag, and remains exposed to the flame, only for a few minutes, it loses that percentage of carbon which causes it to be called steel, and it becomes malleable iron.

Thirdly, puddled steel was, I believe, first made above twenty years ago, by the celebrated steel-maker, Solley, from Indian charcoal pig and hematite pig iron, by using in the slag both manganese, common salt, and clay—which invention was patented by Dr. Schafhautl, of Munich, and sold to Solley. The ores from which these irons were made, containing but little manganese and clay, required those ingredients to be added in the puddling furnace, and even then the change remained four to five hours, and even longer, in the slag-bath before the necessary change was effected to produce steel. About ten or more years ago it was found in Westphalia that Prussian pig iron could be converted into steel without the use of manganese, clay, &c.; and since that time the manufacture of puddled steel has gradually increased in Prussia and other German States, in Belgium and France, and last year was successfully brought out at the Mersey Iron Works, Liverpool; before which, without the public being generally aware, it had been made at Low Moor in large quantities for the Sheffield market. Among the many Prussian works at which steel is thus made, the Phœnix Company (who have above a million pounds sterling invested in their different establishments) make largely, and the men are ordered to puddle steel or iron just as it is required. At the works founded by our countryman, John Cockerell, at Seraing, six puddling furnaces are used to make steel; and since they have commenced this branch of business, no other steel is used in the manufactory for fitters' tools or any other purpose. The puddled steel is, however, for the finer purposes, melted into cast steel. Puddled steel is also made in France, and in Nassau at a large works I built in 1842, where, by the last accounts I received, only steel for railway-wheel tyres was puddled there; so that from the foregoing it may be seen that puddling pig iron into steel is an old-established operation.

Now, Mr. Editor, as I have resided abroad for many years, and am not well posted up in the English law of patents, will you have the goodness to inform me if, for instance, myself or friends wished to make puddled steel, should we be obliged to apply to Messrs. Riepe, Clay, Spence, or Benzon for permission to put pig iron into a furnace by little and little, or all at once, or to open and shut the damper as our puddler wished? or by the English law, should we be allowed to employ any of my old German puddlers, or any of Mr. Solley's old puddlers, without interference from any of those gentlemen who have lately taken patents for a process which, it would appear, till lately has been unknown to them? From the foregoing, I would not have it supposed that steel can be made as cheap as iron: far from it, for the moment steel is taken from the puddling furnace it must be treated differently from iron; the hammering, rolling, and welding are conducted in a much more expensive manner—even the same machinery cannot economically be employed; and those who may attempt it will find the truth of the assertion to their cost.

Middlesbro'-on-Tees, April 25th, 1859. John Player.

SUBMARINE TELEGRAPHY.

Sir,—There can be little doubt, at the least in the mind of one important individual, that when your correspondent "A Telegraph Engineer" dies, wisdom will die with him; but, judging him from his numerous letters which have appeared in your columns—especially so far as they relate to long submarine circuits—those who have had a large amount of practical experience upon the subject have no difficulty in coming to a conclusion, that in "A Telegraph Engineer" wisdom is not in any degree "justified of her children;" or, in other words, to reiterate the criticism which his ignorance on this subject called forth,—"It was quite evident that he had never had the opportunities of trying any practical experiments upon this subject; and if he had those opportunities, his letters were a sufficient proof that he had not the ability to avail himself of them."

When your correspondent talks of either "great names," or "accurate facts," he forgets that, so far from him, we have had neither; and, therefore, when he tells us that it is "unnecessary to occupy your columns with the examination of a question which has been so completely solved, both by theoretical deductions and experimental inquiry, as that of enlarging the size of the conductor of any future Atlantic cable. It admits of no refutation; it is so undeniable a fact that it admits of no discussion; there exists no difference upon this point"—he is stating that which the discussion at the Society of Arts the other evening fully proves is not "accurate facts." When in the discussion which followed the reading of Mr. Varley's paper, clever and ingenious as it was, Professor Tyndall, a gentleman noted for his high scientific attainments, declared that the whole matter was one yet to be solved and determined; and Mr. C. E. Walker, one of the most eminent and practical electricians of the present day, who had spent a month in carrying out the most careful and laborious experiments upon 2,400 miles of the Atlantic cable, and who since had been trying experiments upon five or six conductors of different sizes, declared that, so far as his experiments went, they did not at all tend to Mr. Varley's conclusion as to the size of a conductor for a future Atlantic cable; and when the chairman, in closing the discussion, stated that, in his opinion, the matter had not advanced one single step toward solving the difficulty, that he quite coincided with Professor Tyndall's remarks that we ought to look for the laws which regulate these matters, and complimented one side in adhering to a small, and the other a large conductor—surely it would have better become your correspondent to have jumped upon his legs with indignation, and boldly told Messrs. Walker, Cook, and Tyndall, that it admitted of no refutation, it demanded no discussion, there existed no differences—in fact, that they knew nothing, but he knew everything. It is hardly necessary to say such a course was not "convenient" for even "A Telegraph Engineer."

Of course it is not only "grossly inaccurate," but "highly ridiculous," to say that no improvements have taken place in the construction of submarine cables, and if for no other reason than simply because your correspondent declares there have.

With a less presumptuous individual the assertion of "A Telegraph Engineer" would have sufficed; but when, after declaring "the papers which have been read," the discussions that have ensued in your columns, and the heaps of patents filed, specified, and completed, are so many proofs of improvement, and yet goes on in the very next paragraph to declare, "if the cables of the present day differ but slightly in form from those primarily submerged, it is not that no progress has been made in their improvement, but that subsequent experience and careful deliberation have shown that, very much to their credit, the promoters of the first cable succeeded in obtaining a pattern proved to be of the best construction,"—then "ignorant" individuals like myself are apt to fall into the delusion that one of these two things must be incorrect.

If the present form of cable be proved the best, then the "heaps of patents filed, specified, and completed," all of which are supposed to improve some defects in the present construction of cables, as a matter of course, are no improvements at all; if, on the other hand, the present form is not the best, then, although it may be thought a daring thing, I really do not see what other conclusion can be come to but that "A Telegraph Engineer," without the weight of "a great respected name" to support his assertion, has not had the other great qualification of "accurate facts."

Why, Sir, in the short time which has elapsed since my last letter, two more cables—one of them the last cable submerged—have stopped working; if your correspondent is really "A Telegraph Engineer;" he must know full well that out of all the cables at present submerged, he cannot name six in perfect working order; and it is a very curious fact, in the face of the alleged improvements, that the cables last submerged are in the worst condition. Take four of the best cables down, the Emden, the Hanover, the Hague, and the Malta cables.

The Emden cable has stopped working, and attempts are being made to repair it. After months of undermining and labour, three out of the four wires in the Hanover cable are in something like working order. Three wires out of the four in the Hague cable are totally bad; and the Malta cable has broken twice within the last three months; and not a week passes without some of those still efficient requiring repairs.

It is one of those facts as clear as noonday, that the present form of cable "has not proved to be of the best construction." And if the "heaps of patents" taken out to improve this state of things is not sufficient in itself to convince even "A Telegraph Engineer," then a glance at the share list of the *Times*, or an attempt to raise money for carrying out submarine telegraph purposes, will soon set the matter at rest.

And as to the conductors in these cables being the result of "pure mathematical conclusions and deep experimental inquiry," it may be so; but the "mathematical conclusion" which determined the conductor of the Dover cable, some twenty-four or thirty miles, to be of the same size as the Malta cable, some 400 miles, seems very much to have varied according to the idea of the parties who worked out "their experimental inquiries."

The "pure mathematical conclusions" which led the Submarine Telegraph Company to place a cable down 280 miles long, containing a conductor one-third the size of the conductor in the Hanover cable only 160 miles, must have had their basis upon a far different class of "experiments;" and yet the smaller conductor worked quite as well as the larger one; and the two cables your correspondent mentions, the Red Sea and the Hague cable, as having been the result of "mathematical conclusions," is one of those assertions based upon no "very accurate facts," for if the theory of your correspondent is right as to the size of conductors for long submarine circuits, how does he reconcile the fact that the Red Sea conductor for an 800 or 900 mile circuit is only a very little larger than the Hague conductor for a 160 mile circuit? Either "pure mathematical conclusion" and "deep experimental inquiry" do not confirm your correspondent's theory of conductors, or they have both been at fault, so far as the Red Sea and Hague cables are concerned. If "A Telegraph Engineer" will only look over "Magnet's" letter, he will see the right reason assigned for choosing the conductor in the Red Sea cable.

All those charges of "lamentable ignorance," "absurdity," and "highly ridiculousness," of which your correspondent is so lavish, I can well afford to pass over; it would neither advance the solution of these difficult questions, nor become my own self-respect to bandy personalities through your columns, even with so redoubted an antagonist as "A Telegraph Engineer."

But there is one portion of his letter—the coarse vulgar allusion to a gentleman, as eminent for his high scientific abilities as for his courteous gentlemany demeanour, under the slang phraseology of "a surgeon from Brighton"—which, although it will in no way injure the object of the abuse, still is very much calculated to injure the cause of that free discussion in your columns, which can only be carried on so long as the amenities and courtesies usually practised amongst gentlemen are observed.

I happen to know, personally, that several parties, well qualified, from their vast experience upon the subject, to give your readers valuable information and practical experiments, are deterred from appearing in your columns from the reason that, at the least, one of your correspondents, who is most deficient either in arguments or facts, is no way deficient in that other qualification which supplies the place of arguments with abuse. Let him endeavour to copy at the least the courtesy of "X. Y. Z." If minus the ability, and if he cannot attain either the talent or courtesy of "X. Y. Z.," the less he indulges in abuse, and the sooner he leaves the A B C of submarine telegraphy, the better.

In contrast, allow me to thank "Magnet" for the tone and courtesy of his letter. So far as the Red Sea core is concerned, I can only reassure him of the fact that it did cost considerably more than the Atlantic; and why it did so, I must leave him and the Gutta-percha Company to settle.

I am sorry that he so misunderstood my last letter as to suppose that I advocated a conductor composed of one 22-gauge wire for a future Atlantic cable. I never imagined the idea; and the moment "Magnet" can show a single practical experiment in favour of considerably increasing the size of an Atlantic conductor, I for one shall be very glad to join his side; but, so far, practical experiments show nothing of the sort. So far as Allen's cable is concerned, it is made upon directly the opposite principles to what is right. The *beau ideal*, the perfection of any cable, consists in the principle that no strain or tension whatever shall come upon the core; and the nearer a cable is made to this principle, the nearer it approaches perfection. Allen's cable is nothing more nor less than a strand, covered with gutta-percha, the outside covering being a little harder than the other. For insulation it may, no doubt, be very good, and to a certain degree will also lessen the induction; but if a strain or tension is put upon a gutta-percha covered wire, the result is that you stretch both gutta-percha and conductor. The moment the strain is relaxed, the gutta-percha retracts, but the wire does not, and the consequence is that the wire is forced out in an elbow shape; and I have not the slightest doubt but that, with Allen's cable, the strain of 5 cwt. or 6 cwt. would act with it in the very same way. Personally I have the greatest respect for Mr. Allen, and wish him every success; but the construction of his cable is radically wrong; and however hard the outside surface may be, the vital injuries even massive iron cables receive in paying in and out of ships would, I am afraid, utterly destroy a cable without any outside covering whatever.

I am glad "Magnet" agrees with me as to the value of "practical experiments;" those related by Mr. Hyde at the Society of Arts as having taken place by Professor Hughes upon the Red Sea cable are most valuable. Take the speed Professor Hughes declares he obtained upon 2,000 miles of the Red Sea cable, with perfect insulation and a conductor double the size of the old Atlantic, namely, from four to six words per minute, taking into account that the Atlantic cable is fully 500 miles longer than the Red Sea cable, 500 miles added to which would have made a difference in the rate of speed of fully 100 per cent., even by his own calculation, because the rate of speed at 500 miles was twenty words per minute, an addition of 500 miles decreased the speed 100 per cent. from twenty words to eight or ten per minute; a further increase of 700 miles decreased the speed more than 100 per cent. again, and eight or ten words came down to four or six; so that by taking these averages, it will be seen that, had the Red Sea cable been 2,500 miles instead 2,000, from two to three words per minute would have been about the speed. Professor Hughes also declared at that meeting that he worked 2½ words per minute through the Atlantic cable. A comparison gives Atlantic cable, very bad insulation, 2½ words per minute; Red Sea cable, large conductor, perfect insulation, from two to three words per minute. ***

SUBMARINE TELEGRAPHY.

Sir,—If your columns were open solely for the purpose of recording the opinions of "Electro" respecting "Telegraph Engineer," and the latter's replies to the former, I think a fine opening for warfare was obtained by the remarks of the latter in your impression of the 22nd inst.; but I conceive that your object is the illustration of facts, and that you will be much more obliged to "Electro" for being the means of calling forth the reply of "Magnet," than for the nine paragraphs, containing, on an average, fourteen lines, none of which contain a single fact, with which "Telegraph Engineer" has endeavoured to put down "Electro."

I dissent from many of the scientific views of the latter, but I agree with him that we are not advancing; and I think, in his way, he has done something to assist us after truth by drawing out "Magnet."

"A Telegraph Engineer" says that the Red Sea Telegraph "leaves little to be desired in the way of insulation," and "that it has been the result of due mathematical calculation." Now, Sir, what is the object of the Red Sea Telegraph? I opine, to communicate with India. What is the first consideration? I opine, to communicate direct. What has the construction of this particular cable done towards this object? Possibly to enable messages to be sent for 800 miles with stations on foreign, perhaps hostile, territory. Is this the *ne plus ultra* of submarine telegraphy after we have been fourteen years at work? I agree with "Electro" that we have not advanced, and with "Magnet" "that we must have direct telegraphic communication with our dependencies."

Nothing that telegraph engineers have yet done, or that electricians have yet advanced, point to this latter. We are still discussing on resistance, retardation, and thickness of dielectric, never considering the application of the electric fluid, or the sensitiveness of the instruments employed.

Let "Telegraph Engineer" give us some facts showing the actual speed of messages from London to Paris—from the Suffolk coast to the Continent—from Dublin to Holyhead; let us compare these rates with the form of cable used; let us know whether these rates in any way compare with the rates at first obtained—and we shall know whether we have advanced. I believe, with "Electro," that we have not; and I shall be glad to hear, by something more than assertion, from "Telegraph Engineer" that we have. Lastly, Sir, as you have opened your columns to a discussion on the merits of Mr. Hughes' instrument, pray let us have that apparently beautiful and practical machine taken to pieces by your correspondents, so that we may learn whether reason or prejudice sets it aside.

O.

SUBMARINE TELEGRAPHY.

SIR,—What "Magnet" chooses to designate as "simple facts," are anything but simple in practice, in connection with the Atlantic Telegraph. He ignores facts which are known to "complicate" his "simple facts" sadly; and, besides, judging from what we know already, it is believed there are other facts—not yet known—which do so, and will, some time or other, be ascertained to do so, denying success to "Magnet's" views.

Of this, however, we may be certain, that if the Valentia line of 2,000 miles, or the Halifax line of 3,000 miles of continuous length, could possibly work, *a fortiori* one of 750 miles in the same, or, on the whole, it is believed, in better circumstances for working, would be much more certain of doing so; and of course the working of this short length (a shorter could be found, if necessary), would insure the complete success of the Icelandic line. But, further, though a length of 750 British (650 nautical) miles is workable—as, judging from our experience in the Mediterranean, there cannot be any rational doubt that it is—we may be excusably sceptical in the highest degree that a continuous length of 2,000 miles or 3,000 miles could be worked; more especially after our experience in connection with the Valentia line. And are vast sums of money, in addition to those already thrown away, to be lavished on the merest uncertainties? Neither right scientific nor commercial principles could, for one single instant, approve of such a course, when we have another by which success is certain.

But even supposing "Magnet's" views were to some extent realisable, can lines 2,000 or 3,000 miles in continuous length ever compare, commercially, with one 2,200 miles in length, divided into three portions, each not exceeding 750 miles in length? For if an accident should happen to the former, the whole line is rendered useless; but should it happen to the latter, it only affects the particular portion where it occurs. The beneficial effects of this in various ways would be very great, and need not be particularised, as they must suggest themselves to the mind of every one on the slightest reflection. Besides, by being divided into three short lengths, these, it is believed, would work with not only as great, but probably with greater speed than a very long continuous sea-length—supposing, what in point of fact is denied, that the latter could work at all. And if it could work at all, there is great ground for apprehending that, at the best, it would only do so in a very intermittent, uncertain, fitful way.

"Magnet's" letter displays so strong a bias as to verge, in one instance, on what must be regarded as a very uncalled-for personality. This is very condemnable in discussing a question like the present—that being not what was, or is, any man's profession now or formerly, but which is the best course for the successful laying down of a successfully working telegraph to America; and, for the reasons assigned above, it is thought there cannot be the slightest doubt that its only solution is by the adoption of the route by Scotland, Iceland, and Greenland, as by this route success immediate and ample will be obtained,

H. K.

Edinburgh, 23rd April, 1859.

AGRICULTURAL ENGINES.

SIR,—In your paper of the 8th inst. appears a concluding letter from your correspondent "Implement Maker," commenting upon the Judges' Report on the Royal Agricultural Society's Show held at Chester last year. Speaking of the fixed steam engines, he says, "The first prize was awarded to Barrett, Exall, and Andrewes' boiler, 16 ft. long by 4 ft. 6 in. diameter, flue 2 ft. 6 in. diameter, circumference of flue 7 ft. 10 in., depth of side flues 2 ft. 6 in., width of bottom flue 2 ft. 6 in., giving a total surface of plate exposed to the action of the flames of 210 square feet, including the ashpit, or 10 ft. per horse for a 10-horse boiler."

He then goes on to say, "The second prize was awarded to Hornsby and Son's 8-horse engine; boiler 12 ft. long by 4 ft. 6 in. diameter, tube 2 ft. 6 in. diameter, circumference of fire-tube 7 ft. 10 in., plate surface of two side flues, 8 ft. 8 in.; or a total surface of 192 square feet, including ashpit, or 24 ft. per horse-power."

Now supposing the above data to be correct, your correspondent will easily find that, in the case of the first prize boiler of 10-horse power having a total surface of 210 square feet, if the surface be divided by the horse-power, we should have 21 square feet per horse-power, and not 10, as stated by him.

I now come to the data from which the above calculations are derived; and here again I must ask your correspondent how he can make it out that one boiler 16 ft. long has only 210 square feet of surface, while another of exactly the same diameter and size of flue, and consequently the same surface exposed per foot run being 12 ft. long only, can have a total surface of 192 square feet? If all things are alike in both boilers except their length, it is obvious that if the length be divided by the horse-power we shall have $\frac{16 \text{ ft.}}{10\text{-horse power}}$ = 1·6 ft. run per horse-power for the first prize engine; and for the second prize engine $\frac{12 \text{ ft.}}{8\text{-horse power}}$ = 1·5 ft. run per horse-power. Then taking the total heating surface in the second prize boiler, as stated by "Implement Maker," as 192 square feet for a 12-ft. long boiler, we should have a surface due to a 16-ft. long boiler of 256 square feet; and this divided by 10 horses, the power of the first prize engine would give rather more than 25 square feet of heating surface per horse-power, and an excess over and above the Royal Society's conditions, and vastly at variance with "Implement Maker's" statement. The only way I can account for this great difference is by supposing that he calculated the respective surfaces from the woodcut in the society's report, and must have mistaken the front flue doors shown in the elevation for the flues themselves, which are not shown.

After all, the quantity of evaporating surface depends upon the amount of steam required to supply a given amount of power in a given time; therefore, if one engine can be constructed to consume 50 per cent. less fuel per horse-power than another, it is evident that the effect will be virtually to increase the surface of the boiler *pro rato*. This was the case with the first prize engine at Chester; and therefore it is, comparing the quantity of fuel used by this engine with others of the same class, I do not hesitate to say that the boiler applied with it is more than necessary either in theory or practice.

Reading, April 25th, 1859. JOHN PINCHBECK.

STEAM TRACTION AND AGRICULTURE.

SIR,—I read in your valuable paper of this week a letter from John W. Giles, of Size-lane, Bucklersbury, on the above subject, and the concluding paragraph (if I read it aright) so exactly coincides with my views, that I will beg a short space in your next for a word or two on the subject.

Mr. Giles holds the just argument, that whatever is brought to substitute animal power should as much as possible represent the animal itself; and he goes on to say, "A horse or a man cannot exert a tractive effort without the active aid of the laws of gravitation; in either case, its efficiency does not depend on the friction alone obtained by the weight, but by the assumption of such a position of the body, by which gravitation becomes active. No animal can exert a tractive effect if the centre of gravity of its body is immediately perpendicular to the point at which the propelling foot comes in contact with the earth; the body is thrown forward, its weight brought into suspension obliquely by the pressure of the foot, and horizontally by the resistance of the weight to be drawn; traction is the result; and the muscular system performs but a secondary purpose in the effect, and employs itself in maintaining the active operation of the law of gravity."

Now, Sir, it is but two or three years since that a long argument was held, I believe, in your paper, and in the *Mark Lane Express*, respecting Boydell's traction engine; he himself asserting that the earth was his fulcrum, and all the engineers in the kingdom opposing him by insisting that the axle was. I remember being of the same opinion with the multitude, and thought how strange it was of Boydell to assert that he gained anything by putting his pinion on the top of the wheel instead of at the sides or the bottom. I have made three engines of my own locomotive, and in doing so I discovered that Boydell was right. The patent engines of Clayton and Shuttleworth have their cylinders in the smoke-box; consequently the crank-shaft is more immediately over the wheel, and with a pitch chain which I use has a more vertical lift than their ordinary ones, where the crank is forward and the chain has a more horizontal pull, of course from the top of the wheel; and as your correspondent justly observes in the words which I have quoted, with the horizontal pressure, "traction is the result."

This problem is of the greatest importance, and, as a mechanical principle, ought to be decided at once, as a great advantage will be lost sight of if neglected. For instance, Mr. Boydell is convinced on the subject, and puts his pinion on the top of his wheel. I saw the other day, at Teddesley, a locomotive engine of the Marquis of Stafford's, made by Mr. Back, of Birmingham, who placed his pinion next the ground. If the axle is the fulcrum, Mr. Back may possibly get an advantage by going as close to the resistance as he can. On the other hand, if Boydell is right in his argument, then Mr. Back loses the whole advantage of the wheel as a lever.

So satisfied am I that Boydell is right, that, to prove it, I have constructed a model engine on a raised platform, whereby I have an opportunity of showing that a line over the hind wheel, pulling horizontally from the top over a pulley, with a ¾ lb. weight, will propel the engine, with another line from the axle or engine over a pulley, and raise a 1 lb. weight; thus showing a gain of 25 per cent.

It seems natural to suppose that the axle must be the fulcrum of a wheel revolving on it; and so it is when there is no traction. When the engine stops at a wet, slippery place, and does not progress, her wheel spins round, and instantly the axle becomes the fulcrum; but, be it remembered, she is stationary, and as soon as she proceeds the ground becomes the fulcrum, the axle the weight moved, and the top of the wheel the power applied; thus forming a lever of the second kind, the same as the oar—the water the fulcrum, the boat the weight moved, and the other end the power applied.

I know I have got on tender ground with this argument, as I am only an amateur mechanic, and I know I have got almost all the engineers holding a different opinion; but as your correspondent seems to argue the same way, and as our agricultural engines will ultimately be made to propel themselves from place to place, it is of the greatest importance that this question should be thoroughly understood.

I think of exhibiting my model engine, on Monday and Tuesday next, at the Farmers' Club House, 39, New Bridge-street, Blackfriars, when any person can see for themselves the effect of drawing from the top of the wheel or the sides.

Baydon, Wilts, April 27th, 1859. J. A. WILLIAMS.

RIFLED FIRE-ARMS.

SIR,—In these times the construction of rifled fire-arms has become of so much importance, that any explanations illustrative of the subject cannot fail to be of interest.

In an able leading article, inserted in THE ENGINEER of the 15th inst., you gave your readers some very valuable information; but I cannot help thinking some of your observations admit of reconsideration. You observed, with reference to the Whitworth gun,—"When we take to using solid pistons in our engine cylinders we may believe in it, but so long as we use elastic pistons, so long must we continue to use elastic packing in guns to prevent windage. To use the Whitworth shot with so sharp a spiral, made to fit by planing with accurate machinery, is very like shooting a bolt out of a nut." Will you allow me to show how the case of a piston working in the cylinder of a steam engine differs materially from that of a projectile propelled from the barrel of a fire-arm? A piston moves to and fro in its cylinder, and any leakage of steam, however small, is of consequence, and ought to be prevented. In fire-arms the projectile is driven out of the barrel, and the escape of gases caused by a small amount of windage is not material; in fact, it is easy to conceive how in the case of an elongated projectile the escaping stream of gases as they rush past the projectile still contribute to urge it along. In the steam cylinder, the loss of power and inconvenience caused by leakage are constantly increasing, but in fire-arms the exploding gases of gunpowder are generated at every charge, and always in excess; and even if the windage be such as to cause a material escape, the charge may be increased. In all muzzle-loading guns, windage must, as every one knows, be allowed for to some extent, to enable the pieces to be loaded. Mr. Whitworth, in his work on rifled arms (page 81), describes how the requisite allowance for windage is made in his system, while the projectile is kept steady, and concentric with the bore. It seems idle to speculate upon the practicability of firing hard metal projectiles from hexagonal rifle barrels when the thing is actually done with success. The public journals, including, I believe, THE ENGINEER, have given accounts of experiments made before official committees, when the Whitworth steel projectiles were fired from the hexagonal barrel, and penetrated through ½-inch wrought iron plates. The steel projectiles are not found to injure the barrel, nor do they "jam." Again, the brass howitzers rifled by Mr. Whitworth answer successfully, we are told, with wrought and cast iron shot. It must always be remembered that the advantages of any particular gun are to be estimated as a whole, and not by its perfection in one particular point. Consider, for instance, the case in point—that of windage: it certainly allows of the escape of gases; and, taking for granted that this is to some extent a disadvantage, though, as has been shown, a small one, it may at first sight be thought desirable to remedy it; this can be done by using the old lead-coated projectiles, as was done by Richards in 1809, or by attaching elastic packing to the shot, as was proposed by Lancaster in 1851. In the latter system the idea of applying the principle of steam cylinder packing was carried out, but it utterly failed. The use of the lead-coated projectiles has lately come once more into favour; but however skilfully the system may be worked out, it will always be liable to grave practical objections. The cannot must necessarily be made breech-loading, and can only be used under favourable circumstances, for the dust or mud of field service would in all probability soon "shut it up." Again, when the lead-coated projectile is rifled by forcing it through a grooved barrel, the friction is enormous, and the "leading," *i. e.*, depositing of lead in the bore, is a serious difficulty; at the same time there will be a danger of the shot "stripping," and of the coating of lead becoming loose either in store or when actually fired. These are some of the difficulties which far outweigh the possible advantage gained by preventing all windage; and though they may perhaps be surmounted when guns are tried by experiments made "at home at ease," they would tell fatally in actual service, when the pieces

——— Are all besmirched
With rainy marching in the painful field.

As in mechanics a bar is only as strong as its weakest part, so in military matters the value of a piece can only be safely rated at the degree of efficiency which can with certainty be depended upon. No system can be safely called an improvement, even on the old smooth bore, unless it at least embodies its "aye ready aye" character; and simplicity of arrangement, combined with efficiency under unfavourable circumstances, must be held to be indispensable.

A RIFLEMAN.

LOCOMOTIVE IMPROVEMENT.

SIR,—Your correspondent "Labor omnia vincet," in THE ENGINEER of April 15th, states, speaking of the advantages of Mr. Dubs' patent single eccentric direct motion for inside cylinder engines—"There is another advantage with this motion, working expansively: the lead remains the same, and the steam can be cut off to the greatest nicety at any part of the stroke required."

I do not see how Mr. Dubs' motion can have any advantage over the old "fixed" link motion in general use in any of the above respects; for, with a properly-adjusted fixed link motion—that is, a motion with the link suspended by its centre and reversed by raising or lowering the valve-rod and motion-block—the lead can be got equal throughout, and also "the steam can be cut off to the greatest nicety at any part of the stroke required," by making notches in the reversing quadrant close enough to give that nicety.

Allan's "Straight Link Motion," patented two or three years ago, gives all these results, and has the advantage over ordinary link motions of requiring no balance-weight to aid in reversing, the one part being balanced, through levers on the reversing shaft, with the other.

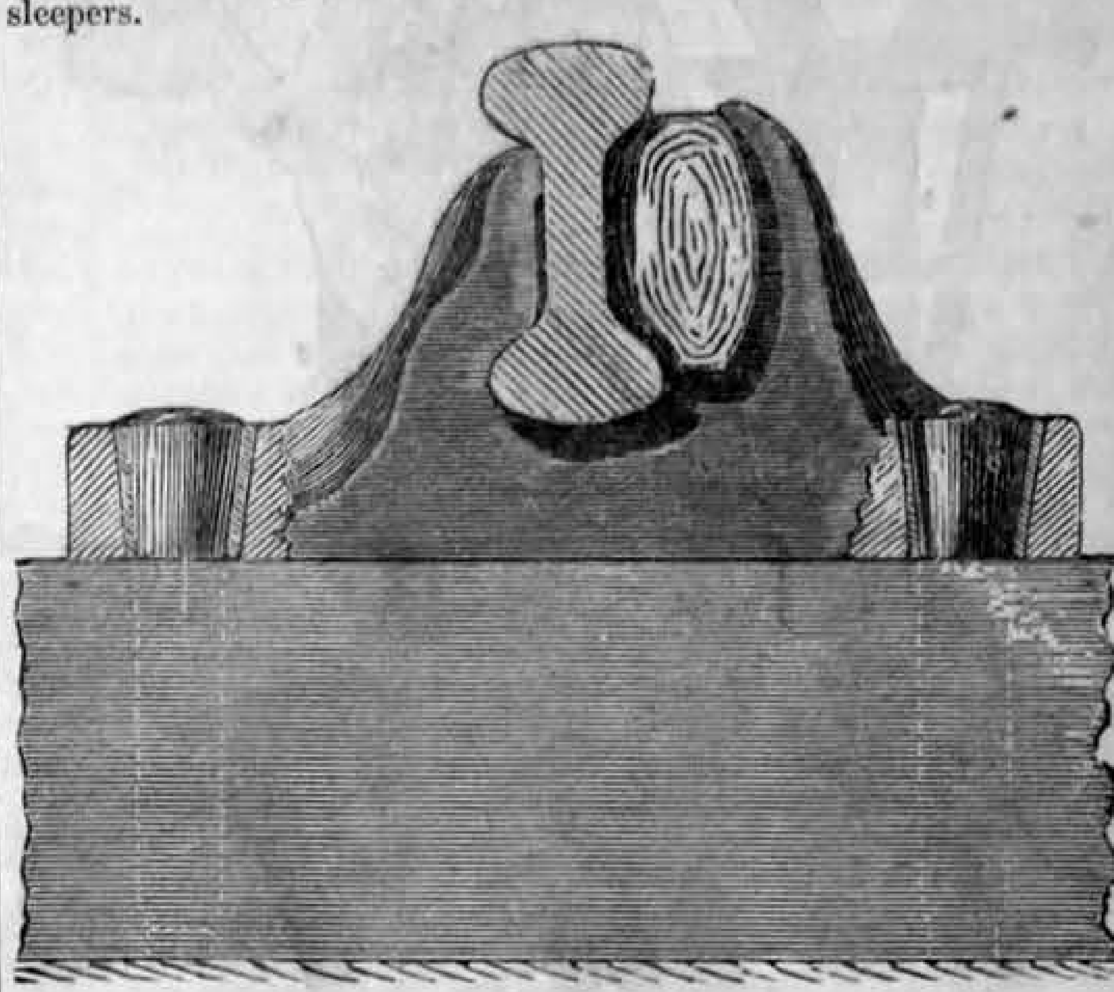
I think if "Labor omnia vincet" will take the trouble of constructing a model of either of these motions, he will find by the results that what I have said is correct—that is, providing the centres of the model are properly arranged.

I do not mean to say anything against Mr. Dubs' motion by these remarks, but only to state that, in the particulars mentioned, it does not possess any advantage over other motions in general use.

April 23rd, 1859. J. N.

RAILWAY CHAIR FASTENING.

SIR,—I send you the enclosed sketch as a suggestion of an improved method for using oak treenails in securing railway chairs to the sleepers.



A A are oak ferules fixed in he chairs, and through which the treenails are driven.

The principal defect in treenails is their liability to abrasion in the iron chair, and which I propose to obviate by using the wood ferule.

I do not know whether this is an original idea or not. I have seen the ferules used with iron spikes, but never with treenails.

Rugby, 16th April, 1859. A PLATELAYER.

PEAT FUEL.

SIR,—In your paper of last week I was much pleased to see a notice of an "Irish Vegetable Fuel Smelting Company," for working the ores of that country. This is an indication of the decay of that narrow jealousy or neglect which has so long rendered valueless the mineral wealth of Ireland. Vast as it is, its development need not be feared by the capitalists or manufacturers of this country, for a market will be provided for it by the universally growing demand for engineering material, which is as yet in its infancy. As you have stated, the iron of Ireland once stood first in the markets of earth; a thousand years ago it formed a large item of the trade with Spain. I have seen an old Irish sword that could be bent to a hoop 9 in. in diameter, and would instantly resume its straightness. This iron was made with the charcoal of the woods of oak, and the peat now suited for smelting purposes is chiefly composed of that tree, having undergone a process of decomposition equal to carbonisation. The preserving qualities of "bog peat" is due to the quantity of oak wood which it contains.

Having long foreseen the virtue of peat as a fuel for smelting, if at all properly managed, I feel confident of the success of the undertaking. In many instances these masses of fuel are surrounded by rich ores cropping out on the surface. There are three classes of peat—fum, slean, and bog. Only the two last are suitable for smelting purposes, the first being too light and spongy.

Slean is a rather dense, brownish peat, composed of horizontal layers; the forms of its components are slightly traceable in it. It increases in density from the surface downwards, and is generally about 10 ft. deep. In its normal state (when dry) it is about one-fourth lighter than coal, and burns with a whitish ash. This class is the most generally diffused.

Bog is darker and heavier than slean, and no trace of its components is visible, except oak, and hazel nuts, and logs of oak trees. It is sometimes 30 ft. deep, and is generally situated in the gorges of hills. Turf made from it, after the fashion of the country, is about the same weight as coal, and burns with a strong heat. This is the most suitable peat for smelting. If cut with an angular spade in pieces of about 6 in. square, and 1 ft. deep, and compressed to about 6 in. or 4 in. deep, according to the degree of moisture, it will make an excellent smelting fuel, and might be delivered in the Midland Counties at one-half the price of coke.

It is my opinion that the use of this fuel will produce an article equal to the charcoal iron of northern Europe.

Birmingham, 25th April. E. A. LEONARD.

GLYCERINED PAPER.

SIR,—Will you do me the favour to correct an error made, no doubt unintentionally, by a correspondent in your last number for April 22nd, on the subject of "Paper from Wood?"

It is there stated that the use of glycerine in the manufacture of paper was patented in 1845. Such is not the case. Glycerine, with several other substances—glue, treacle, India-rubber, gluten, &c.—are claimed in patent No. 10,935, 1845, for facilitating the moulding of papier-maché; but there is not the most remote pretension to claim the use of glycerine for the preparation of paper for dry printing (patent No. 524, 1857), or for improvement in the manufacture of paper (patent No. 1,623, 1857).

You will, I trust, see the propriety of correcting this misstatement, on referring to the patents above quoted. JAMES BROWN.

68, Leadenhall-street, 26th April, 1859.

SUPERHEATED STEAM.

SIR,—I am sure the engineering world would be infinitely indebted to Mr. Wethered if he explained why the mixed steam is superior to plain superheated steam, both being same temperature; also the reason of its use being abandoned in the French navy.

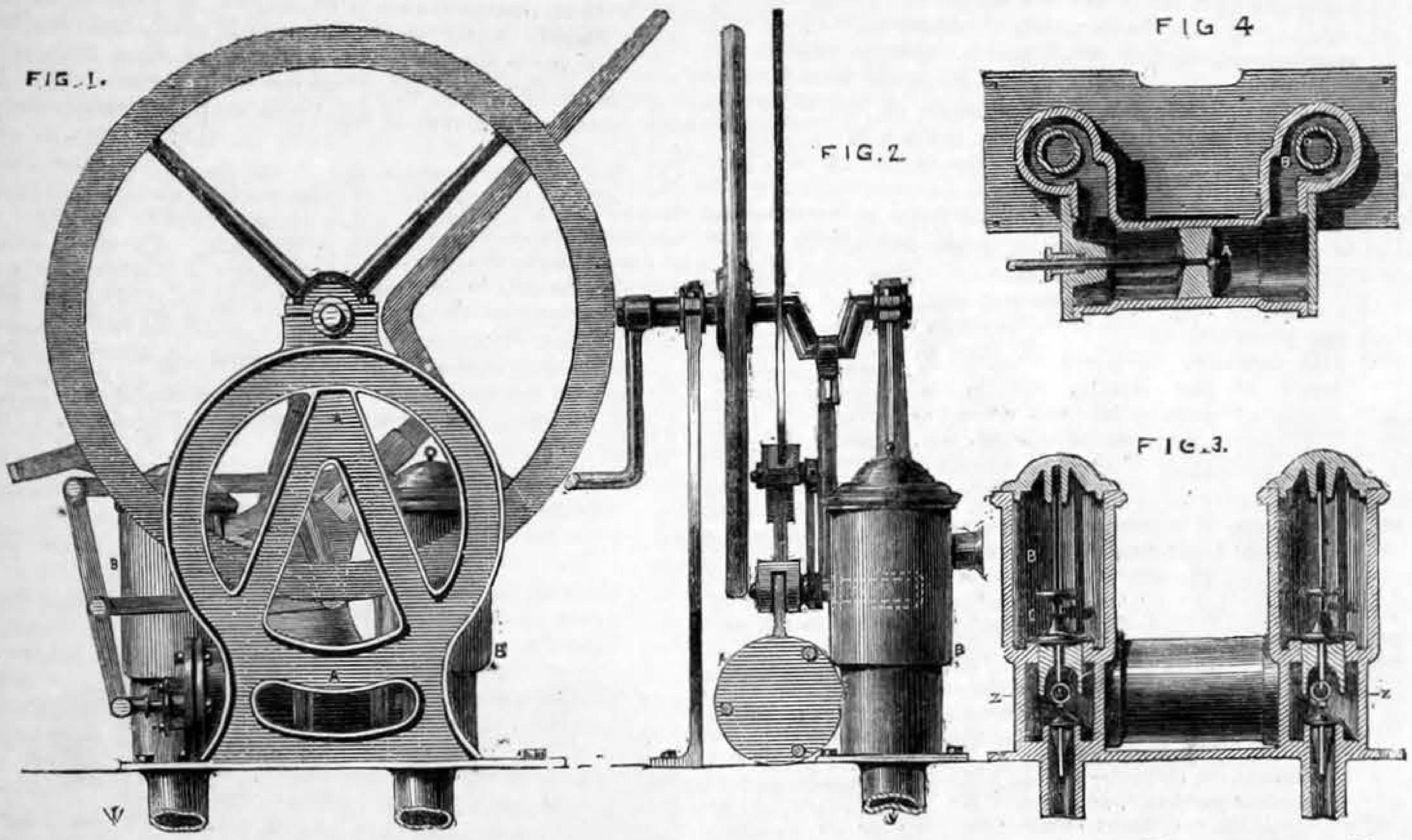
The Government report on this subject proved the superiority of superheated steam over Mr. Wethered's patent mixed—at least, that is, I believe, the general opinion. I. C. E.

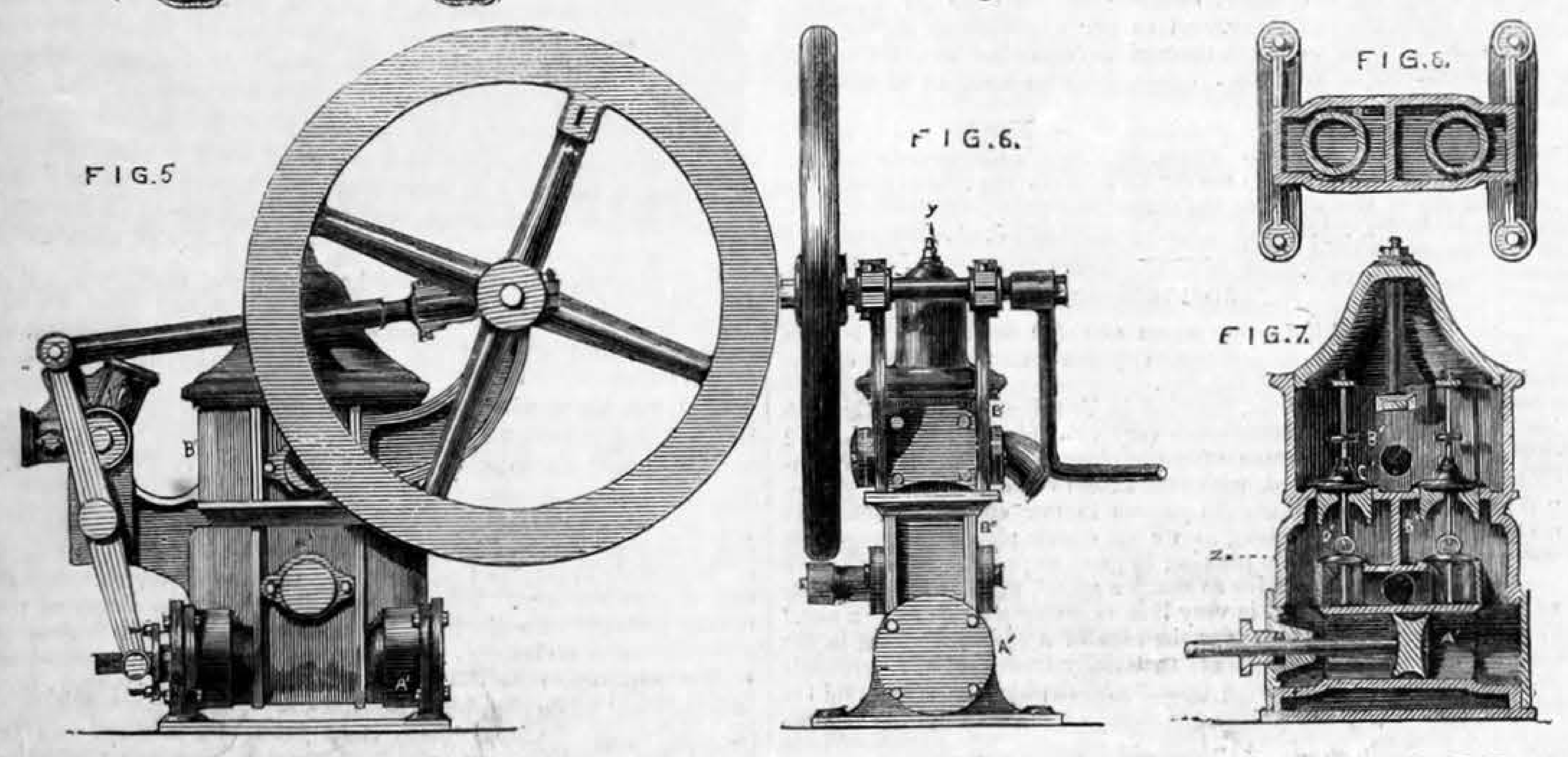
London, April 25, 1859.

GOLD IN NORTH WALES.—Messrs. S. Groucutt and Sons have discovered tracings, not only of copper and silver, but also of gold, in their iron ore minerals at Cwm, having had some of their mineral analysed by first-class men. A moderate per centage of gold, silver, and copper has been extracted.—*North Wales Chronicle.*

REDPATH'S IMPROVEMENTS IN SHIPS' PUMPS.

Patent dated 14th September, 1858.



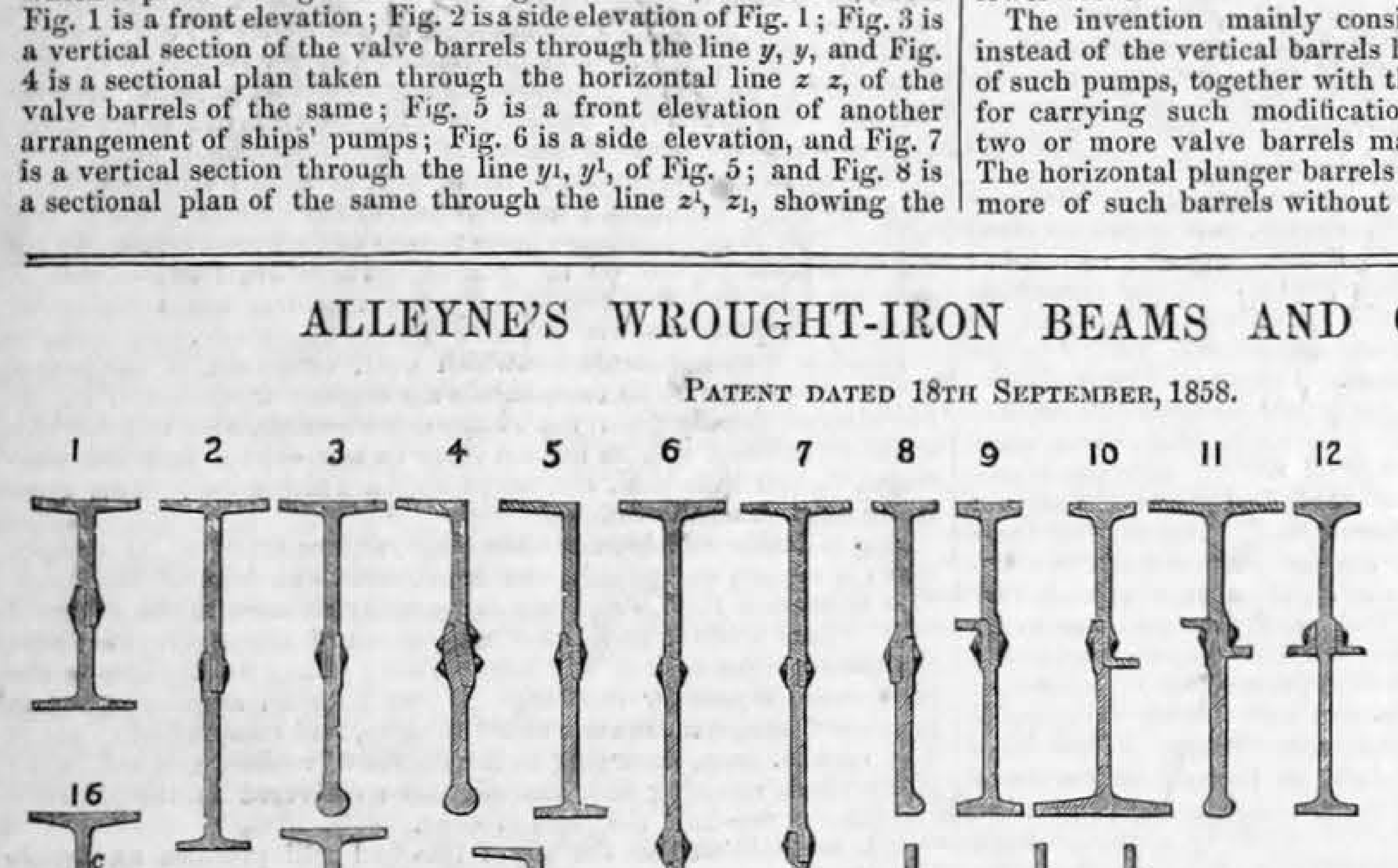


This invention, by C. J. Redpath, of Limehouse, Middlesex, refers to improvements on the invention of "ships' and other pumps," for which a patent was granted to George Wilkinson, 4th March, 1852. Fig. 1 is a front elevation; Fig. 2 is a side elevation of Fig. 1; Fig. 3 is a vertical section of the valve barrels through the line *y*, *y*, and Fig. 4 is a sectional plan taken through the horizontal line *z z*, of the valve barrels of the same; Fig. 5 is a front elevation of another arrangement of ships' pumps; Fig. 6 is a side elevation, and Fig. 7 is a vertical section through the line y_1, y^1, of Fig. 5; and Fig. 8 is a sectional plan of the same through the line z^1, z_1, showing the water passages. A, A¹, are horizontal pump barrels; B, B¹, the valve barrels and chambers; C, C¹, the upper valve, and D, D¹, the lower valve.

The invention mainly consists in the application of horizontal instead of the vertical barrels hitherto used for working the plungers of such pumps, together with the mechanical arrangements requisite for carrying such modification into practical operation, whereby two or more valve barrels may be operated by a single plunger. The horizontal plunger barrels may be placed so as to use two or more of such barrels without the addition of valve barrels.

ALLEYNE'S WROUGHT-IRON BEAMS AND GIRDERS.

Patent dated 18th September, 1858.



Great difficulty is experienced in rolling wrought-iron beams or girders of great depth when furnished with flanges or enlargements at both edges. By the invention of J. G. N. Alleyne, of the Butterley Ironworks, Alfreton, wrought-iron beams and girders are made in two or more pieces united by scarfed or notched or lapped or diagonal joints. The two pieces are placed together, and connected by one or more rows of rivets or bolts and nuts.

Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 represent sections of various girders or beams constructed according to the invention; Figs. 13, 14, and 15 are side elevations of the girders or beams shown in section in Figs. 1, 4, and 7 respectively; Figs. 16, 17, 18, 19, 20, and 21 represent sections of wrought-iron bars of suitable forms for manufacturing girders according to the invention. These bars are rolled in a rolling mill with grooved rollers of suitable forms. The beam or girder shown in Figs. 1 and 13 consists of two similar wrought-iron bars rolled of the sectional form shown in Fig. 16, and rivetted together. The rivets may be placed farther apart in the centre of the girder than at the ends, as shown in Fig. 13, the main point being to connect the ends firmly together. Each bar is rolled with a flange projecting on each side of one of its edges, while the other edge is rolled with a recess or step or half lap *a* at one side, and a projection *b* at the other side. The recess *a* amounts to half the thickness of the vertical web *c*, so that when the two bars are rivetted together, as shown in Fig. 1, the vertical webs of both bars are in the same plane.

Fig. 2 is a section of another girder, very similar to that shown in Fig. 1, but with top and bottom flanges of unequal size; Fig. 17 is a section of the upper bar of this girder.

Fig. 3 is a section of another girder, with a bead or thickened edge instead of a bottom flange; Fig. 18 is a section of the lower bar of this girder or beam; Fig. 8 is a section of a very similar beam, with a half bead or projection on one side only of the bottom edge.

Fig. 4 is a section of another girder, with a bead or thickened lower edge, and a single flange at the upper edge; Fig. 19 is a section of the upper bar of this girder; Fig. 14 is an elevation of this girder. This girder is shown with a double row of rivets, and with a diagonal lap or scarf at the junction of the two bars. Each bar is thickened a little at *d*, so that it may be flush with the edge of the other bar. These variations are applicable to all the other forms of girders shown, and the joint of the girder shown in Fig. 4 may also be constructed like those shown in Figs. 1, 2, and 3.

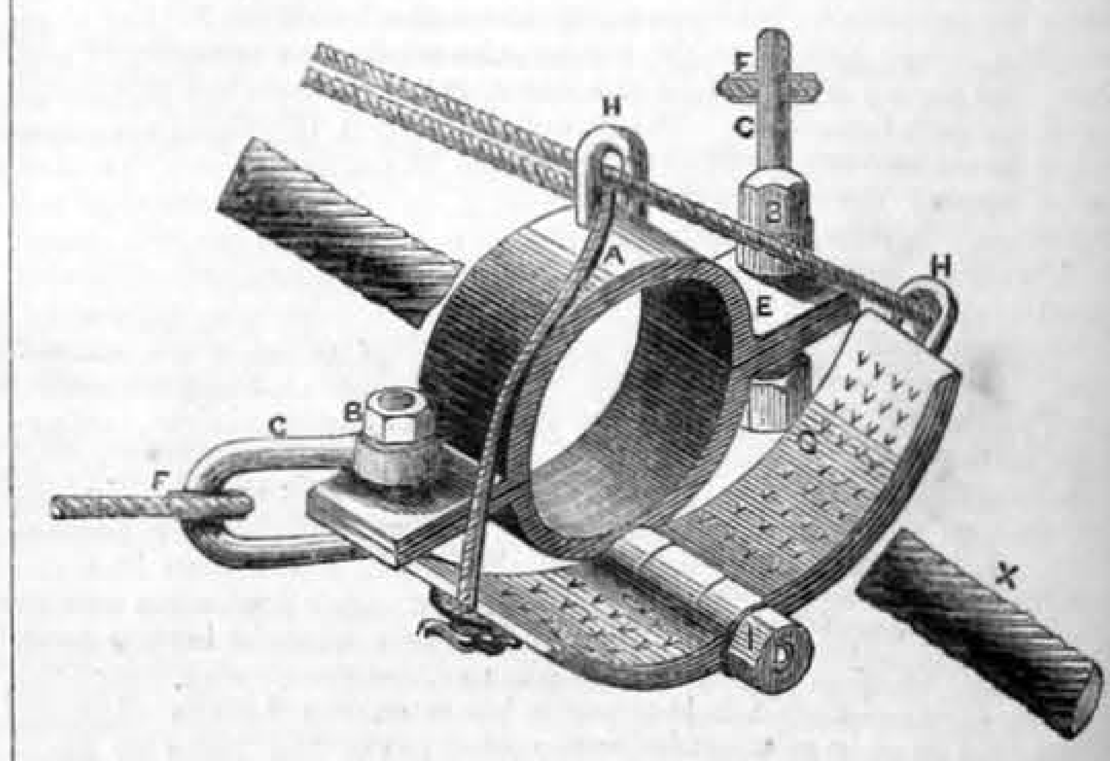
Fig. 5 is a section of another beam or girder, having a single flange at top, and a double flange at bottom. The two bars are united with a diagonal lap or scarf, as shown.

When beams are required of greater depth than can be conveniently made of two bars, three or more bars rivetted together are employed in a similar manner; thus Fig. 6 is a section of a girder or beam constructed of three bars rivetted together, the central or intermediate bar being of the form shown in section in Fig. 20, and being made with a half lap at each edge to fit the corresponding half laps on the top and bottom bars. The intermediate bar may be rolled with the half laps on the same side as in Fig. 20, or on opposite sides as in Fig. 21, the upper and lower bars being rolled with corresponding half laps, as shown in section in Fig. 7. Fig. 15 is an elevation of the girder shown in section in Fig. 7. Two or more of these intermediate bars may be introduced between the top and bottom bars, if required, to obtain a beam or girder of sufficient depth. In some cases one of the bars may have its edge turned over or rolled, so as to form a flange at its junction with the other bar, as shown in section in Figs. 9 and 10, or both bars may be so formed as shown in Fig. 11. These flanges may be used for supporting joists or for other purposes, and also serve to increase the lateral stiffness of the beam or girder. The same result may be obtained by rivetting angle irons on one or both sides of the beam or girder, and the angle irons may be secured by the same rivets which connect the bars together, as shown in section in Fig. 12. These angle irons may extend the whole length of the beam, or may be merely short pieces rivetted to the beam at the places at which they are required for supporting joists or for other purposes.

GRYLLS' APPARATUS FOR SUBMERGING TELEGRAPH CABLES.

Patent dated 18th September, 1858.

This invention, by H. W. Grylls, of 47, Mark-lane, consists in an apparatus to be used when a submarine or other cable is being either submerged or laid down, or when it is being again taken up, by means of which, in case of fracture or other accident, a hold may be taken of the cable at any required distance from the stern of the ship, and the portion of cable saved, which may have been already payed out, if such fracture take place at any point between the stern of the vessel and the portion of the cable where the apparatus is situated.



The illustration represents a perspective view of the apparatus, in which A, A, is the metal guide ring formed in two parts or segments and fitted with lugs E, E, through which the arbors or bolts B, B, pass for the purpose of connecting the parts together. These arbors or bolts are made sufficiently long to pass through and secure the eyes of the shackles C, C; F, F, are thimbles moving freely upon the shackles C, C, and to which chains, or wire or other ropes, may be attached; D is a bolt securely fastened to the guide ring A, A, upon which the sockets of the jaws or gripers G, G, are placed, thereby forming a hinge joint fixed in position by the nut I; H, H, are staples securely rivetted to the jaws or gripers G, G; K is a staple or guide also securely fixed to the guide ring. When the apparatus is used for the purpose of saving a telegraphic cable in case of fracture, it is made fast to the stern of the vessel by chains, or wire or other ropes of any required length attached to the thimbles F, F. Wire or other ropes or chains are also made fast to the staples H, H, and having passed through the staple or guide K, are continued to the deck of the paying-out vessel. The cable X, X, is passed through the guide ring A, A, and between the open jaws of the gripers G, G. The apparatus being thus suspended to the stern of the vessel allows the cable to pass freely through it as long as may be required; but should the cable part between the stern of the vessel and the part of the cable at which the apparatus is situated, the rope or chain attached to the stapes H, H, is immediately hauled taut by any convenient means. This causes the jaws or gripers G, G, to turn upon the hinge bolt D and collapse, thereby grasping the cable tightly, and it may then be drawn upon deck or otherwise disposed of.

The "Mersey" Steamer.—The new paddle-wheel steamer Mersey, just built for the Royal Mail (West India) Company, by Messrs. Samuda Brothers, of Poplar, was taken out for an official trial yesterday (Thursday) week, in charge of Captain Bax, appointed to the command of the ship. The Mersey ran the measured mile in Stokes Bay four times, and subsequently went down the Solent as far as Hurst Castle, her performances throughout the day giving the greatest satisfaction to all present. At the mile she averaged 13½ knots, the result of each run being as follows:—

	m. s.	Average
1st	4·31	13·284 knots per hour.
2nd	4·30	13·333 „
3rd	4·38	12·950 „
4th	4·24	13·585 „

Her draught of water was 10 ft. forward, and 10 ft. 4 in. aft. The Mersey is schooner-rigged, and has accommodation for about 100 passengers; she is 1,000 tons burden; and 250-horse power; length, 260 ft.; breadth, 30 ft.; depth, 16 ft. Her engines (oscillating) are by Maudsley, Sons, and Fields. She carries six boats, two of which are fitted with Clifford's patent lowering apparatus, which the company have also ordered to be applied to the three large steamers (Parramatta, Shannon, and Seine) about to be added to their fleet.

Discovery of Noah's Ark.—It appears that in the eastern portion of that good old State whose staple productions are "pitch, tar, turpentine, and lumber," some remarkable fossil discoveries have been recently made, among which is what appeared to be a portion of a vessel's deck, some 40 ft. in length, and bearing a close resemblance to lignite. The time has been when the discovery of such a remarkable fossiliferous specimen would have set all the geologists and archæologists of the country on their heads; but at this enlightened period of the world's history, when the duty of not only managing, but explaining all things terrestrial, has devolved upon a class of men known as editors, it excites no surprise; for the simple reason that, whatever occurs on the earth, or whatever is discovered above or beneath, or in the waters around it, is certain of a speedy and satisfactory solution. See how easily the editor of the *Wilmington Herald* settles this fossil matter:—"How this vestige of human labour and art came there, is a question easy of solution. We understand that some erudite geologists say that somewhere in Baden county is found the oldest known geological formation in the world. If this be so, if this is the oldest part of the world, it must, of course, have been the first ready for the residence of man, and the first occupied by him; *ergo*, the Garden of Eden was somewhere in the Cape Fear region, which was then a better fruit-growing country than it is now. We think Adam must have settled somewhere around this way, for all the people claim to be descended from him. If Adam and Eve started life in eastern North Carolina, it is not probable that Noah wandered far from the old homestead. This supposition gains strength when we consider how Noah pitched his ark. Where else could he have got so much or so good pitch or other naval stores to pitch her within and without? Following up the train of reasoning, why should not these fossil remains have come down from Noah—be, in fact, portions of his ark? To be sure, the absence of Mount Ararat is a little in our way; but when we get to be philosophically regardless of all facts that stand in the way of our hypothesis, we won't mind little trifles like this."—*Scientific American.*

TO CORRESPONDENTS.

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

*** *We must request such of our correspondents as may desire to be referred to makers of machinery, apparatus, &c., to send their names and addresses, to which, after publishing their inquiries, we will forward such letters as we may receive in answer. Such answers, published to catch the eye of an anonymous querist, are in most cases merely advertisements, which, we are sure our readers will agree with us, should be excluded as much as possible from this column.*

J. V. H.—*The publishers are Messrs. Spon, of Bucklersbury.*

TRACTION ENGINES.

(To the Editor of The Engineer.)

SIR,—Mr. T. E. Merritt, of Rochester, will, perhaps, be glad to learn that neither Mr. Giles nor himself are the inventors of the mechanical feet for steam engines; this mode was patented by Mr. Brunton, of the Rutterly Ironworks, in 1813, and in 1824 Mr. David Gordon had a modified patent for the same thing; these are fully described in "Galloway's History of the Steam Engine," published in 1831, page 324, and also in "Herbert's Encyclopædia," published in 1842, vol. ii, page 398. E. J.

Old Park Ironworks, Wednesbury, 25th April, 1859.

PUMPS.

(To the Editor of The Engineer.)

SIR,—Can any of your readers kindly inform me what size of a pump is required for a 2-horse high-pressure engine and boiler, the stroke of the pump to be 2 in? ENGINEER (JUN.)

Manchester, 25th April, 1859.

[*A pump of* 1-*in. bore and* 2-*in. stroke, working at sixty strokes per minute for forty-four minutes of every hour, would supply* 2¼ *cubic feet of water—or about the quantity which would be evaporated.*]

BOAT BUILDING.

(To the Editor of The Engineer.)

SIR,—Would you or any of your numerous correspondents be so kind as to inform me what draught of water a boat 20 ft. by 6 ft. would require, to be propelled by a screw? What size of cylinders and pitch of screw to drive it at the rate of ten miles an hour? Pressure of steam 20 lb. per square inch. Or do you think paddle-wheels would be better? D. J.

April 25th, 1859.

SUPERHEATED STEAM.

(To the Editor of The Engineer.)

SIR,—Steam cannot yet be admitted among the sciences. It is evident, from recent discussions, that the laws by which steam is governed are not yet sufficiently ascertained and determined to admit its claim to that distinction.

The papers in your last two numbers, and the important letter in last Saturday's *Times*, on Penn and Son's experiments aboard the Valetta on the Thames, show this. But who is to determine when doctors differ? No doubt something will come of the challenge given by the Hon. Mr. Wethered to Mr. Fairbairn.

The constant experiments of the Admiralty will evolve something, and the case of the Valetta on the Thames will decide a most important point, viz., whether superheated steam alone, not combined, will be free from that destruction of lubrication which has been alleged by Mr. Wethered and his predecessors in the same line. If so, shall we revert to combined steam? This is certainly a most interesting question, and it is so chiefly on account of its commercial importance. If Penn and Son's scheme succeed, it would seem that the Peninsular and Oriental Steam Company will save per annum £210,000.

Will you permit me to say that, after carefully considering the paper read by the Hon. Mr. Wethered before the British Association last autumn, I am still sceptical as to the peculiar advantages of combined steam; and I shall be glad to receive further information on the subject. "Comparison proveth all things." TEMPIUS.

April 26th, 1859.

MEETINGS NEXT WEEK.

SOCIETY OF ENGINEERS.—On Monday, 2nd May, at 7 P.M., a paper will be read on "Perspective."

THE ENGINEER.

FRIDAY, APRIL 29, 1859.

THE FUTURE.

NOW that the suspense, with which the warlike preparations on the Continent have been regarded, is broken by the actual commencement of hostilities, we have to accept events as they occur, and to be prepared for whatever the destinies of war may have in store for the world at large. The least timid cannot but apprehend, in the great crisis now before us, the general disturbance of Europe. How long England may keep aloof it is impossible to say, but we have the most active defensive and precautionary measures in prosecution on all sides. The temporary political excitement in which we are now plunged will soon subside, the abstract principles of Government now at issue having less direct and visible interest than the destiny of Europe, to which all eyes will be now turned. The great nations now pitted against each other, as well as those which may become involved in the progress of events, will become consumers to the extent of their means, whilst their powers of production will be greatly diminished. Every step in war is attended with a vast consumption of material; and as this rises, production declines. Agriculture, the great regulator of all national exchanges, will feel the shock in its most vital part. The legions of young men drawn from the plough—the deprivation of the land of so much of the intelligent physical energy which underlies all the sources of national wealth—will tell with terrible effect upon the productive energies of France and Austria. Superadded to this cause is the disturbance and anxiety which are left behind in field and hamlet; the absorbing interest with which all not actually engaged in will watch the issue of war. Just as production is disturbed at home, so must these nations become purchasers abroad. The price of grain must rise, as the crops to which millions are looking for their supply may be cut off by violence or neglect. The employment of shipping must extend; hundreds of thousands of men cannot be moved from one part of a continent to another, and their supplies be sent after them, without a draught upon the general shipping of the world, whatever bottoms may be engaged in the actual transportation. America will have a market for millions in value of her breadstuffs, the culture of which in the United States is assuming the proportions of vast commercial operations, employing many thousands of capital and even hundreds of men upon single estates. This movement is withholding capital from domestic manufacturing operations, and to a corresponding degree extending the market for British products. The new French loan of £20,000,000 to be immediately negotiated — mostly, probably, in France—shows the drain of capital which is likely to go on from that country. Very likely £200,000,000 of European cash are to be sunk within two years, in prosecuting the war now commenced. Whatever portion England may be compelled to contribute to this enormous loss of the world's means, there can be no doubt that her manufactories will be actively employed in the meantime in keeping up the standard of the world's production. Our exports for the first three months of the current year are largely in excess of those in the corresponding period of 1858, and considerably more than those of the first quarter of 1857, a period marked by great commercial inflation. In the meantime, our colonies are likely to progress with a renewed impulse; India has now risen to the rank of our principal customer, a position which that country will doubless maintain as long as it remains a dependency of the British crown. In all the conflicting course of events, of war and waste on the Continent, and peace and prosperity in our colonies and in the United States, England, at all events, is likely to gain largely on all sides. However speculation and the development of new enterprises may be checked, manufactures and legitimate commerce must considerably extend. As is well known, this country, during the progress of the Russian war, enjoyed a remarkable degree of commercial prosperity; and there is nothing inconsistent with the present aspect of affairs in expecting a renewal of that prosperity at an early period. In this view we do not, of course, calculate upon the contingency of the resources of Europe being annihilated in the contest now commenced, although a reaction must come when the strife is ended. Supposing every nation in Europe to fight as long as it is able, a large share of the spoils would pass into the hands of whatever nation could maintain its resources of production: and England being, most likely, that nation, would reap the profit, as long as her customers had aught to trade upon.

SUPERHEATING STEAM.

THE daily press enjoys peculiar privileges, of which we, as representing a different branch of journalism, have perhaps no right to complain. The great financial or political luminaries, the "leading journals," may challenge admiration with a wonderful narration of any matter of practical engineering or mechanics; for which narration an humble sheet like our own, specially devoted to such matters, would be tabooed forthwith. We have lately had a most startling announcement of the great results attained with a superheating apparatus fitted to the Peninsular and Oriental Company's steamer Valetta, an announcement wherefrom we would have supposed that the respectable firm of John Penn and Sons had achieved the greatest improvement ever made in the steam engine since the time of James Watt. Stripped, however, of the imposing peroration with which the "indefatigable reporter" of your morning journal is wont to introduce the discovery of a new planet or the advent of a new ferry-boat, the column or so in the *Times* of Saturday last, devoted to the subject of superheated steam, merely informs the public that another trial has been made with an apparatus long known and variously modified for such superheating; but to what extent this apparatus will overcome the known objections attending the use of steam so heated, neither the trial itself, nor the authority of the reporter, can establish. We are told, at first, that the Valetta's engines, of 400-horse power, have been removed to a vessel of nearly double the tonnage, and engines of 260-horse power substituted in their place. Further, that, with the smaller engines, the vessel is driven at the same speed as before, with an estimated consumption of 24 to 26 tons of coal a day, against 75 tons as formerly used. Truly, indeed, there has been an improvement somewhere; and the reporter of the circumstance is only diverting us from the point by confining his observations wholly to the merits of the superheating apparatus. Without this apparatus, which only heats the steam 100 deg. over the temperature due to its pressure, would the vessel consume her 75 tons a day as before? When such improvements are asserted, the respective means by which they are supposed to have been realised should be indicated as distinctly as possible. In addition to "Mr. Howard and Dr. Haycraft" superheating apparatus, consisting of steam pipes variously placed in the smoke-box or furnace, has been applied by a great number of engineers, including Jacob Perkins J. E. M'Connell, John Wethered, Mr. Partridge, Mr. Pilgrim, and others. Major Fitzmaurice, in a letter to the *Times*, states that he superheated steam with encouraging results some dozen years ago. We mention these facts in no spirit of detraction, as for the practical introduction of some good means of superheating, whereby all the intrinsic advantages of pure dry steam can be obtained without injury to the machinery, we believe the world is likely to be considerably indebted to the eminent firm to whose recent attempt the *Times* has generously devoted so much space. Whether, however, all the conditions involved in the application of surcharged steam "have been most satisfactorily fulfilled in the new engines on board the Valetta," is a matter which must be determined by experience. So far as the description goes, there is nothing substantially new in the arrangement of the apparatus employed; it belongs to a class of expedients with which numberless trials have been before made, perhaps with apparent temporary success, but which for some reason it could not, or at least did not, maintain in regular practice. We believe that a full discussion, by competent parties, upon the nature of the advantages of superheated steam, and of the best means of realising them in practice, would now be of great value to the world. That such steam has peculiar properties, whereby it is enabled to accomplish an increased effect over that obtained from ordinary anhydrous or saturated steam is well known; although it is not by any means yet settled upon what principle those properties are acquired. There are those who believe superheated steam to be a distinct elementary substance; Mr. Wethered professes to believe as much of a mixture of superheated and ordinary steam—although we may, perhaps, ask what do those who hold these opinions understand by the term "distinct elementary substance?" That there is a considerable amount of priming in nearly all forms of hard-worked boilers is well known, as also that there is a considerable condensation in exposed cylinders. Whatever water is carried over in mechanical suspension with the steam abstracts, of course, so much heat, without producing any effect; whilst it doubtless offers some dynamic resistance in the engine itself. That superheating, out of contact with the water in the boiler, will obviate these losses is quite apparent, as in the first case the suspended water would be converted into steam; and in the next a sufficient surplus of heat would be imparted to the cylinders to prevent condensation. To what extent it is desirable to increase the normal temperature of the steam is a question, and is, perhaps, to be regulated by circumstances. In some observations made upon the engine at the Woolwich Arsenal gasworks, steam superheated to 500 deg. in the pipes leading from the furnace was reduced to 290 on reaching the cylinder, showing a very extravagant loss by radiation. In other cases results of apparently great economy have been attained with a temperature of 350 deg. with steam of 15 lb. pressure; and this is the temperature reported of the apparatus on board the Valetta.

The surveyor of the navy says, in reply to the observations of the Committee on Marine Engines, "For many years all doubt has vanished respecting the fact that considerable economy arises from the use of superheated steam, the degree of economy depending, as might be expected, upon the extent to which the principle is carried out, and upon the mode adopted for superheating the steam." This, indeed, is the general opinion of engineers, nearly all of whom are more or less cognisant of such apparatus as has been applied to the Valetta.

Steam is, in itself, a lubricator; and if the interior of the cylinder were never exposed to rusting from condensed water when standing, the piston would run, we cannot say how long, without oil. We have seen a stationary engine in which there was no opening for oil or tallow to the cylinders, and it had been working perfectly for upwards of a year. On some lines of railway on which there were no gradients down which the engines could be run without steam, we have known it to be a practice only to let tallow into the cylinders in very small quantities, just before going into the engine shed, the tallow used being merely to prevent rusting. In superheating, much or all of the natural moisture of the steam is converted into a dry, elastic gas, destitute of any lubricating properties, whilst also the wearing surfaces are at a heat of perhaps 400 deg., or whatever may be the temperature of the steam. In one of the river steamboats, the steam is now being intensely heated in iron pipes passed directly through the fire, the temperature in the conducting pipes being upwards of 500 deg. Whether or no increased packing is necessary, must be determined by experience; but it has been asserted that no additional quantity of tallow is required above that formerly used. This somewhat taxes ordinary belief, but a wider practice may prove it to be true. It will be an interesting question also, how long the heating pipes will last under the temperature to which they are exposed. We have the assurance of the parties interested in the patent that wrought iron lap-welded pipes have withstood nine months' use in the crown of the furnace. This fact, if it be confirmed by continued trial, is certainly encouraging, subversive although it be of received opinions in such matters. It is true that the steam is flowing in a constant current through the pipes; but there can be no question that a furnace plate, once exposed to the full action of the fire without any protection from water behind it, is soon burned, however rapidly the steam may be passing off from the boiler.

Considerable interest has been excited in behalf of "combined steam" employed by Mr. Wethered. That gentleman claims for a mixture of ordinary and superheated steam a greater elastic power than can be obtained from either used separately. In the four years during which Mr. Wethered has laboured to introduce his system here and in France, he has made out a considerable economy in favour of combined steam, as compared with superheated steam of much greater temperature. We refer to Mr. Wethered's paper, read last year before the British Association, and published in THE ENGINEER of 22nd October last (page 308, vol. vi). How steam, first superheated, and afterwards deprived of a portion of its temperature and elasticity, and again permeated with moisture, can do more work than when in its most gaseous form, is a singular anomaly; and perhaps the circumstances under which the trials may have been made do not quite establish it. The only attempt which we have ever known to be made to support this point by anything like a principle is, that the thermo-electricity disengaged by the sudden mixture of steams at different temperatures, just as both were about to enter the cylinder, produces an increased effect. As it is, we doubt if anyone is able to disprove, without trial, what Mr. Wethered claims, however they may dispute him. In his belief he is certainly in a great minority, perhaps of *one*; and, nevertheless, it is for the interest of all who have interests to be affected by the universal agencies of steam, to establish his proposition as a veritable physical fact. Its value would be millions. It cannot be denied that distinguished Government authorities, whether unwittingly or not we cannot say, have promulgated the evidence to which he turns to confirm his statements. Yet we will venture the assertion that not one engineer in one hundred in this country ever comprehended the real nature of the proposition embodied in Mr. Wethered's plan, until his distinct enunciation of it last autumn in his paper already referred to. The utter absence of plausibility in his hypothesis has prevented its acceptance since among the list even of probabilities. We only know that it is perhaps not an impossibility; and we hope, though with some misgiving, that the challenge lately thrown out by Mr. Wethered to Mr. Fairbairn will lead to some decisive investigation.

In the meantime we fear we have heard the last of the apparatus initiated with so much *éclat* upon the Valetta, although most sincerely do we hope to have continued reports of its success. The difficulties in the way of success are wholly, as we believe, of a mechanical nature, and if not already overcome, must, in all probability, soon be, although this reasoning was as good and as much in favour of success a dozen years ago as now. There is now, however, a much greater degree of attention being directed to the subject, and a much more competent determination to succeed; and thence do we look for the final solution of the problem.

THE ENGINES OF THE NAVY.

THE Lords of the Admiralty are not likely, we apprehend, to be dazzled by the amount of light thrown upon the condition of the steam machinery of the navy, and the extent to which "its present construction and use are in accordance with the most scientific and economical principles," by the report of their Committee on Marine Engines. From the manner in which that committee entered upon the subject we were led to expect an exhaustive exposition of all its principal details, such as, together with a collection of general information upon collateral points, would make their report a most valuable acquisition, not only to the Government, but to all in any way interested in steam navigation. The report parades at great length a list of engineering firms, operative engineers, inspectors of machinery, naval officers, clerks, boiler makers, and others who were examined upon the subject, and even includes in the list the Surveyor of the Navy, who, in his "replies," with which the report is interstratified, flatly denies ever having been examined at all, notwithstanding he had expressly invited that distinction, and that the committee were acting, indeed, under the special suggestion to have "frequent intercourse with the Surveyor and the officers in charge." So, too, the divisions of the report, as indicated by the distinctive headings of its sections, are formidable in number and eminently suggestive of the most important practical deductions. Here, however, the report breaks down, as we discover little else besides the three pages embracing a list of the victims of the committee's inquisition, and a dreary procession of headings, under which, for our life, we can find little or nothing relevant to the apparent matter in hand. Wherever the report ventures beyond a vague generalisation of a few obvious facts or principles, the Surveyor's "reply" is judiciously interposed in less pretentious type as an antidote; and we must do the Surveyor the justice to say that, in nearly every case, whatever vitality may appear upon the surface of the committee's recommendations is effectually extinguished in the corrective paragraphs in question. As for many of the conclusions of the committee, they are no more theirs than they are those of everybody else;—mere commonplaces, requiring and accompanying no argument; conclusions, indeed, which nobody would think of disputing, any more than that ministers should be moral, or that gunpowder should be highly inflammable, or that eggs intended for culinary purposes should be of the best possible quality. The committee, however, notwithstanding the painful lameness and obvious impotence of these conclusions, complacently characterise their production as a "necessarily somewhat lengthened and minute report," and refer impressively to the importance of the duty intrusted to them. They publish their anxiety "that no pains should be spared in gaining access to all existing sources of information in connection with the object of the inquiry," and they refer triumphantly to the readiness with which these sources have been opened to them by the individuals subpœnaed under the powers of their commission. With a charming candour, however, the committee finally declare, in their effort to recapitulate what they have, or more properly, perhaps, what they have not done, that, "with all these advantages, and after so particular inquiries, it may perhaps be said that the result is inadequate to the time and labour which have been expended, and that a corresponding accession of information has not been added to the previous stock of knowledge possessed by practical men." Our readers will, possibly, forgive us if we do not suffer this conviction to be weakened by the recital of the wordy attempt introduced by the committee to get clear of it.

The first recommendation of the committee is altogether in accordance with the custom of similar inquisitorial bodies, and therefore safe, viz., that the accounts under which their inquiries have been prosecuted should be more fully and systematically kept. It appears that the committee had been so unfortunate as to misapprehend the circumstances, and to overlook some of the documents relative to certain changes of machinery in one or two vessels; but the ready reply of the Surveyor first disposes of one fact of importance, viz., that money accounts, as such, form no part of his charge; and, again, that much of the information, the absence of which the committee have deplored, was placed before them and overlooked. Some of the additional information recommended, the Surveyor, however, thinks it best hereafter to supply, and therefore promises to do so, stating, by the way, that such had been for some time in contemplation.

The second recommendation is, that zealous and diligent conduct on the part of engineers should be rewarded and promoted under a regular system; as well as that a corresponding system of reprimand and warning should be established for the careless and undeserving. Very proper as this recommendation unquestionably is, the committee do not make out that any other system has been adopted, although the Surveyor does show that the report refers, by marginal note, to certain portions of the voluminous minutes of evidence; in which, however, no mention is made of any case in point. In one or two other instances—all which were recited by the committee—the Surveyor acquits his department satisfactorily.

The third recommendation—to reduce the number of assistant-engineers, and to promote the better class of stokers to a corresponding rank—is one upon which the committee offer no argument; whereas the Surveyor disposes of it by reasoning apparently quite cogent, showing—what would have been naturally supposed—that such a reorganisation would be most inexpedient.

Nobody would dispute the apothegmatic proposition embraced in the fourth recommendation, "That care be taken to secure a full and practical acquaintance with the great principles of steam navigation in all officers entrusted with the command of steam vessels."

The fifth, sixth, seventh, eighth, and ninth recommendations, referring to the manner in which repairs should be made in the steam-ships of the navy, are argued by the Surveyor, who, we should say, had succeeded in making out his case, that little or no change is necessary. The committee bear testimony to the excellence of the present plan—which, however, they state should be modified—for the preservation of the engines and boilers; upon which the Surveyor pertinently asks, "Why, then, deviate from it?"

The committee's tenth recommendation amounts to a commonplace which would have been equally good from meaner authorities; and under which any surveyor, no matter what class of machinery possessed his preference, could easily shield himself. It is, "That the purchase of complicated steam engines be abandoned, and none received into the service but those which are marked in their construction by the most severe simplicity that is consistent with the execution of the work assigned to them." *Apropos*, one might say that very bad machinery should not be employed, and that good engines and boilers should be preferred. We offer our own suggestion to the consideration of their Lordships of the Admiralty, just taking occasion to remark that the committee do not show that any engines have been at any time patronised merely for the sake of their complication, nor that any engines, however complicated, have been yet adopted without the idea that they were as simple as possible for the best attainment of their capabilities.

From hence to the fifteenth recommendation, inclusive, the matters embraced are chiefly political, and involving mainly questions of opinion, upon which few rigid rules could be laid down. So far, however, as the committee's recommendations are specific, the Surveyor quietly demolishes them by a few common-sense observations, which serve only to show how much better an earnest and responsible officer is likely to understand his business than a formal commission suddenly appointed to a vast and comprehensive inquiry, and having but little acquaintance with the practical working of the system to be inquired into.

When, however, the committee come to inquire how far the present construction and use of the machinery of the navy is in accordance with the most scientific and economical principles, we are led to hope for valuable information. The decision of such a question involves, to some extent, a decision as to what some of these principles really are. It is here we look to the elaborate labours of a Government commission to enlighten us. Turn we to the document. Under the caption of "High-pressure Steam" we have an historical abstract of the circumstances under which it had been introduced into the navy, and a recital of the "obvious objections" against its use there. These objections are, *videlicet*, "The noise made by the blast; the danger, in time of action, of damage to the boiler, when charged with steam of great power; the length of time required, in case of emergency, to get up the steam, and —so forth." To the first two objections it might be replied that gunpowder was still more objectionable, as being both very noisy and very dangerous; whilst, as to the time employed in raising steam, the introduction of an artificial draught would render it much shorter than with ordinary low-pressure marine boilers. As forming a Government commission, the members should have been referred to what Lieut. D. Bona Christave, a French naval officer, has written upon this point, in the introduction to his translation of Mr. Williams' work on the "Combustion of Coal." Possibly our readers will pardon a short quotation :—" C'est dans de pareilles circonstances (those where it is difficult to push the fires with the natural draught) que l'on apprécie tout l'avantage du tirage forcé et que l'on en regrette l'absence; car, avec le tirage forcé, il est facile de pousser les feux, d'augmenter la quantité de chaleur latente dégagée, puisque l'on a la possibilité d'augmenter à la fois, et proportionnellement, l'air et le combustible introduits dans les fourneaux. C'est ainsi que les navires américains, qui sont presque tous munis de ventilateurs, alimentent des machines de 800 cheveaux avec des chaudières qui seraient insuffisante pour nos appareils de 300 cheveaux; c'est ainsi qu'ils obtiennent ces grandes vitesses si généralement, mais si faussement attribuées à des formes de carène supérieures. Il faut espérer que les marines européennes fineront par surmonter leur répugnance peu justifiée pour le tirage forcé et qu'elles se décideront à se servir de ce puissant moyen de doubler et même de tripler à l'occasion le puissance des chaudieres." We gave a translation of the whole of Lieut. Christave's essay in THE ENGINEER of October 22nd and November 5th and 12th, 1858 (pp. 307, 347, and 365, vol. vi.) The translation of Mr. Williams' work, it will be recollected, was made under the auspices of the Minister of Marine, for the use of the French navy; and it is to the French naval authorities that the above significant passage is addressed.

Having led us, however, to the disadvantages, "obvious on the most cursory view," with which the use of high-pressure steam is attended, the committee most adroitly get behind a quotation from Main and Brown's "Treatise on the Marine Engine;" which quotation is but a threadbare repetition of the usual arguments about the advantage of a vacuum, lower temperature for radiation, &c., with the inevitable reference to the use of high-pressure steam in locomotives. After observing that the diminished weight of high-pressure as compared with low-pressure engines is of trifling consequence, and that the boilers of the former are heavier than those of the latter, the committee state that the great and paramount evil of the high-pressure engine—an evil, in their opinion, sufficient to decide the question—is the necessity of using salt-water in the boilers. The committee do not even condescend to notice the subject of surface condensation, nor do they make any notice of the fact that many tubular boilers, generating steam of moderately high-pressure, have been worked successfully for years with salt-water, under a constant blow-off. Nor do the committee appear to have entertained the idea that high-pressure does not necessarily imply non-condensation, and that those who propose a higher pressure of steam do not all intend to dispense with the condenser. The committee abruptly dismiss the whole subject, after showing that some gain attended the application of a condenser to one of the gunboats fitted with high-pressure engines, and recommending a corresponding modification in all the gunboats; a recommendation in which the surveyor, in his interstitial replies, appears by no means disposed to agree. So much for high-pressure steam; and we sincerely hope that no future Government commission, charged with a similar inquiry, will deem the subject exhausted.

Under the head of "Boilers," the committee go into some very general observations, and conclude that the present tubular boiler, with brass tubes, is altogether the best, either for "high-pressure or condensing engines," in the navy. They do not find even one other boiler which has been yet tried at sea, which is at all likely to answer in the Government steamers, with the exception of Lamb and Summer's patent; and this they do not recommend for trial, notwithstanding it is largely used in the mercantile marine. At the same time, to give no offence, the committee can see no positive objections to such a trial. The committee appear, however, to have gone to a considerable extent into the merits of a boiler contrived by Admiral Tucker and Mr. Blaxland, and to have obtained some rather unpromising results from trials made upon it at Sheerness. Beyond this enumeration, the examination of plans of marine boilers by the committee does not appear to have extended. Whilst upon the subject, they gave some attention, however, to the working of two arrangements devised by one of their number—Mr. Nasmyth—being respectively for preventing the leakage of brass tubes in the gun-boat boilers, and for preventing the safety valves from leaking. Perhaps we shall be favoured, in a supplementary report, with the results yet to be obtained from these arrangements. The question of preventing smoke is disposed of in less than eight lines, in which the notable expedient, of which somebody in Glasgow has been guilty, of arranging hollow grate bars so as to heat a portion of the air on its way to the furnace, is mentioned with some favour. A few lines are devoted also to the ventilation of boiler rooms; and with these, the important consideration of the boilers for her Majesty's steam navy closes. Truly, if, besides the matters mentioned favourably, all others which, as connected with the subject of boilers, are not even hinted at, are to be understood nevertheless as having been duly investigated with satisfactory results, this portion of our naval machinery is all that could be wished.

As to the construction of engines, the committee consider the oscillating engine of Penn's and the double cylinder engine by Maudslay and Field as the best for paddle propulsion. For the screw, the single piston-rod engine of Humphreys, Tenant, and Dyke, is recommended as the best under 300-horse power; beyond which Penn's trunk engine and Maudslay's double piston-rod engine the committee consider the simplest and best adapted to the requirements of men-of-war. Although these conclusions would be generally acknowledged as judicious, the committee favour the Admiralty with no reasons, beyond those of the most general nature, for their discussion. The committee recommend that the list of contractors supplying marine engines be increased, and that the pattern be determined by the Admiralty.

In respect to working steam expansively, the committee's report is more specific than usual. They refer to the difficulty of effectively maintaining the ordinary expansive gear in quick-working direct-action engines, and to the fear of breaking down where the link-motion is employed for the purpose. They protest against the use of cams, as altogether unsuited to quick-action engines, and give their preference to a "gridiron expansion valve," worked by a separate eccentric; an arrangement of which the committee present a tracing from the Messrs. Caird, of Greenock. The committee state, as a fact in some way connected with the working of this particular form of valve, that they had observed one instance wherein, with 25 lb. steam, superheated or dried 8 deg. only, and cut off at one-quarter stroke, the consumption of coal was reduced to 25 lb. per horse power per hour, the speed of the vessel being at times 13 knots. To all this, the surveyor briefly generalises the conditions to which improvement in expansive working is limited, and quietly snubs the recommendation of the committee as to the particular form referred to.

The committee, in dealing with the subject of superheating the steam, conclude that superheating is, after all, only the drying of the steam from its contained moisture; and state, as their opinion, that if anything of the kind is to be attempted in the navy, the steam room around the uptake may be increased so as sufficiently to answer the purpose. The report does not, however, raise the question as to the comparative effects of superheating in contact and out of contact with water. The Surveyor intimates, in his reply, that nothing which has engaged the attention of the committee, in respect of superheating steam, is likely to have been lost sight of by any persons interested in steam matters.

Upon the form of vessels of war and the amount of engine power to be put into them, the committee and the Surveyor have considerable to say, the former hardly venturing beyond speculation, and the latter keeping within the limits of experience. We shall endeavour, in our next number, to give some portion of the report to our readers, although it appears destitute throughout of any leading idea likely to lead to any considerable improvement in the machinery of our navy, which, indeed, the report might lead us to suppose was, with a few trivial exceptions, almost nearly perfect already.

FRIENDLY SOCIETIES.

FEW who were not dealing directly with the workmen of our engineering and manufacturing establishments would be prepared to learn the extent to which the operations of their amalgamated society for mutual aid are now carried on. The eighth annual report recently issued shows that the Amalgamated Society of Engineers, Machinists, Millwrights, Smiths, and Pattern Makers, now numbers 182 branches, including points in Canada, Malta, and Australia. The number of members in December of last year was 14,745, a single branch—Manchester 3rd—having, if it be not a misprint in the report, as many as 926 members. The balance in hand, which amounted in December 1857 to £47,947, had been reduced at the date of the present report to £30,353. During the year 1858 there were collected £34,123, and expended £51,716. The secretary observes that, when trade is very bad, sickness, and even death, appear to be more general among the members. The sick benefit, which, in 1857, averaged 8s. 4½d. per member, was, in 1858, 8s. 11d. Funeral benefits averaged 2s. 2¾d. in 1857, and 3s. 1½d. in 1858. In donation to members out of employment the expenditure in 1857 averaged 19s. 9½d. per member, whilst in last year it was £2 6s. 7d. In the two principal benefits—that to members out of employment, and that to members in sickness—there has been expended, during the year 1858, £42,168. The report observes—"It requires no stretch of imagination to conceive the vast amount of misery that must have been alleviated by the expenditure of this large sum of money." To superannuated members, and to those afflicted by paralysis or accident, and to the relations of deceased members, the society has paid during the year 1858 the sum of £5,200. The secretary, with justice, remarks, "I think I am justified in saying that we have need to be greatly proud of our institution; and the great benefit it confers upon society should be a source of satisfaction, not only to our own members, but to the country at large."

The number of deaths reported for the year is 278, 147 having been members, and 131 members' wives. Of the whole number, 96 were from consumption, 23 from inflammation, 39 from unenumerated causes, and the remainder divided among 29 forms of accident and disease.

The equalisation of funds, a feature which makes the operations of the society general and pervading throughout all its widely spread branches, is fully stated in the report. Crewe remits as much as £409 to various corresponding branches, and Lambeth is the recipient of £441 from Sydney (Australia); Greenwich and Southwark. Manchester 3rd, and Leeds North, draw each from as many as six other branches to replenish their funds, reduced by donations and transfers. The importance of the society's influence in ameliorating the condition of its necessitous members, as well as aiding those in comparatively comfortable circumstances, cannot be over-estimated. There is nothing in the nature of its benefits against which any honest pride could take offence; whilst in every part of the kingdom its strong protective influence is felt in all the branches of labour included in its sphere. It is one of the greatest assurance organisations for personal relief anywhere in existence. In this aspect it obtains the support of thousands who would never subscribe to the life and health association, and of many who, but for the strong and timely aid of the society, would be reduced, in times of need, to the most desperate extremities.

PROGRESS OF ART INSTRUCTION.

THE public examinations in drawing held in the Metropolitan District Schools of Art, have just been completed, and show satisfactory progress.

1,093 students have been examined, of whom 298 have taken rewards of the second or higher grade; and 1,760, being almost entirely parish children, have taken 334 of the lower grade.

The numbers at each district school have been as follow:—

At the Training School at South Kensington, 280 students in the second or higher grade, of whom 113 obtained rewards; and 400 children of parish schools, of whom fifty obtained rewards in the lower grade.

At St. Martin's, 232 students in the second or higher grade, of whom eighty-two obtained rewards; and 552 children of parochial schools, of whom eighty-eight obtained rewards in the lower grade.

At Gower-street, 102 students in the second or higher grade, of whom thirty obtained rewards.

At Spitalfields, 155 students in the second or higher grade, of whom fifty-two obtained rewards; and 180 children of parochial schools, of whom fifty-two obtained rewards in the lower grade.

At Finsbury, fifty-five in the second or higher grade, of whom twelve obtained rewards.

At Saint Thomas Charterhouse, fifty-eight students in the second or higher grade, of whom eight obtained rewards; and 274 children of parochial schools, of whom fifty-six obtained rewards in the lower grade.

At Lambeth, seventy-one students in the second or higher grade, of whom twenty obtained rewards; and 222 children of parochial schools, of whom fifty-six obtained rewards in the lower grade.

At Rotherhithe, thirty-six students in the second or higher grade, of whom —— obtained rewards; and 159 children of parochial schools, of whom twenty-five obtained rewards in the lower grade.

At Hampstead, seven students in the second or higher grade, of whom four obtained rewards.

At St. George's-in-the-East, thirty-four students in the second or higher grade, of whom seven obtained rewards; and seventy-six children of parochial schools, of whom seven obtained rewards in the lower grade.

CANADA.—MONTREAL, APRIL 4.—The ice has broken up, and the river is clear down to Sorel, where it still holds. The completion of the great centre tube of the Victoria Bridge was a touch-and-go affair, but it has been accomplished, and now this great engineering work, on which the success of the Provincial Grand Trunk Railway mainly depends, may be considered to be secured. The weekly line of mail steamers will commence from the 20th instant, bringing Liverpool and Chicago within twelve days. By the Canadian route overland from Quebec the distance is 3,594 miles, while by New York it is 4,170. By water from Chicago to Sarnia and Collingwood, and thence by railway to Quebec, is 1,091 miles, making a total of 4,164 miles to Liverpool by water and rail, while by water to New York and Liverpool the distance is 4,650 miles. If British shipowners possessed the same energy as the Americans they would soon secure the carrying trade of the west, and divert it to Quebec from New York; the latter port has been created by the commerce of the west since the opening of the Erie Canal. The Canadian Government are now seeking to regain the trade by means of their gigantic railway system in connection with the ports of Quebec and Portland, and those of Sarnia and Collingwood on Lake Huron, as the nearest, cheapest, and most expeditious route to the great and flourishing States of the West, with a population of 10,000,000.

LITERATURE.

New Resources of Warfare, with especial Reference to Rifled Ordnance in their chief known Varieties, including Authenticated Weight, Measurement, and Mode of Construction of Armstrong's Wrought Iron Breech-loading Guns; together with an Account of their Shells and Fuses, illustrated by Descriptive Drawings; being a Supplement to "Projectile Weapons of War and Explosive Compounds." By J. SCOFFERN. Longman, Brown, and Co.

WE have given the title of this work in full, in order that our readers may be enabled to form a judgment as to the relations between promise and performance in Dr. Scoffern's book. An advertisement with the title *in extenso* would naturally lead one to expect an exhaustive treatise on the subject: the book itself is a lanky and meagre affair of seventy pages of leaded type, containing scarcely any original matter, with a good deal of argumentative and theoretical exposition concerning the comparative effects of vertical and horizontal shell-firing. Dr. Scoffern is known as a chemist of some repute, who has, for some time past, been engaged in experimenting upon explosive compounds, and who, if he has not added to our store of information on that subject, has at least popularised and systematised what was already known. The book has evidently been hastily written to meet the present demand for information concerning the specialities of the Armstrong gun, of which there is a figure and description, differing in some trifling details from that given in the *Mechanics' Magazine* of the 25th February. With regard to the theoretical and argumentative matter, it reminds us not a little of Captain Fluellen's didactics anent the "disciplines of war;" but there is too much of the "tiddle-taddles and pibble-pabbles" which the valorous Welshman so emphatically condemned.

Dr. Scoffern opens with the following "dreadful note of preparation:"—

At no period since the discovery of gunpowder has the application of science to purposes of destruction been more arduously attempted, or more successfully achieved, than during the past ten years; and as to afford another illustration of the providential co-ordination of all things, some of the most deadly applications of science to swell the resources of warfare are (so to speak) matters of to-day, just when Europe seems destined to be set on fire, for the purpose of throwing a new light on some disputed readings of the Treaty of Vienna. Perhaps never, in the whole history of projectiles, has an arm of destruction, large or small, awakened for itself so great an amount of popular or lay attention as the Armstrong cannon now formally adopted in our service. *I am able to supply, for the first (?) time, a full explanation, accompanied by correct (?) drawings of that gun;* a matter of no little interest, it is assumed, at the present epoch.

The italics in this quotation are Dr. Scoffern's, and give the key-note of the book. It must have been rather mortifying to the author to find himself anticipated by the editor of what he calls a "technical illustrated journal." In a foot-note he acknowledges this fact, but with the qualifying reservation, that the editor in question had stated that he could not vouch for the perfect accuracy of the drawings he gave; "and, indeed," continues Dr. Scoffern, "they will be found to differ from my drawings of the gun (obtained from a reliable source, and which I can depend upon) in some important particulars. To cite an example:—The breech-screw of the Armstrong gun is perforated, as described at page 37, whereas the journal referred to depicted it solid. Other particulars of discrepancy will be discovered by reference."

We have at the present writing both drawings before us; but, after a most careful scrutiny and comparison, we have failed to detect any other discrepancy than the one alluded to. This is rather provoking, after the italicised statement in our first extract:—"*I am able to supply, for the first time, a full explanation, accompanied by* CORRECT DRAWINGS, *of that gun.*" On again referring to Dr. Scoffern's drawing, we find in a foot-note that it is no drawing at all! "*This diagram,*" he tells us, "is to be regarded in a *functional sense*, not as a copy to a scale!" So we must take the promise of "correct drawings" in a *functional sense*.

With regard to the rather delicate question of publishing what he calls "a scientific State secret," our author informs us that—"Reticence on these matters can only be expected on behalf of scientific men in office. One like myself, not in Government employ, owes no allegiance (on scientific ground) but to the spirit of inquiry and the force of truth." This is certainly taking high ground; but we are at a loss to understand how "the spirit of inquiry and the force of truth" require "scientific State secrets" to be divulged. We were not before aware that science and patriotism were antagonistic, or that the force of truth required any Englishman to disclose information damaging to his country.

Dr. Scoffern seems to be but half satisfied with this reasoning, for immediately afterwards he remarks:—

If any *lingering doubt* had existed in my mind as to the propriety of making known these facts to the British public, the doubt would instantly have been set at rest by the consideration that, before these pages are issued, the secret which our Government would affect to guard so carefully will have been known, even to all its details, by the Governments of France and the United States. Sir William Armstrong was necessarily associated with others in elaborating the piece of ordnance which bears his name; and I am informed that a dispute of a pecuniary nature having arisen, two malcontents immediately set off, one to France and the other to America, with drawings and all particulars relative to the gun."

We have no wish to be considered hypercritical in the matter, but we really cannot allow this style of reasoning to pass unchallenged. The editor of the "technical illustrated periodical" already referred to has, we observe, adopted a similar apology for publishing the "scientific State secret" of Armstrong's gun. After stating that the Government had been exercising unwonted care in keeping the nature of the invention a secret, he declares that if he believed it possible to prevent foreign Governments from learning all about it, he would support them in their course, and would willingly refrain from divulging what he knew about it; *but* "there is always plenty of French and Russian gold to be had in this country for secrets of far less importance than this." This we at once admit: there are in every community unscrupulous individuals who would sell their souls for a consideration, if a purchaser could be found for (in their case) an article of such questionable value. We do not, however, see the cogency of the conclusion which the writer draws from his premises:—

Knowing these things, we view all official attempts to suppress information in this as a challenge to the press; and we feel some pride now, as on all other occasions, in showing that the British press can do as much for the British public, in the way of obtaining information, as bribery can do for foreigners.

We do not for a moment believe that our contemporary ever intended to lay himself open to the charge which his own statement would naturally involve. But he has certainly not stated his case very clearly. If apology were required at all, it ought to have been simple and precise; instead of which, we have a most involved and illogical piece of circumlocution which condemns itself.

Whether the British press is justified in obtaining "State secrets" by unfair means, is a question which was answered not very long ago in the case of the Ionian despatches, and requires no comment from us. Whether an editor would not be justified in publishing them *after they had once ceased to be secret*, is another affair altogether. We would fain put this forward as the real apology in the case of Armstrong's gun; but, with a most singular perversity, the editor referred to, with the view of rendering his information appear more valuable, repudiates any such palliation. He says:—

It was publicly stated last week, by a newspaper correspondent, that the secret of the gun is out, and has been for weeks. But we have as yet met with no public detailed description of the Armstrong gun; and if the writer himself had been in possession of it, *he would not, we presume*, have evaded it altogether. Judging from the refusals we have ourselves met with, we believe no unofficial person will have had easy access to the information in question. *There are, however, means of penetrating all such barriers as a Government like ours can raise;* and the following statement will show that the precautions taken have proved insufficient.

We have no desire to put ourselves forward as superior to the usual temptations which beset journalists; but we cannot, in justice to ourselves, avoid stating, that, although cognisant of all the information which has yet been published concerning the Armstrong gun, we purposely abstained from divulging it in our columns. We had as much certainty as either Dr. Scoffern or our contemporary that the secret would not be kept; but, on principle, we did not conceive ourselves warranted in doing what we could not but condemn in others. To say that a certain piece of mischief will inevitably be done by somebody, and that, since somebody will reap advantage from it, we may just as well do it and enjoy the benefit as another, appears to us a very poor argument. It is precisely this style of reasoning that renders any secret of the kind under discussion so difficult to be kept. Where everyone acquainted with a secret assumes that if he do not divulge it his neighbour will, *and that, therefore*, he is warranted in anticipating him, there can be no hope of keeping it; but if, on the contrary, everyone felt bound in honour to maintain secrecy until his neighbour had spoken out, the thing would be easy enough.

Having said our say about the objectionable part of Dr. Scoffern's book, we can now with the better grace bear testimony to its merits.

There is a very philosophical exposition of the present fluctuation in the balance of destructive resources, which are shown to be due to "the oscillations caused by the powers of attack and powers of defence, mutually dominating over each other, preparatory to a more nicely-balanced equalisation to be at length established between them."

We think he might have added, that the cause of these oscillations was due to the influence which the improved state of the mechanical arts began to exercise upon the form and construction of warlike implements and appliances.

Dr. Scoffern traces all the changes which have recently taken place, in naval and military armaments, to the introduction of the Paixhans system of firing shells or hollow incendiary shot from long guns in place of firing them from mortars.

With regard to the comparative functions of solid and hollow shot, the following is well put:—

Whereas the force of an ordinary shot is determined (other things being equal) by the distance it has travelled over—or, in other words, by the force of its impact—the force of a shell, regarding it merely as to its shell function, is determined *by the locality where it may happen to be at the time of bursting, and the power of its bursting charge.* Cannon balls have often dropped on to a ship's deck, and wrought no injury whatever. They have lodged in a ship's side, and their presence there has been rather more advantageous than would have been the hole resulting from their extraction. Performing the office of a plug, a solid shot has often kept out that flood of water which, by rushing into the ship, would have sunk her. But contemplate a live shell dropped down on a ship's deck, or bedded in a ship's timbers. Contemplate that shell under solemn covenant to burst at the expiration of a given short time, and bursting accordingly! The consequences are obvious. A few such explosions, accurately timed, would destroy the largest ship that swam on ocean.—For a season let us assume land fortresses to have no existence. Let it be imagined that the only functions of war-ships are to be brought into operation against other war-ships; then the conclusion seems almost inevitable that shells discharged horizontally, as ordinary shot would be—the system, in point of fact, of Paixhans—must necessarily present advantages over solid shot, so various and so numerous, that no unprejudiced judge could hesitate to accept them for naval armaments. Nevertheless, such recognition was not universally accorded. It is not universally accorded even now. Only the Americans have adopted the shell system exclusively for their navy; in other words, to abandonment of solid shot altogether. Even the French still retain a complement of solid shot in their naval armaments, and ourselves still more. Wherefore this discrepancy of practice? is the question which may now be asked. Are there two rights and two wrongs on one and the same matter? If shells exclusively are best for the naval armaments of the Americans, wherefore not for ourselves and the French? The explanation is simply this:—Whilst the Americans never contemplate the possibility that ships shall operate otherwise than against ships, the French and ourselves hold in perspective a second view of a war-ship's functions—namely, *the attack of fortresses.*—Let us pause here to notice an admission made tacitly, or overtly, by France, England, and America—namely, that the Paixhans system is *not* adapted in the highest degree to the attack of stonework. Officers of the American navy, with whom I have conversed, conceded the point at once. "We should never dream of attacking a first-class fortress in that way," they said. "Other means would be taken."

Before proceeding to consider the kind of naval armament best adapted for the attack of land fortifications, we must supply an omission in this estimate of the naval supremacy of the Paixhans guns. The author states that the force of a shell, regarding it merely as to its shell function, is determined *by the locality where it may happen to be at the time of bursting, and the power of its bursting charge.* It may occasionally, and at rare intervals, happen that solid shot drop innocuously on the deck of a ship, and that they sometimes perform the office of a plug to keep the water out; but if the advantages of the Paixhans shells only came into play in such exceptional cases, we fear that their supremacy in naval engagements will be but short. The Paixhans gun is not rifled, and consequently the shell can only be ignited by a timed fuse; consequently, *the locality where it may happen to be at the time of bursting* can only be guessed at, within rather extensive limits of error. To determine with accuracy the locality where the shell is to burst, when fired horizontally at such a comparatively small object as a ship, it must be ignited by percussion, or, in other words, by striking against the object at which it is aimed. But to do this, the projectile must be polar, or fly with one end always forward and ready to receive the impact of collision on a fulminating cap or other contrivance; and as polar projectiles can only be fired by rifled ordnance, it follows that in the most important attribute of a shell—that is, the determination of where it is to burst—the Paixhans gun is decidedly inferior to any form of rifled gun, and must in the end give way to it. As to the second requisite of a shell, *its comparative bursting charge*, its capability in this respect must evidently depend upon where it bursts. The Paixhans shells have an advantage in their superior dimensions over any rifled shell which it has hitherto been practicable to construct, not even excepting Sir William Armstrong's. In naval warfare, however, it is to be presumed that precision of aim and consequent precision as to the locality where the shell is to burst, is of far more importance than the amount of the charge which a shell can carry.

To exemplify the present relations between the offensive and defensive capabilities of ships and land fortifications, Dr. Scoffern gives the following graphic comparison and analysis :—

We will imagine the *dramatis machinæ* involved to be ships of war and a fortress. We will assume that those on board ship propose the demolition of the fortress or the capture of it, whilst those on land propose the demolition or capture of the ship. Both are armed with a certain complement of shell-guns, of course; but not yet the refinements of rifled artillery. The opposing forces are at—say 1,500 yards distance, and the strife begins. Estimating the relative advantages involved, let us glance at them. The fortress is stationary, the ship can move: the estimate involves subtraction as well as addition. The fortress must stand still to receive all the broadsides of the ship; whereas the latter may move about, and thus disturb the aim of the fortress. But every advantage here is on the side of the ship. Less probability is there of her being hit, indeed, because of her motion; but that very motion interferes with the accuracy of her aim. The fortress is a larger mark: granted. The ship would hardly fail to hit it; whilst the fortress would stand many chances of not hitting the ship. This, too, is granted; but as to the probabilities of injury after being hit, the advantages are immeasurably on the side of the fortress. Distant 1,500 yards, or even 1,000 yards, a ship might as well fire a broadside of China oranges at a first-class fortress, with the probability of inflicting as much damage as by the firing of iron balls. No distance more considerable than 300 or 400 yards will tell for good. A ship, then, which intends to finish her work that way, will have to take up the distance of 300 or 400 yards, and (as long as possible) *keep it*. It is quite worth while to reflect on this small fact just now, when long-range rifle guns, of small shell capacity (*Armstrong's*), are in the ascendant. Whether rifle gun or common gun, the projectile it hurls must either be shot or shell. If shot, the question is, not how far it will go, but *how hard it will hit* at a given distance. If shell, then, superadded to its hitting or penetrating power, comes the even more important consideration of its power of explosion. How much gunpowder or other explosive material will it hold? The powder-holding capacity of the largest possible Paixhans shell is quite insignificant viewed as to its ability to batter down a fortification at a range of 1,500 yards. Such shells might do great execution among the gunners of a battery *en barbette*, or even against an ordinary uncovered battery; but casemated batteries may be regarded as proof against Paixhans shells; that is to say, shells fired horizontally from unrifled guns. The next question is, whether the shells of rifled guns would be more effective. That depends upon the size to which rifled ordnance may be developed and brought into practice. Armstrong's rifle gun being that by which the greatest expectations are now raised, that arm may be accepted as our standard of investigation. Up to the present time that weapon has been turned out but of two dimensions: the larger has a bore of 3½ in., and a length of 10 ft. 6 in.; the diameter of the smaller being only 2¼ in. The largest projectile weighs 32 lb., and is capable of containing 1 lb. of powder.

The 13-in. bore unrifled monster gun, forged by the Mersey Iron Company, Dr. Scoffern declares (somewhat hastily, we think,) to be a complete failure. It is already, he tells us, cracked at the breech, and its touch-hole is rapidly burning too large for service. Our information concerning the gun in question was that a slight flaw had indeed appeared in the breech, but not such as to occasion any fears as to safety under ordinary charges; as to the burning of the touch-hole, that is a casualty which all guns are liable to, and is, moreover, one which can be repaired without much difficulty or expense. There seems, however, at present, but too much reason to fear that there are all but insuperable difficulties in the manufacturing malleable iron guns of large calibre, capable of being rifled in the manner of the Armstrong gun, and adapted to the discharge of shells of sufficient weight and internal capacity to be used for the attack of first-class land fortresses. Elsewhere the author very pertinently remarks, in speaking of the recent improvements in breech-loading rifled ordnance :—

The conclusion forces itself irresistibly on my mind that to the end of breaching and demolishing first-class land fortresses, ordnance having a calibre so small as 3½ in. will not be found large enough. Long range is a fascinating element of contemplation to the public. To assume the little speck, five or six miles out at sea, darting Armstrong bolts at Cronstadt or Gibraltar, is very attractive. But an important question remains. What can these bolts accomplish when they get there? To effect demolition is the intent of their mission—and their means of demolition are limited, after all. *To burn, or batter down, or blow up*, and the list of resources is exhausted. Now, though it might be very easy for Sir William Armstrong to set fire to a town near the sea coast—Brighton, for instance—it would puzzle him to burn the granite of Cronstadt or the casemated rock of Gibraltar. Whether the Armstrong guns would succeed in battering down a first-class fortress at long range, say at four or five miles, may be judged of after studying the effects of these artillery on the iron-cased floating battery, distant only from the Mayflower—whence the shots were fired—400 yards. Finally, as to burning or blowing up. There are functions which, as I have already shown, must necessarily be proportionate to the capacity for explosive or combustive matter. *Want of capacity is perhaps the weakest point of the Armstrong shell.*

The description of the Armstrong gun and shell is very clear, and in most respects a much more perspicuous one than that given in the *Mechanics' Magazine*. Indeed, wherever Dr. Scoffern's powers of exposition are called into play, he is singularly apt and lucid, and in every case carries his reader along with him.

The Whitworth rifled cast-metal guns are casually noticed and condemned; there are, also, short notices of the Wahrendorff rifled cast-iron gun, exhibited in the Crystal Palace in 1851, and the Cavalli breech-loading rifled cannon, having a pyriform core of gun metal cast in the breech and a chase of cast iron enveloping it.

As a collateral influence in developing the recent improvements in ordnance of long range, the author traces with great clearness the progressive steps by which the results already obtained have been arrived at. The Minié rifle was the first innovation which disturbed the relations which existed between small-arms and field artillery. As mere round shot told for little against skirmishers loosely thrown out, the effective range of the old smooth-bore musket was limited to about 200 yards and as grape-shot and canister were effective up to a range of at least 300 yards, the preponderance lay with the artillery; whilst with shells, and more particularly what are called shrapnells, which are effective up to distances of 1,000 yards, the superiority was so decided as to necessitate the more liberal use of rifled small-arms. When at length the Minié rifle extended the range of the infantry weapon to 1,000 yards, the balance of advantages became in favour of the smaller arm. To restore the predominance of field artillery as compared with the modern long range rifle, the French set to work to improve the capabilities of field guns for throwing shells. This was thought to be accomplished by a modification of the 12-pounder long gun, which was shortened and lightened until it assumed somewhat of the form and dimensions of a howitzer. This compromise between the functions of a long 12-pounder field-gun and the howitzer was found capable of throwing hollow shot with good effect to a range which enabled them to deal on something like equal terms with the improved rifled small-arms. Following up this idea, Dr. Scoffern thinks he has gained a clue to the nature of the jealously-guarded secret of the new French field-gun. He says :—

Notwithstanding the secrecy in which all relating to recent proceedings taking place in French arsenals has been clouded, there can be little doubt at this time that rifled cannon constitute the *arcanum imperii*. This conclusion might have been arrived at from a judicious correlation of disjointed evidence. Firstly, it oozed out that the French were throwing aside 12-pounder field-guns, and adopting 4-pounder guns in their place. Now it is not difficult to perceive that a 4-pounder spherical gun, *i. e.*, a gun the bore of which is competent to hold and project a 4-pounder spherical iron shot, must, *except a rifle gun*, be totally inefficient and contemptible in practice—especially must it be contemptible as to its shell-launching capabilities. But, *if a rifle gun*, the case is altered. Then it need not, and assuredly would not, throw spherical shot or spherical shells. Such rifled ordnance would be adapted to the launching of elongated shot and shells, something like the Minié in form, or even more bolt-like. Such a nominal 4-pounder might thus be made to launch projectiles, not of four pounds merely, but perhaps of twelve, twenty, or even more pounds. *Therefore the newly-adopted French ordnance must necessarily be rifled ordnance.* It will be found, I believe, that the French rifled field-gun now accepted again is a nominal muzzle-loading 4-pounder, two-grooved, firing an iron shell elongated like the Armstrong projectile. The adaptation of the shell to the rifle grooves is accomplished by a pewter band spread out into wings on two sides of the shell.

We have not space at present to go more minutely into the other portions of the work, or to enter into Dr. Scoffern's theory of vertical firing with rifled ordnance for the reduction of first-class land fortresses. We believe that he is mistaken as to the capabilities of *rifles* for this purpose. It is conceded on all hands that the great artillery problem of the day is to get a means of enabling ships to attack land fortresses on at least equal terms. For this purpose, Dr. Scoffern proposes that rifled ordnance of malleable iron, of large calibre (if such an idea is practicable), should be fired with mortar charges and elevation, from iron-cased batteries. In such a case, he assumes that the long range to be obtained by such a combination would be utilised in the increased force of impact which a projectile of great weight would have in the descending trajectory of the curve due to its elevation. He seems to imagine that there is something in the rifle principle which gives increased propulsion to the projectile, and elongates the range. We have always understood, on the contrary, that the effect of rifling small-arms or ordnance was rather to shorten than extend the range; all that the rotation of the projectile accomplishes is to give increased accuracy of aim. It is difficult, therefore, to see what advantage the rifled ordnance could give in vertical firing, where the principal object to be obtained is not so much accuracy of aim as force of impact. The polarity of the shell, as a means of igniting it by percussion, is, in the case of vertical firing, of but questionble efficacy. Is it certain that, after performing a parabola in the air, a rifled shell will descend, like an arrow, point downwards?

With regard to the monster mortar of Mr. Mallet, Dr. Scoffern makes a suggestion which deserves notice. He says :—

Just in proportion as ordnance are increased in size, so that the weight of the projectile is proportionately increased—also just as rifle projectiles, of equal weight, and equal area of surface contact, are more tightly impacted in the barrel—so, theoretically, should the grains of gunpowder be larger. I should, for instance, have been well pleased to have seen Mr. Mallet's great mortar tried with gunpowder having grains as large as horse beans.

As to the application of chemical resources to the charging of shells, upon which Dr. Scoffern ought to be able to speak with some authority, as he is now, we understand, engaged in making experiments with new forms of combustion and explosive shells, it is some relief to the philanthropic class of the community to learn that the sphere of application in this respect is restricted to an extent which a person not conversant with the subject would not imagine.

In relation with this subject, Dr. Scoffern relates an incident of so ludicrous a nature that we cannot think of omitting it :—

A gentleman, to whose labours in the elaboration of explosive projectiles I have more than once borne honourable testimony, has either permitted the following statement, or suffered from the publication of that statement unknown to him. I perceive it set forth that a gentleman is in exclusive possession of the knowledge of what he calls his "liquid fire charge." Why *I* was the person who first told him how to make that liquid fire—nay, I gave him some; and the fact of my doing so ought to be impressed on his memory. "By no means put it into the recesses of your pocket," I said; "carry it in your hand, for if a little oozes out, you will burst into flame inevitably." He went away, promising to attend to the advice. Nevertheless, hating to be conspicuous, I imagine, he put the bottle into his pocket (a skirt-pocket, fortunately), and pursued his way. Some of the liquid fire presently oozed out, and the result was as I have said. The gallant gentleman's skirts were set on fire, and he was presently seen, meteor—or rather comet-like, rushing through the streets. If this circumstance does not bring to his memory the real state of the case, he must be very unimpressible. But I shall believe, until otherwise assured, that the gentleman alluded to has no cognizance of the statement in question.

Well done, Dr. Scoffern! With this parting shot at Captain Norton, we take leave of the author. We can assure our readers, as, indeed, the extracts we have made will show, that the book is both interesting and instructive. The price is not stated, but we imagine it must be cheap; and to those interested in the subject we would unhesitatingly recommend the purchase of the "New Resources of Warfare."

On Naval Warfare with Steam. By General Sir HOWARD DOUGLAS, Bart., G.C.B., G.C.M.G., D.C.L., F.R.S. London: John Murray, Albemarle-street.

FROM the date of the next war which may occur between first-rate European Powers, will begin a new era in the history of civilised warfare. On land, as on the sea, the tactics which have hitherto been adopted will be found obsolete, and will have to give place to a new system. Those who may not perceive the necessity of the change, the nations or the individuals who must still cling to the traditions and strategic axioms of the latest European struggles, connected as they may be with the successes and brilliant achievements of a past generation, may require, by a few hard lessons and dearly-earned experience, to be convinced of this truth. But it behoves us all—now that inventors and thinkers, of our own country more than of any other, have changed the aspect of the battle-field, and stultified the latest combinations of naval warfare—to perceive and to take the vantage-ground they have prepared for us. It is not merely the deadly weapons we possess, nor the newly-acquired and powerful means at our disposal, that can advance our success or ensure our safety. The same appliances are open to all. They give but wider opportunity to strength and energy; they are fortune's gifts to the brave and to the keen of intellect; worse than useless to others who cannot use her favours: for there has been hitherto no eureka that can remain a secret engine of destruction or exclusive power to destroy. The philosopher, ever more or less cosmopolitan in his broad sphere of vision, might look with alarm and anxiety on the exclusive possession by one nation or by one *coterie* of a terrible and unknown means of warfare. But, from the very nature of these new appliances of science, they must become a legacy to those who are foremost in the path of progress. One man perhaps, and that man an inventor—we use the term with more reverence than is commonly given to the name—*might* in his own breast hold the secret power which, at any time, could turn the tide of war in his country's favour! We wish, indeed, the possibility of this had greater likelihood of being evidenced by the fact; but such a reservation would seldom occur, despite all the vexatious neglect which commonly meets the originator of signal improvements.

It is our promptitude in recognising the conditions on which depends the successful application of our new powers that must determine our individual benefit from improvements in the means of warfare. There are men ever ready to follow in the wake of recognised success—men whose powers of observation and judgment are sufficient to appreciate a fact that has been established—an innovation which has stood the test of actual trial, and which also may have borne its chiefest fruits. But these are not the men which we shall require at a crisis which at any time may arrive. In England's next struggle, whether on the tented field or the no longer uncertain ocean, success must be won by those qualifications which can give confidence in an untried field of action, by the original observation, intuitive skill, and unhesitating determination, to which, when they accompany the knowledge of the true conditions of success, men give the name of genius.

It is a mistake to assume, as has been done, that these new appliances place the power of successful warfare solely in the hands of those nations whose vast resources enable them to command, in greater degree, the crude *materiel* of war. Power may indeed employ them against weaker States; but the same means may become more terrible in the hands of those who may have all to defend and but little to lose. Wealth may indeed supply its own defence, but cannot, with so much at stake, afford with safety to become the aggressor of lesser nationalities. The truth is that every new weapon of destruction, which is a gift to all, becomes of most avail to those who need its use, and must use a desperate means for a desperate purpose.

With these remarks, which may be necessary to counteract some mistaken impressions which are prevalent on the subject, of the purpose and value of our new appliances of warfare, we introduce to our readers a work which we hope may be the first of a series of treatises on naval and military science, as modified by recent improvements. In the Introduction to this treatise, Sir Howard Douglas, in dwelling upon the probable effects and comparative advantage to different countries of the introduction of steam as a moving power for ships of war, alludes to the opinion which prevails abroad, that such innovation will operate to the disadvantage of Great Britain. This opinion is founded on the assumption that our naval successes and our supremacy on the sea have been hitherto due to our skill in anticipating the effects of changes of wind and tide, and to the superior efficiency of our seamen in executing the manœuvres rendered necessary by such changes. Granting that this is the case, and also that Great Britain will *not* maintain her superiority in naval warfare by her progress in nautical science and her advances in mechanical contrivance, the opinion might be well founded. But, as our author proves, there is nothing to justify such a presumption; and the advantage of our resources in producing steam machinery of the greatest power and perfection, and in obtaining engineers and seamen qualified in the highest degree for naval service, should enable our commanders to preserve their present superiority over those of the Continent, providing always that they are prepared to avail themselves of every improvement that science and practice can suggest.

The first section of the work is devoted to a consideration of the mechanical principles involved in the application of steam power to ships of war, most of the details being adapted for scientific professional study. In the comparison of the respective advantages and disadvantages of the paddle and the screw, preference is of course given to the latter; nevertheless, arguments are adduced to show the inexpediency of entirely superseding the wheel-steamer. With regard to the description of screw best fitted for vessels of war, that of Messrs. Maudslay and Field, with which the ship may proceed under canvas alone, without the necessity of the screw being raised out of the water, and without the immersion of the screw offering any resistance to the onward progress of the ship, receives particular attention. To prevent the fouling of screws by ropes, nets, &c., becoming wound upon their bosses, an accident of frequent occurrence, the author proposes to employ strong and sharp steel knife edges, fixed to the metal trunk in which the screw works, in such a manner that any rope that may have hitched in the boss may be acted upon, during the revolution of the screw, as a body revolving in a turning-lathe is acted upon by the chisel.

The second section, which concludes the work, and which regards more particularly the naval profession, treats of the tactics of warfare with steam-vessels. It is shown that the advantage hitherto secured by obtaining the "weather gauge" will now be the result of a superior degree of speed in the vessels of a steam fleet, for which no tactical skill on the part of the enemy can compensate. But it is also inculcated that, with an enemy willing to fight, the amount of steam power should, in order to secure efficient gunnery, be limited to that which is barely sufficient to keep the ship under the guidance of the helm.

RAILWAY MATTERS.

ANTWERP AND ROTTERDAM.—The directors of this company state in their report that the capital account, which is closed, consists of 50,000 shares, of £10 each, £500,000, and 2,000 bonds, of £40 each, £80,000; total, £580,000. The revenue account for the year 1858 shows that £47,747 had been received, and £29,016 expended, leaving a balance of £18,731. The receipts consisted of £33,685 from the railway, and £14,062 from the steamboats; while the expenses consisted of £18,859 for the railway, and £10,157 for the boats, showing that the net receipts from the railway amounted to £14,826, and from the steamboats to 3,905—making together, as above, £18,731. The working expenses on the railway amounted to 55½ per cent. of the receipts, and on the railway and water taken together the working expenses amounted to 60½ per cent., showing a reduction of 10s. per cent. as compared with 1857, and £9 per cent. as compared with the working expenses of 1856. The passenger receipts amounted to £27,158, being a decrease of £1,184, or 4½ per cent., upon 1857. The receipts for luggage amounted to £2,321, being nearly the same as in the preceding year. The receipts for horses and cattle amounted to £2,512, showing a decrease of 8 per cent.; and the goods receipts amounted to £15,260, being an increase of £2,717, or 22 per cent., upon 1857, and of 57 per cent. upon 1856. The plant and permanent way had been kept in a perfect state of repair. The net profit for the year 1858 amounted to £13,130, out of which the board recommend the payment of a dividend of 6¼f. per share, leaving the balance, 5,246f., to be placed to the credit of the reserved fund. The report states that there is every probability of the line being extended from Moerdyk to Rotterdam, and that the company will have the use of it on paying a reasonable toll, which would have the effect of increasing their receipts and diminishing the expenditure.

EAST INDIAN.—The directors of this company state in their report that 21 miles of additional line were opened on the 1st of October last; the line from the river Adjai to Cynthea, 24 miles, will, it is expected, be completed during the present year; the next 33½ miles by June, 1860; the following 25 miles by the end of the present year; and the remaining 25 miles into Rajmahal, by the autumn of 1860. The state of the next division, 24 miles, is not quite so forward, though 12 miles are ready for the permanent way; the succeeding division, 26 miles, will, it is expected, be ready for the rails in July, 1860; 26 miles of the next 43 will be ready for the rails by the end of this season; 15 miles of the following 31½ miles are now ready for the permanent way; the Monghyr tunnel on this division is steadily advancing; the progress in Keeul and Hullchur divisions, 24½ miles, has been considerable; 11 miles out of the next 31½ are ready for the rails, and 6 more will be finished immediately; on the next 31½ miles the progress has been satisfactory, and 13 miles are ready for the permanent way. The works on the Soane district, 78½ miles, extending to the river Kurrumnassa, the boundary of the Bengal division, and at the Soane bridge, have been resumed, are steadily progressing, and 43 miles will be ready for the permanent way before next rains. The whole length thus included in Mr. Turnbull's report is 419 miles. From Mr. Purser's report it appears that 123 miles in the North-West Provinces are open for traffic, and that 282 miles are ready for the permanent way materials. The board reported on a former occasion the steps which were in preparation to meet the difficulty of transport; and they have now the pleasure to state that, of the six steamers building in this country, one has already been shipped for India, the hull of the second is completed, a third will be tried during the next month, and the remaining three are well forward. One pair of engines is completed, four pairs will be ready in about two months, and the last pair is well in hand. There are seven barges, each capable of carrying 420 tons, under contract: of these one is finished, four others will be ready in about three weeks, and the remaining two are well forward. There are also fifty 45-ton barges under contract; thirty-two are completed, and the remainder nearly finished. The number of passengers carried during the half-year ending the 30th of June was 581,274, of which 555,082 were third class, 28,051 second class, and 8,445 first class. The increase in the total number of passengers was 69,218 as compared with the corresponding half of the preceding year. The number of passengers carried in 1858 was 1,172,852 against 1,070,907 in the year 1857. The gross traffic receipts for the half-year ending the 31st December were £85,972, showing an increase of £16,639 over the corresponding half of the preceding year. The receipts for the year 1858 amounted to £166,871 against £133,640 in 1857. The net traffic receipts for the half-year ending the 30th of June, 1855, amounted to £10,631; ending the 31st of December, 1855 to £20,621; ending the 30th June, 1856, to £27,791; ending the 31st December, 1856, to £29,269; ending the 30th June, 1857, to £40,215; ending the 31st of December, 1857, to £42,555; ending the 30th June, 1858, to £45,170; and ending the 31st December, 1858, to £12,978. The last amount will be affected to the extent of £4,744, if the Government refuse to admit as a charge against revenue the cost of replacing the iron sleepers which were put down for experimental purposes. The gross receipts on 121 miles of railway per mile per week in 1855 amounted to £10 12s. 6d.; in 1856 to £15 5s. 5d.; in 1857 to £21 4s. 9d.; and in 1858 to £26 10s. 5d., including an additional twenty-one miles for three months. The net receipts paid to the East India Company were in 1855 £31,252, in 1856 £57,060, in 1857 £82,770, and in 1858 £88,148. The line from Allahabad to Cawnpore has been for some time past available for the use of the Government, but the latter had consented to the line being opened for general traffic on the 3rd of March. In the prosecution of the surveys of the Jubblepore line, Mr. Evans, the chief engineer, and his assistant, Mr. Linnell, were attacked and murdered by a party of rebels. Mr. Linnell, whose qualifications were reported to be of the highest order, had but lately joined the service, but Mr. Evans was one of the oldest and most respected of the company's officers. The total amount of capital now created for the main line is £10,731,000, the amount specified in the contracts with the East India Company as the probable amount of capital required for the construction of a double line to Burdwan and a single line for the remainder of the distance to Delhi. In consequence, however, of the delay and losses caused by the mutiny, and its effect on the cost of transport, labour, and materials, this sum will not prove altogether sufficient to complete the line and provide the necessary amount of rolling stock.

EAST SUFFOLK.—It is stated that this line will be opened, as far as Woodbridge, on Monday, the 2nd of May. Some doubt exists as to whether the section between Ipswich and Woodbridge will be completed by that date.

CORNWALL.—According to present arrangements this line is to be opened on Monday, the 2nd of May, by Prince Albert in person. It is understood that his Royal Highness will leave Windsor at 6 a.m. by special train, and arrive about noon at the Albert Bridge, Saltash, where he will be received by the directors and the Government authorities.

FRENCH RAILWAYS.—It appears certain that the railway from Marseilles to Toulon will be opened to the public on the 3rd of May. There are to be two departures in the morning of omnibus trains, at 7 and 8.50, and four in the afternoon, at 2.30, 5, 7.10, and 7.45. There is to be, moreover, an express train at 3.35. The omnibus trains will perform the journey in two hours and a half, and the express train in an hour and fifty minutes.

GREAT INDIAN PENINSULA.—The report of the directors of this company states that the portions of the railway under construction by contract, upon which operations have been carried on during the past half-year, are the Bhore Ghât incline, 13½ miles, the section from Poonah to Sholapore, 163 miles, from Wassind to the foot of the Thull Ghat incline, 25 miles; the Thull Ghât incline 9 miles, and from the summit of this incline to Bhosawul, 190 miles; together, 400½ miles. The board regret that upon the Bhore Ghât incline the contractor has failed to carry forward the work in such a manner as alone could have secured its completion by the date fixed in the contract. Arrangements were in progress at the departure of the last mail from Bombay to put an end to the contract. On the termination of the contract the most energetic measures will be taken for prosecuting the whole of the works on the Bhore Ghât incline. The directors hope that the through communication by railway between the Concan and the Deccan will be completed without any further obstruction. The works on the other contracts continue to be executed steadily. The portion of the railway from Poonah to Decksal, a distance of 64½ miles, was completed and opened for public traffic on the 15th of December last. Upon the line from Bhosawul to Jubbulpore, 332 miles, the contractors have been principally engaged during the half-year in the necessary preliminary arrangements. The construction of the Nagpore branch, 263 miles, has been let by public competition, and is to be completed by the 25th of March, 1863. During the half-year the opened portion of the railway has continued to be safely and efficiently worked. It consisted, on the 31st of December last, of 88½ miles in the Concan, and 106¼ miles in the Deccan, total 194¾ miles. The gross receipts on revenue account during the half-year amounted to £60,890, and the expenses to £26,400, or 43·35 per cent. of the receipts, leaving a net profit of £34,490. Compared with the corresponding half of the previous year an increase of £28,022 is shown on the gross receipts, an increase of £17,019 on the net profits; and a decrease of 3·49 per cent. on the working expenses. Leaving out of the account the receipts for seventeen days on the portion of the line between Poonah and Decksal, the average receipt per mile from the remaining 130½ miles open throughout the six months amounts to £463, against £371 in the corresponding half-year, being an increase of 25 per cent., which the board consider very satisfactory. The total number of passengers conveyed during the half-year was 553,816 against 383,163 at the corresponding period of 1857, showing an increase of 170,653 passengers, of whom 142,726 were third-class, 26,347 second-class, and 1,580 first-class—the total number of third class passengers being 505,138, of second-class 41,708, and of first-class 6,970. The interest account to the 31st of December last shows that £642,568 had been paid by Government to the company as interest on paid-up capital, out of which is deducted £133,183 paid by the company to the Government out of net revenue, leaving a balance against the company on interest account of £509,384. The combined (London and Bombay) capital account to the 31st of December shows that £4,241,159 had been received, including £330,406 in Bombay; and £3,636,727 expended, including £1,475,733 in Bombay; leaving a balance of £604,432, including £2,965 in Bombay.

GREAT SOUTHERN OF INDIA.—The report stated that, after considerable difficulty and some opposition, the directors had succeeded in obtaining the sanction of the court to make the first section of the line. The directors, after a careful consideration of the whole subject, had determined to take the construction of the works into their own hands. The works would be executed with economy and care under the direction of their own officers, who were fully competent to carry out the undertaking. Captain T. Nutting wished to know whether the guarantee was not for a capital of £1,000,000. The chairman said that had been the amount proposed in the first instance, but their engineer had ascertained that £500,000 was the amount required for the first section from Negapatam to Trinchinopoly, and upon the latter sum they had a guarantee of 5 per cent. per annum. In reply to questions, it was stated that the first section would be eighty miles in length, passing through a populous district, and could be constructed in two years for less than £7,000 a-mile, including working stock.

ARTIFICIAL MANURE.—Professor Hunt, in a lecture at Montreal, said he was of opinion that from 100,000 to 150,000 tons of artificial manure might be manufactured annually from the waste of the Canadian fisheries; and this equal to Peruvian guano. The French were aware of the importance of this manure, and were now manufacturing it, on a large scale, in the Straits of Belle Isle.—*New York Journal of Commerce.*

COTTON FROM AUSTRALIA AND AFRICA.—The adaptability of Australia and South Africa to the growth of cotton of the most useful, as well as the finest qualities, is placed beyond doubt by the samples now at Manchester of cotton recently grown in those colonies. *The Cotton Supply Reporter* (issued by the Manchester Association) of Saturday, publishes further correspondence received from both these localities. The Governor of Sydney, Sir Wm. Denison, takes a strong personal interest in the question of promoting the cultivation of cotton in Australia, and Lieut.-Governor Scott, of Natal, is doing all in his power to further the same object at the Cape. Private merchants and cultivators in both countries are turning their attention to cotton culture; and we learn that 500 labourers have been engaged to commence cultivation at Rockhampton, in Australia.

TREES IN THE METROPOLIS.

WE keep account of the buildings that are run up in the metropolis. Our statistics on most points connected with its population, trade, shipping, and vehicles are pretty accurate; but who can tell us how many trees have been planted in London and its environs last year—or for any number of years past? And yet the planting of trees is a matter of no slight importance in and about a great city, both for ornamental and economic purposes. How little is done to relieve the dark grim ugliness of London in this respect! Long monotonous lines of streets and squares, great hotels and termini, public buildings of various kinds, docks, and railway stations, spring up in rapid succession; but no one cares to plant a tree to afford its shade-relief and pleasant foliage for the eye forced to wander over continuous masses of white stucco.

The annual report to the Metropolitan Board of Works just issued by Mr. Marrable, their superintending architect, tells us that the number of new buildings erected within the metropolis during the last three years cannot be less than 20,000, exclusive of additions. Now, if but the same number of useful and ornamental trees had been planted in that period, what a benefit would have been conferred on present and future generations!

A year or two ago our contemporary, the *Building News*, suggested and supported, in a series of articles, the advantage of a more general introduction of shade-trees for the metropolis. These suggestions met with very general approbation in all quarters, but as yet have been very little acted upon by private individuals or public bodies. It cannot be because trees are unsightly. The Boulevards of Paris, and the like-planted avenue-streets of the Continent, are undeniably picturesque and attractive; nor are the avenue high roads without charms. Indeed, the avenue is a recognised artistic resource by which many of our country mansions and parks profit. Who has not wandered with pleasure under avenues of elms and oaks, the clustering chestnut flowers, and the sweet-scented limes? We are not recommending, however, what are the best trees for cities, we are merely enforcing the opinion of the desirability of increasing our sylvan representatives in the urban and suburban districts.

"Dinna forget to plant young trees wherever you can set them," was the last advice of a shrewd Scotch landholder to his heir, "for they'll grow up while ye're sleeping." Any rich upstart can build a fine house in a very limited time, but he cannot build the old oaks. Every year that we neglect to adorn our pent-up squares, broad thoroughfares, and suburban drives with trees, we are wasting the time that the vigorous shoots might be rooting more and more firmly in the ground. It is not desirable to have trees too thick, so as to keep the sun entirely from dwellings; but houses, streets, and walks may be partially shaded with very great advantage.

It is related of the great Oberlin, that he made every child in his schools plant and rear at least two trees; and thus in a short time the Ban de la Roche, a district naturally bare and rocky, was insensibly covered with luxuriant plantation. In Bâle, there is also an excellent custom. Six trees are planted on the occasion of every marriage, and two at the birth of every child. An abundant supply of trees is thus systematically obtained. Here, on the contrary, individuals are more prone to fell, root up, and destroy trees than to plant them. Something on a small scale is doing in tree-planting in the new parks; but shrubs rather than trees seem to have the preference. We are glad to hear that the Crystal Palace Company are about to form an arboretum in their grounds at Sydenham, for this will be an additional attraction and public benefit.

It has been suggested that each district board in the metropolis should have a landscape gardener attached to it, who might be paid a small yearly fee for suggesting and directing the planting of trees. The vacated churchyard sites in the city, old Smithfield, and other localities, might be adorned by a few trees and shrubs, which could be kept in order for a few pounds a year. There are several deserted squares and groves, now devoted to dead cats and dogs and rubbish, which might also be reclaimed by the surveyors of the Board of Works, and a few trees planted.

When we cross the Channel, and observe how systematic is the planting of trees in the principal towns and cities of the Continent, and how much they add to the beauty and leafy shade, we might take a useful lesson for some parts, at least, of London and its suburbs. What can be more stately and attractive than Berlin and Potsdam for their Linden, Strasse and Unterlinden, and Paris for its Boulevards and Champs Elysees?

Paris, which is much better supplied with trees than our own metropolis, suffered, however, in the destruction of those of the Boulevards some ten years ago, to serve as barricades, or to make room for trees of liberty—trees which, however, never prospered. A classified system of planting has recently been adopted by the civic administration, and each of the Boulevards is to be characterised by the shade and ornament of a special class of tree; whether this uniformity will not have a monotonous effect remains to be seen. Thus the Boulevard de la Madelaine and des Capucine are to be planted with planes; the Boulevard des Italiens with Japan sumacs, the Boulevard Montmartre with elms, the Boulevardes Poissonniere and Bonne Nouvelle with chestnuts, the Rue Royale with South American sycamore or maple, and the space in front of the Gymnasic with catalpas. This autumn the plantations will, it is said, be continued up to the Bastille.

There is ample scope for the introduction of trees, with great benefit and picturesque effect, in many localities of the metropolis; such, for instance, as the new roads formed near the Kensington Museum; the approaches to the new Chelsea Bridge; the Grosvenor-road, on the Thames embankment, from the Pimlico Pier to Chelsea Hospital; Portland-place; the proposed road from Limehouse and Bow to Victoria Park; Victoria-street and Vincent-square, Westminster; Camberwell Green, and such like open spaces.

There is no necessity for sticking trees round the Royal Exchange, St. Paul's, Trafalgar-square, or other similar circumscribed spaces; but there is no reason why they should not adorn the river banks, or some of the railway lines and termini, the banks of canals, the centres of squares, and open roads and streets.

Not only do trees attract and condense the moisture suspended in the air and borne by the winds over the earth's surface, which, falling from their leaves, keeps the ground below moist and cool; but they can, by means of their roots, pump it up from a very considerable depth, and, raising it in the atmosphere, diffuse it over the face of the country. Trees by the transpiration of their leaves, surround themselves with an atmosphere constantly cool and moist. They also shelter the soil from the direct action of the sun, and thus prevent evaporation of the water furnished by rains.

But, apart from the aerating functions of such a large body of trees, the possession of some 20,000 timber trees would in the next generation be no insignificant asset of the then Board of Works. There is scarcely a municipality in Europe which has not valuable property of this kind in its streets, place d'armes, ramparts, and esplanades.

The Metropolitan Board has now the ownership of many thousand acres of thoroughfares, and this area will be increased by new parks, the embankments, and by lapsed squares and commons, constituting a large domain, and the available portion of it bearing, or capable of bearing, many thousand trees.

Judicious planting would go far to redeem the insignificance of many long lines of mean buildings, which now detract from the appearance of noble thoroughfares; and we trust that amid the other public improvements carrying out, or projected, the more general planting of trees will not be overlooked.—*Mark Lane Express.*

RAILWAYS AND PRIZE FIGHTS.—The magistrates assembled in general sessions, at Maidstone, have been discussing the facilities afforded by the South-Eastern Railway Company to large bodies of persons who travelled on their line with the avowed object of taking part in prize fights, and thus committing a breach of the peace; mentioning that on the occasion of the recent fight for the championship a special train of thirty-four carriages, containing nearly 2,000 persons, stopped for a long time midway between Headcorn and Pluckley, the safety of those travelling by the ordinary trains being thereby greatly endangered.

THE PATENT JOURNAL.

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

Grants of Provisional Protection for Six Months.

572. William Mitcalfe, Coal Exchange, London, "Improvements in discharging cargoes, and in raising and lowering bodies."—*Petition recorded 3rd March*, 1859.
588. Richard Leake and Matthew Sykes, Barnsley, Yorkshire, "Improvements in furnaces for consuming smoke and generating heat, parts of which improvements are applicable to furnaces generally."—*Petition recorded 5th March*, 1859.
616 John Cooke, Cheltenham, Gloucestershire, "Improvements in apparatus for giving signals on railways and vessels, and other such like uses."—*Petition recorded 9th March*, 1859.
662. Henry Ambler, Halifax, Yorkshire, "Improvements in breech-loading ordnance, and in the means of producing part or parts thereof, which improvements are also applicable to what are called small arms."—*Petition recorded 16th March*, 1859.
680. Alexander Mein, Saint Rollox, Glasgow, Lanarkshire, "Improvements in making glass bottles, and in the apparatus connected therewith."—*Petition recorded 17th March*, 1859.
740. Benjamin Browne, King William-street, London Bridge, London, "A new method of working or operating switches and signals on railways by improved apparatus for that purpose."—A communication from Victor Armand Prou, Rue de Sèvres, Paris, France.—*Petition recorded 23rd March*, 1859.
762. William Redgrave, Tavistock-street, London, "An improved pillow travelling cap."
764 .Samuel Dreyfous, Guy Richer, and Edouard Cormier, Paris, France, "Improvements in preserving eggs."—*Petitions recorded 26th March*, 1859.
792. John Wilson Hadwen, Kebroyd Mills, Halifax, Yorkshire, "A new art or manufacture for converting certain kinds of silk waste into yarns or threads."—*Petition recorded 30th March*, 1859.
806. Thomas Ivory, Edinburgh, "Improvements in steam boilers and furnaces for the same."—*Petition recorded 31st March*, 1859.
824. Abraham Ripley, Bridge-street, Blackfriars, London, and John Roberts, Nelson-square, Bermondsey, Surrey, "Improvements in machinery for striking or scraping leather and tanned or untanned hides."
826. Anthony Bessemer, Tavistock-terrace, Upper Holloway, Middlesex, "Improvements in furnaces to be employed in the manufacture of iron and steel."
828. Joseph Skertchly, Ashby-de-la-Zouch, Leicestershire, "Improvements in apparatus for regulating the pressure of gas."
830. Arthur Paget, Loughborough, Leicestershire, "Improvements in machinery or apparatus for the manufacture of looped fabrics, and in the manner of constructing the same."
832. Michael Coupland, Haggerstone, Middlesex, "Improvements in furnaces."—*Petitions recorded 2nd April*, 1859.
836. Joseph Eccles, Blackburn, Lancashire, "Improvements in machinery for making bricks, tiles, and other articles formed of plastic materials."
840. James Henry Burton, Enfield Lock, Middlesex, "Improvement in the manufacture of barrels for small fire-arms."
842. Alfred Vincent Newton, Chancery-lane, London, "An improved construction of retarding apparatus or brake for railway carriages."—A communication from Mr. Augustin Castellir, Saragossa, Spain.
844. Matthew Augustus Crooker, New York, U.S., "Improvements in paddle wheels for steamers."
846. Edmund Morewood, Enfield, Middlesex, "Improvements in coating metals."—*Petitions recorded 4th April*, 1859.
850. Edward Fairburn, Kirkless Mills, Mirfield, Yorkshire, "Improvements in machinery for carding wool and other fibrous substances."
854. Benjamin Browne, King William-street, London Bridge, London, "Improvements in propelling ships or other vessels through water."—A communication from Philip Kearney Skinner, Bombay, East Indies.
858. Francis Maltby Crichton, Stoke Abbey, Stoke Bishop, Westbury-upon-Frym, Gloucestershire, "Improvements in clocks or time keepers." —*Petitions recorded 5th April*, 1859.
862. William Owen, Rotherham, Yorkshire, "Improvements in the manufacture of railway wheels and tyres and in the apparatus employed therein."—Partly a communication from Robert Owen, San Geronimo, Central America.
864. John Scoffern, Barnard's-inn, London, "Improvements in lubricating projectiles and cartridges."—*Petitions recorded 6th April*, 1859.
866. Alexander Chaplin, Glasgow, Lanarkshire, N.B., "Improvements in steam boilers."
868. Robert Wardell, Stanwick, and Henry Kearsley, Ripon, Yorkshire, "Improvements in reaping machines."
870. John Lakin, jun., Hall End, near Tamworth, Warwickshire, "A new or improved agricultural drill."
872. James Rawlings, Carlton Hill East, Middlesex, "Improved construction of boot tree."—*Petitions recorded 7th April*, 1859.
874. William Henry Smith, Philadelphia, Pennsylvania, U.S., "Improvements in the construction of cartridges, and in the fire-arms for using the same."
876. William Campion, Nottingham, "Improvements in machinery for the manufacture of looped fabrics."
878. Marc Antoine Francois Mennons, Rue de l'Echiquier, Paris, France, "An improved articulated joint for water, gas, and steam pipes."—A communication from Victor Doré, Paris, France.
880. Nicholas Alexis Grumel, Paris, France, "Improvements in dyeing cotton, wool, silk, flax, and other fibrous materials or fabrics."
882. William Hooper, Mitcham, Surrey, "Improvements in re-working or re-manufacturing compounds of india-rubber and sulphur."—*Petitions recorded 8th April*, 1859.
888. Thomas Barnett, Oldham, Lancashire, Henry Turner Sourbuts, and William Loynd, Hyde, Cheshire, "Improvements in steam engines."
890. John Hawkins, Lisle-street, London, "Certain improvements in the manufacture of stirrups, bits, spurs, buckles, and other such articles connected with harness and saddlery."
892. Richard Jones Derham, Redcliffe-street, Bristol, Somersetshire, "Improvements in cheese vats."
894. Charles Frederic Vasserot, Essex-street, Strand, London, "A new motive power applicable to tanneries."—A communication from Jean Pascal Lucet, Fontenay-le-Comte, Vendée, France.
896. Henry Francis Gardner, Boston, U.S., "Improvements in machinery for blocking or crimping the uppers of boots and shoes, and in treeing boots."—Partly a communication from William Willmott and Philander Shaw, U.S.—*Petitions recorded 9th April*, 1859.
904. Alfred Bower, Liverpool, Lancashire, "Improvements in or applicable to the keels of navigable vessels."
906. Richard Archibald Brooman, Fleet-street, London, "Improvements in candle moulds."—A communication from Auguste Godchaux, Paris.
908. William Henry Barlow, Great George-street, Westminster, "Improvements in beams and girders."—*Petitions recorded 11th April*, 1859.
910. William Clark, Langhaugh, Galashiels, Scotland, "An improved safety block to be used for lowering ships' boats, the same being applicable to other like or analogous purposes."
912. Patrick Aitchison, Sheffield, Yorkshire, "Improvements in taps."
914. Eugene Theodore Noualhier, Paris, France, "An improved ventilator."
916. Philip Hill, Manchester, and John Moore, Salford, Lancashire, "Improvements in weaving double pile fabrics."
918. Mathieu Castay, Paris, France, "Improvements in metallic bridges."
920. Joseph Ward, King's Norton, Worcestershire, "An improvement or improvements in working fly presses used for raising metals, coining, and other like purposes."
922. Samuel Tatton, Leek, Staffordshire, "Improvements in preparing and treating silk, and improvements in dyeing silk."—*Petitions recorded 12th April*, 1859.
924. William Arena Martin and James Purdie, Woolwich, Kent, "Improvements in fire-bars."
928. William Craft, Cambridge-road, Hammersmith, and Thomas Wilson, Bradmore House, Chiswick, Hammersmith, Middlesex, "Improvements in the manufacture of pinafores and bibs for children."
932. John Lee Stevens, Fish-street Hill, London, "Improvements in the fire grates of locomotive, marine, and other furnaces."—*Petitions recorded 13th April*, 1859.

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

935. Joze Luis, Welbeck-street, Cavendish-square, London, "A new cooling apparatus for liquids, especially beer."—A communication from Jean Louis Baudelot, Rue Mogador, Paris, France.—*Deposited and recorded 14th April*, 1859.
988. Alexander William Williamson, University College, London, "Improvements in making extracts from liquorice root."—*Deposited and recorded 19th April*, 1859.

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

945. William Crosley, Westbourne Park, Middlesex, and George Goldsmith, Leicester, Leicestershire.—Dated 19th April, 1856.
994. Charles Swift and John James Derham, Blackburn, Lancashire.—Dated 25th April, 1856.
953. William Maugham, Ifield-terrace, Stockwell, Surrey.—Dated 21st April, 1856.
958. Alexander Symons, George-street, Mansion House, and Edward Burgess, Clerkenwell Green, London.—Dated 22nd April, 1856.
1006. Thomas Heiffor, Sheffield, Yorkshire.—Dated 26th April, 1856.
997. Robert Lakin, Stretford, John Thompson, Edward Gerrard Fitton, and Frederick Alexander Fitton, Ardwick, Manchester, Lancashire.—Dated 25th April, 1856.
1003. Claude Antoine Arnaud, Lyons, France.—A communication.—Dated 26th April, 1856.
1058. Isaac Holden, St. Denis, near Paris, France.—Dated 5th May, 1856.
1097. George Jordan Firmin, Newton-le-Willows, Lancashire.—Dated 9th May, 1856.

Patent on which the Stamp Duty of £100 has been Paid.

452. John Carnaby, St. John-street, Clerkenwell, London.—Dated 20th October, 1852.

Notices to Proceed.

2845. Patrick Robertson, Sun-court, Cornhill, London, "Improvements in shuttles.—A communication.
2847. Maximilien Schaffner, Eisnach, "Improvements in smelting zinc ores, and in furnaces employed for this purpose."—*Petitions recorded 11th December*, 1858.
2851. Robert Whittam, Accrington, Lancashire, "Improvements in machinery or apparatus for tracing designs from an engraved roller, or from an engraver's sketch upon steel or other metallic surfaces used as dies by engravers to calico printers."—*Petition recorded 13th December*, 1858.
2866. Ferdinand Jossa, Bishop Auckland, Durham, "Improvements in furnaces for generating steam and other purposes."—*Petition recorded 14th December*, 1858.
2876. Jonathan Wardill, Commercial-road East, London, "An improved stopper or controller to stop and control the running out of chains and ropes."—*Petition recorded 15th December*, 1858.
2886. John Walter Friend, Freemantle, Southampton, "Improved apparatus for ascertaining and registering the depth and flow of liquids, and the distances run by ships at sea."
2887. Alexander Mackenzie, Glasgow, Lanarkshire, N.B., "Improvements in sewing machines."
2888. Joseph Jean Marcais, Paris, France, "Improvements in galvanic batteries."
2890. Richard Archibald Brooman, Fleet-street, London, "An improvement in plating and gilding forks, spoons, and other metal articles."—A communication from Messrs. de Sauvigny, Paris.—*Petitions recorded 16th December*, 1858.
2893. William Beckett Johnson, Manchester, Lancashire, "Improvements in machinery or apparatus for preparing for joining the rails of railways." —*Petition recorded 17th December*, 1858.
2902. James Taylor, Birkenhead, "Improvements in the construction of pumps or engines for lifting and discharging water."—*Petition recorded 18th December*, 1858.
2920. Robert Clegg, Islington, London, Frederick Angerstein, Kennington, Surrey, and George Ferry, Hackney, Middlesex, "Improved mechanism for imparting reciprocating motion to machinery, and more especially pumps."
2924. Michael Kenny, Queen-street, Dublin, "Improvements in bridges."
2929. Frederick Ransome, Ipswich, "Improvements in the manufacture of grinding and rubbing surfaces."—*Petitions recorded 22nd December*, 1858.
2952. William Beckett Johnson, Manchester, Lancashire, "Improvements in the employment of gas for generating steam, and in engines connected therewith."—*Petition recorded 24th December*, 1858.
2963. Henry Lowe, William Trueman, and John Linwood Pitts, Birmingham, Warwickshire, "A new or improved axle for carriages."—*Petition recorded 27th December*, 1858.
2975. William Taylor, Nursling, and William Dakin Grimshaw, Southampton, "Regulating the admission of natural atmospheric air and eduction of rarefied air or gases from hot-houses or any other place or premises, and for supporting a required temperature."
2976. Richard Dugdale Kay, Accrington, Lancashire, "An improved chemical means of applying or fixing on woven or felted fabrics certain colouring matters produced from tar."—*Petitions recorded 29th December*, 1858.
3000. Henri Robin, Nantes, France, "Improvements in reaping machines."
3005. Frederic Wilhelm Alexandre Casper and Guillaume Henry Schmahl, Rue du Faubourg St. Martin, Paris, "Using spart or Spanish broom in manufacturing seats of all descriptions."—*Petitions recorded 31st December*, 1858.
7. John Oliver, White Bank, near Chesterfield, Derbyshire, "Improvements in lubricators for steam engine cylinders."—*Petition recorded 1st January*, 1859.
38. William Draper, Gordon-terrace, Holland-road, Brixton, Surrey, "Improvements in machinery for printing on paper and other fabrics."
42. William Corfield, jun., Charlton-Adam, Somersetshire, "Improvements in chains for coupling, cranes, cables, mining purposes, hoisting, and all other purposes where chains are used."—*Petitions recorded 5th January*, 1859.
59. William Edward Newton, Chancery-lane, London, "Improvements in machinery for winding, twisting, and doubling fibrous materials."—A communication from Louis Barnabé Duboc, jun., Paris, France.—*Petition recorded 7th January*, 1859.
153. Richard Garrett, jun., and James Kerridge, Leiston Works, Saxmundham, Suffolk, "An improved arrangement of combined threshing and dressing machine."—*Petition recorded 18th January*, 1859.
177. William Edward Newton, Chancery-lane, London, "Improved apparatus for measuring water and other liquids."—A communication from Alfred Nobel, Paris, France.—*Petition recorded 20th January*, 1859.
647. Thomas Patstone, Birmingham, Warwickshire, "Improvements in shades or glasses for gas and other lamps, and in the supports of the said shades or glasses."—*Petition recorded 14th March*, 1859.
62. Henry Ambler, Halifax, Yorkshire, "Improvements in breech-loading ordnance, and in the means of producing part or parts thereof, which improvements are also applicable to what are called small arms."—*Petition recorded 16th March*, 1859.
734. John Macintosh, North Bank, Regent's Park, and Godfrey Rhodes, Regent-street, London, "Improvements in tents and such like coverings for shelter against the weather."—*Petition recorded 22nd March*, 1859.
765. Mark Firth, Sheffield, Yorkshire, "Improvements in machinery for grinding saws and flat plates of steel."—A communication from E. T. Jones, Montreal.—*Petition recorded 26th March*, 1859.
876. William Campion, Nottinghamshire, "Improvements in machinery for the manufacture of looped fabrics."—*Petition recorded 8th April*, 1859.
935. Joze Luis, Welbeck-street, Cavendish-square, London, "A new cooling apparatus for liquids, especially beer.—A communication from Jean Louis Baudelot, Rue Mogador, Paris, France.—*Petition recorded 14th April*, 1859.

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.

List of Specifications published during the week ending 21st April, 1859.

2091, 7d.; 2094, 3d.; 2095, 5d., 2097, 3d.; 2098, 7d.; 2099, 10d.; 2100, 3d.; 2102, 2s. 6d.; 2103, 5d.; 2104, 3d.; 2105, 6d.; 2106, 8d.; 2107, 10d.; 2108, 10d.; 2109, 9d.; 2110, 5d.; 2111, 6d.; 2112, 3d.; 2113, 6d.; 2114, 6d.; 2116, 8d.; 2117, 3d.; 2118, 3d.; 2119, 6d.; 2120, 3d.; 2121, 3d.; 2122, 6d.; 2127, 8d.

*** 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.

2296. T. Archer, *jun., Dunston, near Gateshead, "Apparatus for preventing explosions of steam boilers."—Dated 14th October*, 1858.

According to this invention the supply valve is enclosed in a case having an opening at the top, through which the rod of the safety-valve passes, and by which steam passes from the boiler when the safety-valve is somewhat raised. On the rod of the safety-valve there is another valve, which, when the safety-valve is raised beyond a certain point, closes the opening in the top of the case, and causes the steam to pass through a pipe which leads from the case to the interior of the furnace of the boiler, and so damps the fire and reduces the pressure on the boiler. Steam is also caused to pass on to the fuel in the furnace when the water in the boiler gets too low. This is accomplished by means of a float in the boiler, having a rod attached to it, which passes through a stuffing-box in the top of the boiler. This rod also passes through a hole in a prolongation of the weighted roller, which keeps down the safety-valve, and on the end of the rod there is an enlargement which cannot pass through the hole in the lever. By this means, when the water in the boiler gets too low, the weight of the float depresses the arm of the lever through which the rod passes, lifts the arm of the lever which keeps down the safety-valve, and allows the steam to pass on to the fuel in the furnace.

2313. J. Hick, W. Hargreaves, *and* R. Harwood, *Bolton-le-Moors, Regulators for prime-movers."—Dated 16th October*, 1858.

These improvements relate to apparatus for regulating the supply of water to turbine or other water-wheels, and consist in connecting the clow-shuttle or valve, the position of which is to be adjusted for the purpose of regulating the speed of the water-wheel or other prime-mover with a piston moveable in a cylinder. This piston is actuated by water, admitted either on the one side or on the other side of it, through an admission valve whose motions are regulated by a common ball or other governor in connection with the prime-mover. By these means power can be accumulated, proportionate in every case to the resistance to be overcome in moving the clow-shuttle or valve, whilst the ball-governor has only the friction of the admission-valve to overcome. The opening and shutting of the clow at the starting and stopping of the water-wheel or turbine is accomplished by means of a simple mechanism, actuated by a spoke or other wheel turned by hand, whereby the connection between the ball-governor and admission-valve can be lengthened or shortened at will, and the action of the valve entirely reversed. By shortening the said connection, a constant pressure can be maintained against the underside of the piston, thus causing it to move upwards and raise the clow or supply-valve until the supply of water is effectually shut off from the water-wheel or turbine. This position is maintained until the valve is reversed by turning the spoke or other wheel in the contrary direction. By lengthening or shortening the connection between the governor and the admission-valve the speed of the water-wheel may at any time be altered if found necessary, without any change being made in the wheels which drive the ball-governor. Racks and screws, as at present used for opening and shutting clows or valves, are dispensed with.

2332. A. Allan, T. Whimster, *and* R. Gray, *Perth, "Improvements in steam boilers, also applicable in part to gasmeters, lamps, and lubricating and other apparatus requiring a constant liquid level, and in part to pressure indicating apparatus."—Dated 19th October*, 1858.

This invention comprises improvements designed for the obtainment of a constant or nearly constant water-level in steam boilers, and also applicable, in more or less modified forms, in part for maintaining a constant liquid-level in various apparatus, such as gasmeters, lamps, lubricating and evaporating apparatus, and in part for indicating pressure. The invention cannot be described in detail without reference to the drawings.

Class 2.—TRANSPORT.

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

2291. T. Ingram, *Bradford, Yorkshire, "Apparatus for signalling between the parts of a train of carriages."—Dated 14th October*, 1858.

The indicator used as a signal, in carrying out this invention, may be a bell or other means by which to attract attention, and is operated by a suitable cord, wire, rope, or other band or chain, continued from the part or parts of the train carrying the signal to the part or parts where it may be desired to operate such signal. For the convenience of altering the length of a train by adding to, or removing from it any of the carriages, the operating band or chain is formed in parts, adapted to each carriage, with suitable hook or other connecting means at the ends, by which, when the carriages are connected, the connecting means to the signal may be formed continuous; and in order that the band, or other connecting means, may be alike effective under different stages of compression of the buffers, and consequent variations at different times of the length of the train composed of the same carriages, the portion of band, or other connecting means, to the signal adapted to each carriage is, according to these improvements, formed in two part, and these separate parts pass under pulleys carried by the lower end of a pendant lever carried by the carriage, and are then connected to the buffer apparatus, so as to be drawn up with the compression of the buffers, and they are also connected to the traction springs in such manner as to be lengthened by the extension of the draw bar.

2298. W. E. Newton, *Chancery-lane, London, "Cabin or state room for steam boats and other vessels."—A communication.—Dated 14th October*, 1858.

The object of this invention is the construction of air-tight cabins or state rooms, for steam boats or other vessels, and which cabins or state rooms are so arranged and adapted to the vessels that they shall, in the event of the hull of the boat or vessel sinking, be capable of automatically detaching themselves therefrom, and also of floating on the surface of the water, and under the control of the occupants.

2314. P. Jensen, *Copenhagen, "Apparatus for governing or regulating the speed of marine engines."—Dated 16th October*, 1858.

The inventor employs a cylinder, which is placed in communication with the water at one end, whilst the other end thereof is closed. It is fitted with a moveable piston, and the latter is connected, either directly or indirectly, with the throttle or other valve regulating the admission of the steam to the cylinders of the engine. Now, the more deeply the stern of the ship becomes immersed, the more the pressure of the water upon the piston in the regulating cylinder increases, the greater is the force wherewith the piston is thrust towards the closed end of the cylinder, and the more the air between the piston and cylinder cover becomes compressed, and *vice versa.—Not proceeded with.*

2327. J. Smith, *Newport, Salop, "Rough-shoeing beasts of draught and burden."—Dated 18th October*, 1858.

This invention consists in the employment of a plate or ring, to which clips are attached to fit the outsides of the shoes of horses or other beasts of draught and burden; and by causing these clips and the plate or ring to be drawn together, roughing pieces or a snow-plate are fastened tightly upon the shoe, and thus the feet of the animal are prevented from slipping or being clogged by snow.

2335. W. E. Newton, *Chancery-lane, London, "Hanging and arranging of cylindrical, conical, or spiral steel railroad springs for railway carriages." —A communication.—Dated 19th October*, 1858.

This invention consists in arranging and operating such springs in groups or series of four or more springs, placed in double lines vertically, so as to possess the length of elastic action which two series of the springs would have if placed one above the other, while the space which they occupy vertically is very much less than they would require if the springs were placed in pairs one above the other.

2337. R. A. Brooman, *Fleet-street, London, "Propelling vessels."—A communication.—Dated 19th October*, 1858.

This invention relates to the propulsion of vessels for carrying burdens, such, for example, as those used on canals, and is designed mainly to combine means of adapting the propelling surface to the varying draughts of water of the vessel, with other necessary qualities. And the invention consists in employing propellers, each composed of a float-board attached to vertical rods or arms, the upper ends of which are connected to cranks, and which are combined with other rods and cranks in such manner that, throughout its motion, the float-board always remains vertical. The motion of the vertical rods and of the float-boards is, in fact, the same as if they depended from a rotating crank pin and met with no resistance. The supplementary rods and cranks are added for the purpose of enabling the propeller to move in this manner while encountering the resistance of the water. The float-board is adjustable, and may be readily shifted up and down the vertical rods and arms, to suit the varying draughts of water of the vessel. Any suitable number of such propellers may be employed in a vessel.

Class 3.—FABRICS.

Including Machinery and Mechanical Operations connected with Preparing, Manufacturing, Printing, Dyeing, and Dressing Fabrics, &c.

2297. S. Diggle, *Radcliffe, Lancashire, "Looms."—Dated 14th October*, 1858.

This invention relates, Firstly, to mechanism for moving the boxes of looms in which two or more shuttles are employed; but neither this nor the remaining portions of the invention can be described without reference to the drawings.

2300. R. R. Jackson, *Blackburn, "Apparatus for sizeing yarn."—Dated 15th October*, 1858.

This invention consists in the novel application and use of a ball or other float tap or valve as a means of regulating the supply of size to the sizeing machines, in which tap the escape of the liquid through the tap is prevented by a piece of india-rubber or other appropriate substance, which is pressed by means of the float against the seating or opening of the tap, or is opened and leaves the same to supply the cistern as the float rises or falls in the sizeing liquid. The float tap may either be placed in a separate cistern, so as to feed a number of machines, or in a trough or small cistern attached to the trough of each machine.—*Not proceeded with.*

2315. A Robertson, *Lounsdale, Renfrewshire, N.B., "Applying starch and similar matters."—Dated 16th October*, 1858.

The improvements which constitute this invention consist, Firstly, in causing the fabric or material under treatment to be passed in contact with a roller or drum having a film of the starch or similar matter on its surface, and moving in the same direction as the fabric or material, but at a slower rate. And, Secondly, in rubbing the starch or similar matter into the fabric or material by the means of a second or separate roller or drum, and moving in a direction opposite to that of the fabric or material, but not supplied with starch or other similar matter. Or instead of the rubbing roller or drum moving in a direction opposite to that of the fabric or material, it may be arranged to move in the same direction, but at a greater velocity than the fabric or material.—*Not proceeded with.*

2316. A DUNN, *Dalston-terrace East*, "*Preparing marking compounds to be used on linen and other fabrics.*—*Dated* 16*th October*, 1858.

This invention consists in making up materials, such as the compounds of silver or other materials heretofore used in the preparation of marking inks, in a solid state, in combination with any suitable material; but the patentee prefers to use a material, such as blacklead or other dark substances, capable of giving colour when first used, and before the light or heat, if applied, has had time to act; and such dry compounds in carrying out the invention are made up in suitable forms to be used in ever-pointed pencils, or in other suitable holders. In using such marking instruments, he prefers that the linen or other fabrics should be first damped and then written on whilst damped.

2331. J. OWEN *and* H. DUCKWORTH, *Blackburn*, "*Looms.*"—*Dated* 19*th October*, 1858.

This invention consists in placing the crank shaft as near the bottom of the loom as it can be conveniently worked, and the sword-arm shaft much higher than is at present adopted. The patentees obtain the picking motions by placing on each fly-wheel a bowl or tappet, which acts, as the wheel revolves, on a lever connected by a rod or band to an arm in connection with the picking stick, the top of which is either at the side or passes through the slay bottom. Each lever is made to move out of the way of its corresponding bowl by means of a cam, and where several shuttles are used, pattern cards or lays are employed to govern the movement of the picking sticks. The traverse of the slay or lathe may vary more or less in order to accommodate the loom to different kinds of goods and qualities of yarn. They also employ a damping apparatus under the cloth and yarn beam.

CLASS 4.—AGRICULTURE.

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

2308. L. MARCUS, *Algeirs*, "*Reaping machine.*"—*Dated* 16*th October*, 1858.

The chief feature of this invention consists in a gathering rack actuated by the same movement as that of the other organs. This gathering rack takes on the table the cut grain gradually as it accumulates thereon, and by a travelling motion brings it back on the table, throwing it aside in small heaps for bundling. The grain thus thrown in heaps is not intermingled; the ears are on one side and the stems on the other, as regularly as when reaped by hand. Another improvement is that the cutter is working in a space larger than that in which the other pieces of the machine are actuated by the action of the large wheel, which one is obliged to cause to pass outside of the grain which has to be cut, that is to say, in the space which serves also for the passage of the horses. The cutter and rack should accordingly be about one foot longer than the middle of the machine. Thus the place cleared off by the cutter being quite free, the machine when it returns can pass along without touching any of the grain cut, and without the necessity of removing the grain already cut.

2318. W. CLAY, *Ellesmere, Shropshire*, "*Combined threshing and dressing machines.*"—*Dated* 18*th October*, 1858.

These improvements consist in the construction and arrangement of those parts of the machine which operate upon the corn, chaff, and straw after it has left the drum of the threshing apparatus. On leaving the drum the straw is received upon shakers of a bent or angular form on their upper surface, to which motion is given by a crank shaft revolving in brackets attached to the underside of the inner end of the shakers. About midway between the crank shaft and their outer ends the shakers are supported upon rocking bars, which cause the shakers when acted upon by the cranks to have a tossing motion (increasing in extent in proportion to the distance from the points of suspension), which throws the straw out at the end of the machine. The grain and chaff separated from the straw is received upon an inclined vibrating trough the whole length of the machine, at the lowest end of which trough there is a riddle. This trough is suspended from the frame of the machine by bars, and has a vibratory motion given to it by a crank shaft. A current of air from a fan blower drives the chaff out at the hinder end of the machine, while the grain falling through the riddle passes into a box at the side of the machine, from whence it is raised by an endless chain of buckets into a hummeller, through which it is led to the opposite side of the machine, where it falls into a vibrating riddle-box attached to and moving with the vibrating trough before mentioned. Within this riddle-box there are two riddles, one above the other, and a screen beneath; while passing these riddles the grain is exposed to the action of a second blast, to drive off any chaff or light particles not before got rid of. The motion of the riddle-box causes the small grain and seeds to pass through the screen to one spout, while the best corn is separated and delivered through another.

CLASS 5.—BUILDING.—None.

CLASS 6.—FIRE-ARMS.

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

2310. T. W. G. TREEBY, *Westbourne-terrace Villas*, "*Breech-loading fire-arms and cannons.*"—*Dated* 16*th October*, 1858.

This invention cannot be described without reference to the drawings.

2329. J. WHITWORTH, *Manchester*, "*Guns, gun-carriages, and ammunition.*"—*Dated* 19*th October*, 1858.

These improvements relate, First, to a mode of giving accurate horizontal adjustment to a gun by moving its trunnions laterally in their bearings. This is effected by means of a lever which acts on one of the trunnions, the opposite end of the lever being connected with a screw, which is adjusted by hand. To this apparatus and mode of adjusting guns the patentee makes no claim. Secondly, it relates to the use of discs or cakes of wax, tallow, or other similar lubricating compounds or substances as wads for ammunition for ordnance and fire-arms, whereby the piece is properly lubricated. The lubricating materials may consist of bees'-wax and tallow, used separately or combined; or of paraffine, or such other similar substances as are not materially affected by being exposed to the action of the atmosphere. The patentee has obtained good results from a composition consisting of equal quantities of wax and tallow. These proportions may be varied according to the temperature of the weather and climate, care being taken that a sufficient quantity of tallow be used to ensure perfect lubrication of the barrel at low temperatures, while sufficient wax is employed to make the wad cohere and withstand the effect of high temperature. Instead of mixing the wax and tallow together whilst both are in a melted state, he sometimes melts the wax and runs it into a mould, and when set, pours the tallow into or on to the wax. In this case the tallow adheres to, but does not mix with, the wax, which thus forms a coating. In making wads for small arms he takes a cake or sheet of the lubricating material made of the requisite thickness, and by means of a suitable punch cuts out of it wads or discs. Or the melted material may run in the form of a rod, and afterwards be cut into wads or discs. Thirdly, it relates to the application of tin or zinc, or other hard metals or alloys, as an outer coating for soft metal rifle projectiles. The soft metal for the projectiles is made in a continuous length, and is coated by an adaptation of the well-known apparatus employed in manufacturing lead pipes and coating them with tin or other metal, and which it is not necessary to describe. Any apparatus whereby the soft metal is made in a continuous length suitable for being divided into shorter pieces, and formed into projectiles by the ordinary bullet-making machinery, may be used, provided the continuous length of metal is forced through suitable dies, and through a bath of melted coating metal or alloy, whereby a continuous coating is deposited.

CLASS 7.—FURNITURE AND CLOTHING.

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

2231. N. FELLOWS, jun., *West Derby, Lancaster*, "*Tea-kettles and other like domestic vessels.*"—*Dated* 7*th October*, 1858.

This invention consists in forming the bottoms of tea-kettles and other like vessels concave, and carrying a pipe or pipes from the bottom through the body of the vessel, and out at the side or top thereof, so as to form a flue or flues through which flame and heat may pass.—*Not proceeded with.*

2299. G. LOMAS, *Manchester*, "*Ornamental fabrics for ladies' dresses.*—*Dated* 14*th October*, 185*.

This invention applies to cotton, woollen, silk, or other piece goods upon which patterns are produced by processes of printing, weaving, or by other means, and consists in forming another pattern thereon by embossing, and in such manner that the said embossed parts when the piece is made up may follow a leading outline of the dress. Thus the inventor embosses the edge or edges of a piece of printed cloth, which may then be made up into a "flounced robe," the flounces being oanamented by the embossed parts, or it may in like manner be made up into dresses called "robes à quille."—*Not proceeded with.*

2302. G. DAVIES, *Serle-street, Lincoln's-inn*, "*Manufacture of gloves and the apparatus employed therein.*"—*A communication.*—*Dated* 15*th October*, 1858.

These improvements are effected principally by certain modifications in the cutter or punch used for cutting the material for the gloves, whether of silk or of other woven fabric or skin. The cutter is formed with moveable pieces or blades capable of being taken asunder, and is suitable for cutting from one to several dozens of gloves of four different sizes at one blow of the cutting press. One of the principal results of these improvements is the dispensing with eight seams, and the reduction of the number of seams in the fingers of each glove to four, whereby the manual labour and the material are greatly economised; and the gloves when completed possess a superiority of strength, finish, and elegance, hitherto unattained.

CLASS 8.—CHEMICAL.

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

2307. G. F. WILSON, *Vauxhall*, "*Preparing compounds containing sulphur for preventing and destroying blight, mildew, and insects.*"—*Dated* 15*th October*, 1858.

This invention consists in preparing compounds of sulphur and soap by combining sulphur in a state of solution with soap, in place of simply mixing them mechanically as heretofore.

CLASS 9.—ELECTRICITY.

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

2317. B. NICKELS, *Mitcham, Surrey*, "*Electric telegraphs.*"—*Dated* 16*th October*, 1858.

This invention consists in using wires which are not electrically insulated from the water in which the same are required to be immersed, and in so constructing or arranging an electric telegraph between two places separated by sea or other water as to use the intervening water in forming the battery employed for working the telegraph. Each of the telegraph wires or conductors used (which the patentee prefers to be of copper or alloys of copper) is submerged in the water, so that the two ends thereof are brought to the two distant stations on either side of the water. The ends are respectively connected to suitable electric telegraph instruments, and a wire from each of the instruments is conducted to the water, and the ends thereof are dipped or laid into the water, and by preference copper is fixed at one of the terminals and zinc at the other, though other matters suitable for forming the elements of a battery may be employed.

2321. C. WEST, *Camberwell New-road, Surrey*, "*Insulating and covering wire.*"—*Dated* 18*th October*, 1858.

The patentee claims, First, the mode of applying a solvent to the india-rubber covering of a wire or other conductor of electricity as above described, for the purpose of causing the folds of india-rubber to adhere together, and effecting a more perfect insulation of the wire or conductor. Secondly, the mode of subjecting the india-rubber covering of a wire or other conductor of electricity to the action of a moist heat as above, for the purpose of causing the folds of india-rubber to adhere together, and effecting a more perfect insulation of the wire or other conductor. Thirdly, the covering of insulated wires or conductors with yarns of fibrous material, saturated with a composition for the purpose of preserving such fibrous material, and causing it more effectually to protect the insulated wires or conductors from injury.

2326. A. W. DRAYSON, *Plumstead, and* C. R. BINNEY, *Woolwich, Kent*, "*Submarine telegraphic cables.*"—*Dated* 18*th October*, 1858.

The patentees propose and prefer to use a much thicker wire than usual, and to cover it with silk or other fibrous material that is a non-conductor, or a bad conductor of electricity. This fibrous material is to be secured on the wire by means of a solution of india-rubber or other analogous substances, and the wire thus protected is to be inclosed in a tube of pipe of vulcanised india-rubber or other suitable elastic non-conducting material, in such a manner as to leave a vacant space of and round the inclosed wire, which thus will be inclosed in a kind of tunnel. The interior bore of the vulcanised india-rubber tube or pipe may be either round or square; but if the tube is externally round or cylindrical they prefer the internal bore thereof to be square, or *vice versa*. Owing to the absence of any other metal in the cable than the electric wire itself, there will be much less liability than usual of the electricity being carried off laterally and lost; and from the construction of the cable with an outer covering or tube of vulcanised india-rubber, it will be less liable to destruction from friction against sunken rocks or other substances at the bottom of the sea than the ordinary metallic submarine telegraphic cable. Owing also to the specific gravity of a cable of the kind above described being much less than of a solid one constructed principally of wire, as heretofore, there will be a reduced strain on the cable when being payed out, and consequently much less complicated and expensive machinery than that heretofore employed will be required for depositing the electric or telegraph cable at the bottom of the ocean. In order to compensate for any undue strain on the cable, and to impart to it a certain amount of elasticity, they also propose to introduce at such intervals as may be considered advisable, lengths of cable of from half a mile to a mile long, more or less, constructed upon such a principle as will admit of such lengths elongating to a certain extent when subjected to any undue strain. To effect this object they make such half-mile or mile lengths of cable of wire coiled helically or spirally inside the elastic or vulcanised india-rubber external tube or pipe, so as to admit of this part of the cable being elongated or stretched to a considerable extent without risk of breakage.

2322. R. TIDMAN, *Jermyn-street, London*, "*Apparatus for paying-out and for raising electric telegraph cables.*"—*Dated* 18*th October*, 1858.

This invention consists in employing a raft or floating platform for carrying and delivering electric telegraph cables when paying them out, and for winding such cables upon when it is desired to raise them, and in connecting, by chains or otherwise, to the said raft or floating platform, a lighter raft, or a series of lighter rafts or sea cables coupled by chains or otherwise, and furnished with sets of horizontal rollers, over which the cable passes on its way to the sea. These lighter rafts are used only when paying out cables, being unnecessary when cables have to be raised. The rafts are towed by a steamer.—*Not proceeded with.*

2336. W. GOSSAGE, *Widnes*, "*Utilisation of alkali waste.*"—*Dated* 19*th October*, 1858.

This invention comprises the separation of sulphuretted hydrogen from such mixed gases (obtained from alkali waste), and thereby obtaining carbonic acid gas of sufficient purity to be usefully applicable. The inventor effects the separation of sulphuretted hydrogen from such mixed gases by causing it to be decomposed, either by sulphurous acid gas, or by compounds of nitrogen and oxygen, thereby causing the formation of water and the deposition of sulphur. The invention also comprises means whereby alkali waste can be caused to absorb oxygen from atmospheric air, and the use of such oxidised alkali waste for the production of sulphurous acid gas and carbonic acid gas. He effects the absorption of oxygen from atmospheric air by means of alkali waste, by causing such waste to be exposed to the atmosphere, and he extricates sulphurous acid gas and carbonic acid gas from such oxidised waste by causing it to be acted upon by muriatic acid, or other acid liquors, and applies sulphurous acid so extricated for the decomposition of sulphuretted hydrogen, as before mentioned. The invention also comprises the extrication of sulphuretted hydrogen and carbonic acid gases, also sulphur, from alkali waste, by causing such waste to be decomposed by the action thereupon of such acid liquors as are obtained by the use of muriatic acid in the manufacture of chlorine, which manufacture is usually conducted in connection with the manufacture of alkali, and therefore simultaneously with the production of alkali waste. The invention also comprises the production of sulphuret of iron and sulphuret of manganese, or one of such sulphurets, by the action of alkali waste on the acid liquors obtained in the ordinary manufacture of chlorine, by the use of muriatic acid, and the application of metallic sulphuret so obtained for the purpose of producing sulphurous acid gas.—*Not proceeded with.*

CLASS 10.—MISCELLANEOUS.

Including all Patents not found under the preceding heads.

2280. R. RIDLEY, *Low Wortley, Yorkshire*, "*Safety cages for mine shafts.*"—*Dated* 13*th October*, 1858.

This apparatus consists of a peculiar combination of coiled or barrel springs and gripping eccentrics. The cage is fitted at its upper end with a pair of transverse parallel shafts, which shafts carry at each extremity an eccentric, there being thus two eccentrics on either side of the cage. These eccentrics are disposed on each side of the conducting bars, and when brought into action or partially rotated by the coiled springs hereinafter referred to, they grip or lay hold of the conducting rods, and so prevent the descent of the cage should the rope accidentally break. The coiled springs surround and are secured to the transverse shafts, one end of each spring being secured to the shaft, and the other to the framing of the cage, so that they will have the effect of turning the shafts in their bearings. In the middle of each of these shafts is a lever arm, to which are attached the ends of a double safety chain, so arranged with regard to the winding rope that when the weight of the cage is on the main rope, the safety chains will be tightened, and by acting on the lever arms and shafts will keep the eccentrics out of contact with the conducting rods; but should a breakage of the winding rope occur, the lever arms will be relieved from the tension of the safety chain, and the coiled springs will consequently be free to act, and cause the eccentrics to turn towards each other and grip the conducting rods between them, thus maintaining the cage stationary at whatever part of the shaft it may be.

2283. A. BENDA, *Basinghall-street, London*, "*Models of the human and other figures.*"—*Dated* 13*th October*, 1858.

This invention consists in constructing models of the human and other figures by forming the limbs and other parts of the same separately, and combining them by means of india-rubber, or other elastic strings or cords (which the patentee prefers placing in the interior of the figures). Models constructed in this manner can be placed in various attitudes and positions, and may be used for toys for tuition, for artistic composition, and for various other purposes.

2288. C. COWPER, *Southampton-buildings, Chancery-lane*, "*Manufacture of articles of hard vulcanised india-rubber and gutta-percha, and similar gums.*"—*A communication.*—*Dated* 14*th October*, 1858.

In the first place the india-rubber or gutta-percha is prepared for hardening in the usual manner, and is placed in the mould made of cast tin, or cast brass, or pressed tin, or other suitable material. It is then subjected to the action of steam, or hot air, or heat of any kind, during a period of from half an hour to three hours, the length of time depending on the proportion of sulphur mixed with the india-rubber and other circumstances. It is then removed from the heat, and the mould is removed from the india-rubber or gutta-percha, which, by this time, is in a partially hardened state. Any blisters, holes, or other imperfections on the surface are now moistened by a liquid compound or solution of india-rubber or gutta-percha, and are fitted up and smoothed with the original compound before-mentioned, and pressed again in the mould, care being taken to have the joints of the mould water-tight during the heating process by means of small strips of india-rubber inserted between the joints or otherwise. The parts of the mould are then pressed firmly together by screws or otherwise, and the whole is again replaced in the heat, leaving it there from about half an hour to three hours, when the compound will still be partially hardened. It is then again withdrawn from the heat and removed from the mould, and if the shape be still imperfect it is again perfected in the manner before described, but if the form be perfect the article is placed loosely in a box without the mould. The box containing the shaped articles is then closed hermetically, and exposed to the heat until the articles are completely hardened, which may require six or eight hours' exposure to heat, after which the box is removed and opened and the process is completed. The form of the articles will then be found to be perfect, although somewhat smaller than the mass originally contained in the mould. It will generally be sufficient to remove the articles only once from the mould for the purpose of repairing or patching. Much will depend upon the particular mould used, and the form and thickness of the article, and a little practice will enable the workman to decide whether one removal from the mould is sufficient or not. Articles of no great thickness, such as combs, are partially hardened and the imperfections repaired in the manner before described, and they are then replaced in the mould, and the vulcanising process is completed while they are in the mould. In articles of considerable thickness the great contraction takes place during the last part of the heating process; and the article not being in contact with the mould at that time, the contraction proceeds in a uniform manner. The methods described are more particularly applicable for the purpose of obtaining plain surfaces, or forms with comparatively large ornaments.

2289. A. GORDON, *Whitehall, London*, "*Manufacturing cast-iron, steel, and wrought-iron.*"—*A communication.*—*Dated* 14*th October*, 1858.

These improvements for manufacturing cast-iron, steel, and wrought-iron are as follows:—First, to purify and decarbonise gradually pig or cast-iron, or the iron as it runs from the blast or smelting furnace, so as to convert it at pleasure into malleable cast-iron, steel, or wrought-iron; Secondly, to obtain steel or iron directly in a furnace or cupola or cupolo charged with alternate layers of ore or mineral suitably prepared, and charcoal; Thirdly, to substitute for the combustion or the coke usually employed, or charcoal, the combustion of coal or wood in the manufacture of iron of steel. The means that the patentee employs are as follow:—*First, viz., the decarbonisation of the pig-iron:*—He causes to pass through a mass of liquid cast-iron a current of steam of an exceedingly high temperature mixed with hydrogen and carbonic oxide, in such a manner as to bring the molecules of the metallic bath into contact with the triple current, so as to decarbonise it. Secondly, to obtain steel directly he charges a cupola or cupolo or furnace with alternate layers of suitably-prepared ore and charcoal; then he effects the combustion of the charcoal by means of an exceedingly hot current of air mixed with hydrogen and carbonic oxide, which decarbonises the ore in carbonising the iron, and converting it into steel. Thirdly, to take from the ore the oxygen; and to purify it he confines the ore, without mixing it with charcoal, in one or more earthenware retorts or cylinders, placed in an oven similar to that in which retorts are placed for making gas for illumination, or in any other convenient manner. He burns in the furnace of the oven coal or wood, or any other suitable fuel, the flame of which heats exteriorly all the cylinders or retorts before escaping into the atmosphere; or he heats the retorts with the very hot products of any combustion, such as those produced by the coking of coal. When the ore is raised to the highest temperature that can be effected he allows an exceedingly hot current of hydrogen and carbonic oxide to pass into each cylinder or retort. This double current spreads itself throughout all the bed of mineral, of which mineral the oxygen combines with the hydrogen and carbonic oxide, converting the ore into a bar of iron or steel. Sometimes, instead of taking from the mineral its oxygen by means of a current of pure hydrogen and carbonic oxide, the mineral can be deodorised by causing a very hot current of proto-carburet of hydrogen to pass through and over it. This gas is produced by causing fine sawdust, or liquid rosin, or any hydro-carburet free from sulphur, to fall upon incandescent coke. The generator of the decarbonising and deoxidising currents which he prefers, is a generator of superheated steam mixed with hydrogen, carbonic oxide, and carbonic acid. It is a cupola formed of moulded blocks of fire-clay, fire-bricks, or fire-lumps, forming a vertical cylinder of such materials, of which cylinder the upper end is open at the centre. The earthenware cylinder is surrounded by an outer casing of wrought-iron or other suitable material to prevent expansion of the brick or earthenware cylinder, and to resist the pressure of the gas which is formed by the steam when coming into contact with the incandescent coke. This generator or cupola is charged with coke by the opening at the upper end. Then he closes this opening by a tube curved at about a right angle, the horizontal branch of which is introduced into the mouth of another pipe terminating in the chimney. The coke or coal is lighted by a door at or near the bottom of the cupola, and the gaseous products of the combustion pass off by the pipe into the chimney. When the mass of coke has become incandescent, and also the earthenware lining, which can be seen by any convenient opening, he closes the opening to the hearth hermetically by means of a covering, which acts as the neck and bonnet of a gas retort, and which being luted and screwed home by the usual bridle or bar and screw, closes the opening effectually. Then he takes away the curved tube that closes the opening or hole above described at the top of the earthenware cylinder, which runs horizontally into the chimney, and then closes the said opening with a suitable bonnet, and luting as at the bottom. After having obtained the proper heat in the cupola, and having the cupolo well closed, he allows a current of steam to enter at the top of this chamber, which descends and passes out by a suitable opening contrived on the projecting neck for the door or bonnet of the close chamber similar to the head or end of a gas retort. In traversing from top to bottom throughout the mass of coke a portion of the gas is decomposed. Its oxygen unites with the incandescent carbon to form carbonic oxide, and a little carbonic acid, which pass with the corresponding hydrogen into the decarbonising apparatus after described. When the exceedingly hot aeriform current is required to be formed only of hydrogen and carbonic oxide, he only allows a slight quantity of steam to come into the top part of the cupolo, in order that it may be entirely decomposed during its passage through the incandescent coke. In this case the decomposed steam produces only the hydrogen and carbonic oxide, which latter cannot be changed into carbonic acid by combination with the oxygen of the steam as it does when the steam is in excess. The pig iron can be carbonised in a state of fusion in the crucible of a high furnace, or in a solid state it may be fused in a cupola. *Decarbonisation of pig iron:*—He first mixes the fragments of pig iron with incandescent coke in a blast furnace, such as Wilkinson's, or as is used at iron foundries. To produce the current of steam by the waste flame, he causes the latter to descend by the central tube or pipe of a vertical boiler placed near the furnace on the top of a subterranean passage which conducts the smoke into the chimney. When the iron is in a state of fusion, he carries to the bottom of the furnace under the tap hole or dam, suitably secured, the apparatus for decarbonising it. *Description of the decarboniser:*—The body of the decarbonising apparatus is an iron ladle or pot of suitable size, lined with fire-clay, such as is commonly used for removing the liquid iron in foundries. Its capacity is divided for the occasion into two equal compartments by a moveable vertical grating, formed of iron tubes, the upper end of each of which tubes is secured to an horizontal pipe, with which it communicates. The lower ends reach down near to the bottom of the pot. Each tube is pierced with holes (suitably distanced) upon vertical lines, in such a manner that one-half of this grating of hollow tubes on one side of the pot has the holes so arranged as to blow in one direction; the other half of the grating on the other side of the pot has the holes so arranged as to blow in the opposite direction. These tubes should have a covering of fire-clay, so that the portions in contact with the fused iron be not injured. The horizontal pipe into which the said vertical pipes are all fixed is retained upon the circumference of the said iron ladle by its two extremities, of which one is stopped up whilst the other communicates by a tube with the generator of the quadruple current. To effect the decarbonisation, the patentee opens the screw valve or other suitable contrivance, which at once allows the steam, the hydrogen, the carbonic oxide, and carbonic acid to come into the grating of hollow bars or tubes. The gases which have traversed the incandescent coke of the generator rush from the grating into the ladle or pot, and heat it for a few seconds before he lets the iron fall into it by opening the hole by which it flows from the furnace. The liquid metal now comes under the influence of the aeriform currents, which rush in contrary directions from the two halves of the grating of hollow tubes, and the entire mass of liquid metal takes a rotary movement in consequence. This turning mass being continually divided by the bars of the grating, and lifted by the ascending currents, is so mixed that the metallic carburetted particles are brought into contact with the decarbonising gases. The decarbonisation can also be accomplished in the founder's furnace or cupola by bringing in at the bottom the steam and the said gases to act upon the fluid metal there, thus dispensing with the pot or ladle. By this contact the steam raised to more than 800 deg. of the centigrade, or 1,440 deg. Fah., becomes decomposed; its oxygen burns off the carbon as well as the particles of other substances that render the iron porous and brittle. The oxygen oxidises at the same time a portion of iron, but the hydrogen and carbonic oxide deodorise immediately the iron, which carbonises itself in mixing with the steel. The operation is so easy that a few experiments suffice to show the refining workman the number of minutes and seconds during which he ought to leave the current to flow for transforming the metallic bath into malleable cast iron. When the duration of the flowing and the colour of the metallic bath show pure steel, the refiner stops the decarbonisation by intercepting the current; then the metal can be run into moulds of the desired shapes, in steel or in malleable cast iron, if the metal is more carbonised than steel.—*Decarbonisation of cast iron in the state of fusion in the crucible of a high furnace*:—Supposing an earthenware reservoir established near a high furnace in such a manner that its upper opening communicates with the crucible of the furnace by a channel, the entrance to which is placed underneath the outflowing hole. This reservoir, which he calls the decarbonising crucible, is made of wrought iron plates lined with earthenware or fire-clay, and its interior is divided into an upper and under chamber by a horizontal earthenware drainer, pierced with small holes like a colander. The circumference of this earthenware colander is luted on a shoulder-piece contrived in the interior side of the wall of the reservoir. The bottom of the lower chamber communicates with an earthenware tube, covered by iron provided with a band or bridle, which is to be fastened or bolted round the opening of the decarbonising crucible. This tube is intended to conduct the iron suitably decarbonised into a channel or current that distributes it to the ingot moulds. Opposite the conducting pipe is fixed a tube communicating with the generator of the quadruple gaseous currents. When he wishes to work the decarbonisation, he at first lets the current of steam, hydrogen, carbonic oxide, and carbonic acid come, which heats the upper and lower chambers of the decarbonising crucible and the wall of the flow pipe. Then he lets the liquid iron run from the bottom of the high furnace into the channel which conducts it to the decarbonising crucible. Soon the metallic bath, covering the surface of the perforated plate or colander that separates the upper and lower chambers of the reservoir, runs into the lower chamber by as many threads as there are holes in the horizontal plate. Each metallic thread, finding itself enveloped in an atmosphere of steam mixed with gas raised to more than 800 deg. centigrade, or 1,440 deg. Fah., decomposes instantly the steam, which takes up part of its carbon. The undecomposed steam, mixed with hydrogen and carbonic oxide, hurries away the liquid iron into the flow pipe, where the metal continues to decarbonise itself progressively. The degree of decarbonisation depends on the length of the flow pipe, which experience alone determines as most suitable, according as he wishes to obtain malleable iron or steel at the outlet of this discharge pipe, which conveys them into the channel abutting on the ingot mould. When he wishes to manufacture iron, he pushes the decarbonisation almost to the limit beyond which the iron would cease to be liquid. To effect this, he makes the flow pipe a sufficient length, for the metal finishes in decarbonising itself in falling into a shallow crucible, after having traversed with the gaseous currents a partition pierced with holes adjusted to the outlet of the pipe. He takes out afterwards from the crucible, whilst it is hot, the mass of iron, which he submits to a hammer to remove the finery cinder.—*Direct manufacture of iron or natural steel*:—He manufactures directly iron or steel by treating the ore after the Catalan system, perfected as explained below. Instead of exciting the combustion of the charcoal in an uncovered chamber-vessel as they do by the Catalan process, and as in the Pyrenees, he economises the fuel considerably by burning it in a cupola, or furnace after Wilkinson's plan. After having almost half charged the furnace with charcoal, he finishes by filling the other half with alternate layers of ore and fuel; then he lights it, and hastens the combustion by a suitable blast. The tuyere of the blast has a branch pipe, which communicates with the generator of hydrogen and carbonic oxide. This tube is provided with a suitable slide or valve, designed to intercept and regulate at pleasure the double deodorising current. As soon as the ore is incandescent he opens the valve, that allows hydrogen and carbonic oxide to pass into the tuyere. This tuyere, projecting and suitably inclined into the interior of the furnace, the blowing machine drives to the centre of the lower part of the burning mass a suitable volume of air mixed with hydrogen and carbonic oxide, raised to a very high temperature. This triple current, the proportions of which are regulated at will, carry off rapidly from the ore the oxygen and other substances foreign to the iron, which can thus be converted directly into steel.—*Employment of coal and wood in the manufacture of steel*:—The ore, mixed with a slight quantity of powdered charcoal, is confined along the whole length of one or several horizontal earthenware retorts, fixed in the same oven. These retorts, like those for making gas, carry on their projecting ends an arrangement for fixing a pipe, furnished with a suitable valve for regulating the opening for the escape of the gases from each retort into the atmosphere. Towards the base of the retort, and at its posterior end, he has an opening which communicates by an iron pipe with the generator of hydrogen and carbonic oxide. At first he burns coal or wood in the furnace of this oven, the flame of which heats exteriorly all the retorts before escaping into the atmosphere. When the ore has attained the highest possible temperature he allows an overheated current of hydrogen and carbonic oxide to pass into each retort. This double current traverses the whole length of the ore, the oxygen of which combines with the hydrogen and carbonic oxide. The steam and carbonic acid resulting from these combinations pass off into the atmosphere by the tube placed upon the head of the retort. The ore having lost its oxygen is reduced to the state of iron when not mixed with charcoal, and to the state of steel when mixed with charcoal. He thus directly obtains bars or plates of steel whether the ore mixed with charcoal is decarbonised in cylindrical retorts or in any other forms of gas retorts. And he can avail himself of the heat escaping from coke furnaces to heat the retorts which contain the ore and powdered charcoal.

2292. W. Clark, *Chancery-lane, London*, "*Tanning hides, and apparatus employed therein*."—*Dated 14th October*, 1858.

This invention consists in causing the tanning liquid to penetrate through the fibres of the skin, First, by applying the pressure of a column of tanning liquid; Secondly, by means of a vacuum, which two processes can be employed either jointly or separately.

2293. S. Perkes, *Clapham, Surrey*, "*Machinery for extracting oil from the cocoa-nut and other vegetable matters*."—*Dated 14th October*, 1858.

This invention has for its object improvements in machinery for extracting oil from the cocoa-nut and other vegetable matters. For these purposes the coprah is reduced into a pulp by a rotating rasp made up of circular saws, and such pulp or other vegetable matter from which oil is to be extracted is continuously fed on to an endless table or chain, which is reticulate, or made with suitable passages through for the passage of the oil. This endless chain or table is supported by several rollers on it under side, and the pulp of coprah is fed on to the same at the upper end of the machine, there being suitable mats or fabrics of cocoa-nut fibre or other material on the under and upper surface of the vegetable matters so fed on to the endless table, which is arranged by preference in the form of an inclined plane from the upper to the lower end of the machine. The part of the endless chain or table for the time out of action passes under the supporting rollers, and there are trays under the supporting rollers to receive and conduct off the oil to suitable receivers. The endless chain or table in its movement over the supporting rollers passes under a number of pressing rollers, there being one such roller over each supporting roller. The first or uppermost pressing roller is at the greatest distance above the table or endless chain, so as to offer comparatively little pressure to the vegetable matters on the table, and the rollers in succession are set nearer and nearer to the endless table or chain, by which as the table or chain progresses the matters thereon become subjected to greater and greater pressure. The rollers are made hollow in such manner as to be heated by any suitable hot fluid or otherwise, and in some cases the pressing surfaces of the rollers are of glass. In order to separate the fluid oils from foots and foreign matters centrifugal machines are employed.

2294. H. Martin, *Old Kent-road*, "*Improvements in separating starch from gluten, in apparatus used therein, and also in preparing cement from gluten*."—*Dated 14th October*, 1858.

For these purposes a rectangular trough is used, having wire gauze let in at the ends and middle, or at other convenient parts. In this trough a reciprocating frame is used carrying rollers, by preference four, although other number of rollers may be used. The dough which is to have the starch separated from the gluten is placed between the two end pairs of rollers, the frame is made to reciprocate, and a constant flow of water is allowed to flow on the dough, which will wash out and separate the starch from the gluten, the wash water continually flowing through the wire gauze into a suitable vessel to settle, and there to be treated in the ordinary manner of manufacturing starch. After the dough has been subjected for a time to the action of the frame of rollers the dough—now for the most part gluten—is placed between the ends of the frame and the ends of the trough, by which the dough or gluten is continually beaten by the ends of the frame whilst still subject to a constant flow of water. In order to convert gluten into cement it is combined with stale beer or fermented liquor and oil.

2295. G. Baxter, *Northampton-square*, "*Colouring photographic pictures*."—*Dated 14th October*, 1858.

This invention consists in combining with photographic pictures the processes of intaglio plate and surface printing, and also the processes of lithographic and zincographic printing, as a means of colouring such photographic pictures. For these purposes as many printing plates, blocks, or surfaces are prepared as there are intended to be colours or shades of colours printed on a photographic picture, each printing block, plate, or surface being prepared in a suitable manner to print a portion of the picture with its particular colour or shade of colour, so that when impressions have been taken from all the printing blocks, plates, or surfaces on to a photographic picture, the same will be coloured all over, or to the extent desired. The colours employed may be such as are now ordinarily used in the above mentioned processes of printing.

2301. W. Bacon, *Prestwich, Lancashire*, "*Valves, valve-cocks, gates, and stopcocks*."—*A communication*.—*Dated 15th October*, 1858.

The nature of this invention consists in so improving the construction of a peculiar form of oscillating valve that when it is in position to leave its ports uncovered there will be a passage or passages from the induction port or ports in the valve-chamber to the eduction port or ports in the same through the valve and the valve-spindle, thereby causing less friction to the steam, water, air, illuminating or other gas, or other elastic or non-elastic fluid passing through it, and thus obviating loss of pressure or head; and moreover, in so constructing the valve that when it is in position to cover its ports it will prevent the flow of a fluid from the valve-chamber through either of the ports alternately, so long as the spindle remains untwined; and also in so constructing it that the springs which hold the separate parts of the valve against their seats shall not act on the spindle to force it from its centre of motion.

2303. T. Moore, *Sheffield*, "*Refrigerators*."—*Dated 15th October*, 1858.

According to this invention a square or polygonal vessel of cast iron or any suitable material, of such size as may be necessary, is formed with fretted or interwoven channels ascending with a slight gradient from the base or sides of the vessel to the centre. These channels commence at one angle of the polygon, and run parallel to the sides, that in connection with the last side being necessarily the width of the first channel shorter than the others. All are returned at the same angle as the sides, and continued throughout, diminishing in regular succession; partitions of galvanised iron or other material separate the channels, which are formed of such depths as to contain a series of one, two, or more pipes. These pipes are placed between the partitions; they are continuous, and so connected at the angles that by removing a cap with a screw or telescope joint, one end of each pipe may be opened, the capped or accessible end throughout having the same relative position, that is, each being in the end of the pipe, forming, when the vessel is other than square, a re-entrant angle with the pipe next in ascending progression. The pipes are connected with the inlet for the wort at the bottom and with the outlet at the top, and the whole bound together in position so that they may be raised out of the containing vessel at pleasure.

304. S. T. Clarke, *Kildare-terrace, Westbourne Park*, "*Crossing bankers' cheques and drafts*."—*Dated 15th October*, 1858.

This invention consists in effecting such crossing by means of perforations, the parallel lines with the banker's name, or simply the words "and Co.," appearing in perforations, in lieu of in ink, which latter is not secure or safe from its great liability to be tampered with successfully. By perforating, cutting, or punching out certain portions of the cheque, the same when so crossed cannot possibly be again restored to its former or uncrossed condition. The apparatus required for crossing cheques on this system consists simply of a tool fitted with a series of small punches, arranged so as to produce the parallel lines and words required in crossing a cheque, the whole being fitted into any ordinary or convenient form of press.—*Not proceeded with*.

2305. J. Wainwright, *Birkenhead*, "*Respirators*."—*Dated 15th October*, 1858.

This invention consists, First, in employing two valves for the purpose of allowing the inhalation and exhalation to be conducted through separate media. Secondly, in employing a series of metal plates—by preference three in number—in place of the wire gauze usually employed.—*Not proceeded with*.

2306. G. T. Bousfield, *Brixton*, "*Machinery for cutting the threads of wood screws*."—*A communication*.—*Dated 15th October*, 1858.

The object of this invention is to produce wood screws tapering with a slope at the point, and tapering with a slope also where the core vanishes into the stem of the screw, so that the projections of the convolutions of the tapering portions shall slope towards the point, and be inclined to those of the core at the body of the screw between the tapering portions thereof. The invention consists in cutting the thread of such screws by means of two cutting edges upon the chasing tool or tools, which edges are caused by suitable mechanism to operate successively upon the screw, the one edge having a form adapted to cutting the thread upon the body of the screw between the sloping extremities of the core, and the other cutting edge having a form adapted to cutting the thread upon the sloping extremities of the core.

2309. F. J. Coulon *and* S. G. Giraud, *Paris*, "*Ornamenting skin and leather*."—*Dated 16th October*, 1858.

The improvements which the patentees have made and described for preparing the skins of animals, leather, or imitation of both, principally destined to the manufacture of morocco for impressing the grain or design required, consist mainly in the application of a calender disposed and combined in a peculiar manner.

2311. H. Francis, *Strand*, "*Springs of surgical trusses*."—*Dated 16th October*, 1858.

To produce a truss spring the inventor takes a strip of hot steel, and, instead of forging it by hand, rolls it in the following manner:—He uses a pair of rollers, arranged so as to admit the passing between them a strong iron plate supported on friction rollers, on which plate he affixes the various steel moulds, shaped so as to give the required forms of the different kinds of truss springs, or he passes the moulds between the rollers without a bed plate. He takes the springs so rolled, and gives them the required shape to fit the human body, by passing them between three rollers adjusted so as to produce the required forms in the following manner:—Two of the rollers revolve in the same direction; the third roller, which bends the strip of steel, is elevated or depressed by a lever or other known means.—*Not proceeded with*.

2312. J. P. Gillard, *Paris*, "*Generating hydrogen, and apparatus for applying the same to lighting and heating purposes*."—*Dated 16th October*, 1858.

In carrying out this invention (which relates to a former patent dated 22nd November, 1849), steam is obtained from any suitable boiler or generator heated by the lost heat of the furnace; and in order that, by introducing this steam at once in the retorts, the heat of these latter should not be lowered too much, the patentee causes the steam, previously to entering into the retorts, to pass through tubes situated in the interior of the piers or buttresses of the brickwork of the furnace, by which means this steam will become sufficiently superheated, so as not to cause the charcoal to cool too quickly, or other material with which the interior of the retorts is provided for obtaining the decomposition of the said steam, which latter is introduced in the retorts by means of tubes provided with perforated roses or other suitable openings, and situated in the interior of the retorts, which tubes extend over the entire length of the layer of charcoal or other decomposing material in the interior of these latter. An essential part of the invention consists in distributing the steam in such manner over the decomposing material that an equal degree of heat is kept up on the entire surface of the decomposing material, whereby an equal decomposition of the steam and evolving of hydrogen will be secured, and the generation of carbonic oxide in great measure prevented. For this purpose the tubes are provided with perforated roses or other suitable openings, distributed in such manner over the length of the tube that in the same ratio as the temperature in certain parts of the retort exceeds that of the other parts in this latter, more steam will be injected on these parts than on the remainder, and which regulating may be effected by increasing in these spots either the diameter or the number of the holes, slits, or other projections through which the steam is projected on the decomposing material. He prefers, however, increasing the number of the perforations rather than increasing the diameter or surface of them, as it is very desirable the steam should be injected in a very divided state.

2319. J. A. Mason, *Wirksworth, Derbyshire*, "*Washing machines and apparatus for wringing and mangling*."—*Dated 18th October*, 1858.

This invention consists principally of a box or other receptacle of any suitable or convenient shape, into which the linen or other articles to be wasted, together with the hot water and soap, or other cleansing material, are placed. The process of washing is effected by placing the linen in several layers, separated by corrugated plates or frames made of wicker-work, wood, or other suitable material, every alternate frame being moved backwards and forwards by an eccentric spindle in a direction opposite to the motion of the intervening frames, and to the direction of the corrugations therein. The frames or corrugated plates are held down, by means of which the pressure can be regulated to the necessary degree at pleasure. The wringing and mangling apparatus consists of two or more rollers affixed near one end of the box, and the necessary pressure is obtained by causing the box containing the washing apparatus to act as a weight upon the axles of the rollers.—*Not proceeded with*.

2320. W. A. F. Powell, *Bristol*, "*Closing jars and bottles*."—*Dated 18th October*, 1858.

The inventor forms the stopper with a shoulder on its under side, which fits on to a corresponding seat within the neck of the jar or bottle: an interposed washer of india-rubber or other suitable elastic material making an air and water-tight joint when the stopper is pressed home. On the upper surface of the stopper there are two grooves, at right angles to each other, for the reception of a string or wires, which, being passed round the neck of the jar or bottle, and tied over the stopper, secures it tightly in its place.—*Not proceeded with*.

2323. R. A. Brooman, *Fleet-street, London*, "*Small chains*."—*A communication*.—*Dated 18th October*, 1858.

This invention consists in the employment of machinery, operating essentially as hereafter described, instead of the hand apparatus usually employed in the manufacture of small chains formed of doubly curved links (called in the French "*chaines epinglettes*"), and of links for the same. A quantity of the metal wire, of which the chains or links are to be made, is wound upon a reel, and the end of it is led between tension rollers to a holding and cutting apparatus moved by a cam. Between the tension rollers and the cutting apparatus a nipping contrivance is placed to prevent the wire flying back when it is cut. The wire next passes through a guide-hole, and then comes between the two parts of a forked mandril, which is moved round by a pinion driven by a lever. The motion of the mandril gives the first bend to the wire by winding it partially round the said mandril. A kind of die is then advanced by another cam, shears off the bent piece of the wire, and, still advancing, gives the second bend to the same. A spring arm or presser is then moved against the first bend, and forces the wire around a second mandril, completing the link. The second mandril is then pressed out of the link by a cam acting upon a lever attached to it or otherwise, the die is drawn back, and all the parts return to their first positions, the finished link being at the same time passed out into a receiver. This is the complete process for making the single links; but if the links are to be formed continuously in the form of a chain, a kind of pincer or tool, with one point barbed, is interposed between the guide-hole before mentioned and the first mandril, and is worked so as to place and keep each link within, or looped to the adjacent one.—*Not proceeded with*.

2324. K. H. Cornish, *Mayfair*, "*Advertising*."—*Dated 18th October*, 1858.

The inventor proposes printing one address on a sheet of paper, or a number of different notices in squares or other divisions, and giving away this printed paper (which is printed on one side only) for use in the water-closets of all the Government offices, banks, railway stations, and other large establishments, thus ensuring the notices being brought under direct observation; and for wrapping purposes he intends giving away this part advertising paper.—*Not proceeded with*.

2330. W. F. Batho *and* E. M. Bauer, *Salford*, "*Screws, worms, and wheels, and machinery for cutting the same*."—*Dated 19th October*, 1858.

The inventors construct worms and worm wheels to work together, so that their pitch lines will coincide, and that all the teeth of the worm will bear evenly on the teeth of the worm wheel. The machine or apparatus can either be applied to a common slide lathe, or it can be made to work independently, and consists of a bed or stand, on which they place two headstocks, which carry a mandril. Between the headstocks they have a slide carrying a revolving chuck and a pair of wheels, which impart a rotary motion to both the mandril and the chuck. For cutting the worm, they secure it on the mandril, and the cutting tool in the chuck, which gives a concave worm, and by reversing the operation and placing the worm wheel where they had the chuck, and the cutter where they had the worm, they are enabled to give the true screw form of thread to the teeth of the worm wheel.—*Not proceeded with*.

Royal Mail Steam-packet Company.—The directors state in their report that the credit side of the working account for the past year exhibits an increase in freight and passage money, as compared with that for 1857, of £7,647, notwithstanding the unsettled condition of Mexico. On the other side of the account, the item of coals shows a diminution, as compared with 1857, of £6,721. Wages show an increase of £4,005, which is accounted for by the additional pay of the officers and crews of the ships chartered to the European and Australian Company. In provisions, a decrease of £3,312 occurs, notwithstanding the increased receipts for passengers conveyed; this result is to be attributed to the more complete organisation of the arrangement for victualling the company's ships. The result of working the Australian service, which will terminate on the part of this company with the arrival out of the mails despatched from Southampton in February last, cannot be ascertained until sufficient time has elapsed for the receipt of final returns from the colonies and the subsequent completion of accounts in the London office. The directors can only state, therefore, in general terms than the loss will be greater than was anticipated at the time of the last general meeting, and, under the circumstances, they have deemed it prudent to appropriate the surplus beyond £200,000 to the credit of the insurance fund—viz., £51,949, as a provision to meet such loss. The balance of the profit and loss account, available for dividend, &c., is £36,683, out of which the directors recommend that the ordinary dividend of £2 per share, free of income-tax, be declared.

Iron from Scoria.—It is said that a native of Germany has discovered a process by which iron may be extracted from the scoria, or dross from the furnaces, which is always thrown away as completely useless. It has hitherto been a matter of surprise that this material, which is known to contain a great quantity of iron, has not been treated in the same manner as the ore from which it is produced. Attempts have been made to reduce it into the metal, but with results not commensurate with the expense attending the operation, and great difficulties have always been experienced in prosecuting every plan yet suggested. These difficulties consist in its extreme infusibility, in the large quantity of sulphur and phosphorus contained in it, and principally in the closeness of its body, which prevents access to the reducing gases. In Silesia, where the ore is very poor and difficult of reduction, and yields iron of a bad quality, it is customary to add to it about one-tenth of scoria. In Scotland, in the large furnaces heated with anthracite coal, as much as 25 per cent. of scoria is frequently added to the ore; but it is only in furnaces of the greatest dimension (60 ft. high) that this quantity of scoria can be absorbed without impeding the progress of the smelting. The iron, besides, that is produced from this combination, is always of an inferior quality. The certain profit which would be sure to result from bringing this refuse into use, incited the German gentleman we have alluded to to make the attempt. He set to work with ardour, tried numerous experiments, and at last found his efforts crowned with success. His plan is said to be simple and inexpensive, and the metal, separated from the sulphur, phosphorus, and other ingredients, is described as of good quality, and abundant. The details of the plan are not made public, as the inventor is about to apply for a patent to secure himself its advantages.—*Bulletin*.

Foreign and Colonial Jottings.—A Society of Arts has been established at Melbourne.—There are now thirty-six sugar plantations in the colony of Natal. The arrow-root plantations are also on the increase.—A committee have reported to the Common Council of Newhaven, U.S., that forty shade trees have been killed by the leakage of gas pipes, within four or five years, in that city.—Cotton raised last year in Tunis, under very unfavourable circumstances, the seed having arrived too late, has been valued by the Cotton Supply Association at from 8d. to 8½d. per lb.—A diving apparatus, of simple construction, is now in use in the Rhine. It is a wrought iron tube, with double doors, and is 17 ft. long. It is lowered between two barges, the water is pumped out, and the diver goes down.—The contract with Sir S. Morton Peto for the Oporto Railway, has been put to the vote, and has been rejected by the Cortes.—The only erection on the Island of Perim, according to Captain Playfair, is a lighthouse, which is not yet finished. All endeavours to procure water upon it have failed, and but a scanty supply is procurable from the adjacent coasts. Water-tanks have been constructed, which are chiefly supplied from Aden, and it is proposed to erect reservoirs to collect the rain, as well as a condensing apparatus. Perim has never been permanently occupied by any nation save the British.—A simple contrivance has been invented by M. Dagon, of Moret-sur-Loing, in France, for receiving and enclosing bees from the hive, or when swarming. It consists of an elongated muslin bag, distended on cane hoops, and opening and shutting at the mouth by a running string. This bag being attached to the branch on which the bees are swarming, and the inside rubbed with honey, all the bees will soon make their way to the bottom, when the mouth can be closed, and the bees conveyed away in the bag. The same contrivance is applied to abstract the bees from the hive and obtain the honey.—The Scutari monument to the memory of our heroic countrymen sacrificed in the late war is at length completed, the inscriptions in English, French, Italian, and Turkish on the four sides of its base having been finished during the past week. Stripped of its cloud of scaffolding, the structure is now seen to full advantage, with its pedestal, base, and shaft towering aloft nearly 90 ft. in the air.—In France (says the *Bulletin*) there are thirteen railway companies, the united capital of which amounts to £120,000,000; in Germany there are fifty-five, the capital of which is £103,200,000; in Russia seven companies only, the capital of which amounts to £55,520,000. Two lines of these last-mentioned railways have not yet been opened. The French insurance societies possess a capital of £9,440,000; the German societies of a similar nature, £9,760,000; and the Russian only £2,720,000. The mining interest in France reckons forty-nine companies, with a capital of £10,240,000; in Germany 154 companies, with a capital of £20,200,000; in Russia six companies, the united capital of which is £2,720,000. The silk yarn manufactories are eight in number in France, with a capital estimated at £1,280,000; in Russia there are but eight, but their capital is £1,460,000; and in Germany there are thirty-eight, the capital of which amounts to £4,640,000.

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

(*From our own Correspondent.*)

The Iron Trade and the War Crisis: *The Alternating Hopes and Fears of Masters: Lower Prices necessitated in some instances*—The Pig Iron Trade: *Rates: Expected Reduction in the Make*—The Hardware and General Manufacturing Trades of Birmingham, Wolverhampton, and elsewhere: *Serious Falling-off in Orders—The Holidays and the Elections*—How to Commemorate a Mayoralty—Strike among the Gun-lock Filers—Railway Accident—Singular Accident at a Canal Lift—The Fatal Boiler Explosion at Wednesbury: *Conclusion of the Inquest*—Fatal Explosion of Fire-damp in a Coal Pit: *Two Lives Lost*—Mr. Lionel Brough's Lecture at the Bristol School of Mines: *The Miners' Enemies (the Gases) and the Miners' Friend (the Lamp).*

The week past has been far otherwise than one pregnant with events favourable to the iron interest of Great Britain. The prospects of commerce, in all its different departments, are sadly clouded by the war which is just opening; and the iron trade is no exception to the rule. The injurious effects which the horrible struggle of despots in the Italian campaign will have upon the interest in question will not be apparent only in seriously damaging the future of the continental trade, and for a time almost annihilating it, but it will be felt even more in the prejudicial influence which it will exert upon the progress of the home trade. An evidence of this was afforded at the recent quarterly meetings, when the effects of the distant expectation of the strife which now appears so imminent, occasioned the meetings to pass of less satisfactorily than had been the case for a long previous period.

Every telegram increases the apprehension that we have entered upon a time in which the trade will receive a check that it is generally but ill prepared for after the frightful shock of the commercial crisis; from which not a few firms now go halting. At the weekly meetings of masters in Wolverhampton and Birmingham, just before our last report, there was a strong feeling of objection to the apparent meaning of the remarks of the Earl of Derby in relation to the attitude of this country after the commencement of hostilities. On Tuesday an amount of peaceful assurance was felt after the explanatory speech of the Premier on the previous night at the Lord Mayor's banquet; and the hope seemed to be not without strong foundation that England might be fortunate enough to maintain a position of strict neutrality. This more comfortable assurance received, however, a serious check on Wednesday morning, when there was received, with apparently something more than the authority of a rumour, the announcement that an alliance had been formed between Russia and France. Another display of the designs of the former power upon Turkey appeared to loom in that alliance, with the consequent future intervention of England under circumstances far less favourable to success than on the occasion of the last conflict with the Northern potentate.

With such a state of the public mind, it will not be surprising that at neither Wolverhampton nor Birmingham was there a better feeling than appeared last week. Masters were unable to report any noteworthy accession to the number of orders that had been received before the commencement of the week, either from the United States or from the home market; whilst customers who evidently had orders to give out—though not, perhaps, of any very great value—stated their expectation of having their requirements met at lower rates than has hitherto for some time been possible. Their demands have, in several instances, been conceded to a partial extent, though no great latitude has been conceded by the first-class houses.

Pigs also are giving way, and it is very probable that should the demand continue to slacken, several furnaces will be blown out, in order that the market may not be inconveniently stocked, and such a fall be necessitated as would call for an alteration in wages again to prevent serious loss to the makers.

In Birmingham, as well as in other parts of the country, the manufacturers are receiving few fresh orders; and as those previously on the books were to a very moderate amount only, it would be impossible, in many instances, to keep the workpeople on more than half time. Already the pinch has been felt to some extent by the artisans here, many of whom are very short of work, the fall off having this week been more generally felt, whilst the prospects of any mercantile arrival in trade, even after the election is over, are not at this moment very encouraging. At the present time there are few continental orders of any kind in the town: the principal of these are from Spain; and some preparations have been made of late for the Russian trade; a few orders have just been put in hand, and advices recently received speak encouragingly of the prospects of trade in that quarter. In other respects the continental trade is almost a blank; and so long as war is apparently impending, it is not likely that commercial operations will in any degree revive.

Respecting the different branches, we may report that the military gun trade is steady, and the Government contract is kept up. For metallic bedsteads, all kinds of hollow ware and tubing, there are also pretty fair orders in. A similar remark applies to the heavy steel toy trades—the edge-tool makers being all fully employed; but the lamp and chandelier makers, gas fitters, platers, and all engaged in the fancy trades, are badly off for orders.

The Wolverhampton traders, with those of Willenhall and Wednesfield, have not yet felt the depression to the extent of those of Birmingham.

The past week, however, has not been severely felt by the manufacturers either of Birmingham or Wolverhampton or their dense surrounding districts, as, in addition to its being a holiday week, the elections have unhinged their men for much work.

The Mayor of Hanley (Mr. W. Brownfield) intends to signalise his year of office by erecting a beautiful drinking fountain, in a central part of Hanley, and by building, at a cost of £500, a news and general reading room for the working men of the town.

It is much to be regretted that the dispute among the operative gun-lock filers at Wednesbury, is not yet settled. The men are still on strike, and are at present determined not to make any more of the "iron-back work" at the prices offered. They ask 1s. per pair for filing, and under that price they pledge themselves not to work. For upwards of three weeks the strike has gone on, and although we believe the forgers might have the advance they ask, yet they are united with the "filers," and intend to make common cause with them. It was hoped that the masters would have recognised the reasonableness of the demand made, and so prevented that distress which must be the result of a protracted strike; but this has not been the case yet, nor are there any signs of concession. The operatives have held several meetings lately, and they are firm in their resolve not to work any longer at prices which are, as they say, utterly inadequate to enable them to earn even a slender living at full work. This resolution has not been hastily adopted. Meeting after meeting was held to deliberate upon it, and they seemed to wish to maintain a respectful attitude towards the masters, and to avoid anything like an appearance of threatening or coercion. The evils of a strike were fully considered, and of course were weighed against the already existing evil of unremunerative prices, and the men reluctantly decided that it was their duty to make a stand. If those more immediately connected with the trade would now look at the question at issue impartially, with a view to its adjustment, it would be well. There is surely a solution to it more satisfactory than a compulsory yielding on either side; and it is certainly the duty of those holding high positions in the trade to use their influence for the promotion of the cause of justice, and the settlement of a dispute the perpetuation of which must be injurious to both sides.

An accident of an alarming nature, though fortunately unattended with loss of life, occurred on Tuesday morning last, at a spot known as "Oldacre's Bridge," a very short distance from the Lichfield Station on the Trent Valley Railway. Part of the line being under repair, the traffic for a considerable distance has to be worked on one pair of rails. It appears that an up and a down luggage train (one being drawn by three engines) were within a short distance of each other, and that one of them pushed on, endeavouring to clear the points before the other came up. A collision was the consequence. Several rriages were entirely smashed, their contents scattered in all directions, and the line was for some hours completely blocked up. The drivers escaped by jumping off their engines.

A few mornings ago a most singular accident happened on the canal at Coalport, in Shropshire, by which several boats on the canal, besides the ferry on the river, were smashed to splinters, and several persons had narrow escapes of their lives. The two canals are connected by an incline plane, by which the difference of level is overcome, the loaded boat being let down from the higher to the lower by means of a wooden frame worked upon wheels, and by means of a strong chain attached to a barrel, to which is applied a brake. In the present instance the chain broke, and the boat, containing five tons of iron, together with the carriage, which had but just begun the descent, left to the influence of their own gravity, soon gained an amazing impetus, the fragment of chain dealing out destruction to everything within its reach. A man at the bottom, in one of the boats, hearing the noise, had the presence of mind to jump out and run away. It was fortunate he did so, for that and other boats were broken up in their flight across the canal, from the water of which they rebounded like balls into the air. The boat in which the man had been fell at some distance into the very centre of the ferry-boat upon the Severn, from which several persons had just landed. The ferry, as may be expected, was dismasted and torn to pieces, two men in the cabin narrowly escaping—first, being killed by the falling weight; secondly, being drowned by the sinking of the boat.

The concluding coroner's inquiry into the circumstances attending the late boiler explosion at Wednesbury has been held. The witnesses stated that the boiler was worked at a pressure of 30 lb. to the square inch, and was capable of bearing a much greater pressure; the plates were three-eighths of an inch in thickness, and in some places a little thinner. Mr. Longridge, the Government Inspector, and some other witnesses proved that the plates over the fire had been red-hot, and thus becoming weakened, could not bear the pressure, so that the boiler exploded; the plates had become hot for want of water. There had been a buoy on each boiler to tell the quantity of water. The witnesses also gave an opinion that had the boiler been properly supplied with water when the engine commenced working, it would have taken some hours for it to become low. John Meakin was present, and after being cautioned by the coroner, made a statement to the effect that he tried the buoy when he first went to the pit on Friday morning, and that it indicated that there was plenty of water, and that the buoy must have been out of repair, and deceived him. (Another witness proved that Meakin did try the buoy.) Meakin further said that the explosion knocked him under a bench, and that he immediately applied the brake to the engine, and prevented the men who were descending the shaft from going too rapidly to the bottom. Mr. Longridge said that there were slides to the shaft of this pit, and that Meakin was deserving of every praise for applying the brake so promptly, for had he not done so, and thus prevented the skip from running to the bottom of the shaft, the lives of the seven men who were descending must have been sacrificed. This showed how desirable it was that every pit should be supplied with a proper brake and slides. The coroner summed up, explaining the law of manslaughter, and drew the attention of the jury to the principal part of the evidence. The jury, after a short consultation, returned a verdict of "Accidental death."

A few days ago an explosion of fire-damp occurred at the Bradley Green Colliery, in the parish of Biddulph, North Staffordshire, by which two of the workmen lost their lives, the first man who died being Peter Bottoms, twenty-nine years of age, and the other victim is William Stanway, twenty-six years of age. Mr. Harding, coroner, has held inquiries into the cause of the accident, when George Weaver, one of the colliers, stated that there had been fire-damp in the works for some weeks, and on the morning in question he told the men to watch their lamps, as it was a frosty morning and the gas would be liable to affect their lamps. The two deceased men with others were with him, and they had worked up to about seven o'clock, when the explosion took place. He did not know from whose lamp the fire originated, but the lamp used by a man named Allen Ambury was open, and he did not know whether any naked candles were used. He (witness) was also burnt, and several of the other men. Verdicts of accidental death were returned in each case.

In the lecture which Mr. Lionel Brough, Government Inspector of Mines, delivered a fortnight ago at the Bristol School of Mines, which lecture has been before noticed here, and which was prepared, in great part, for delivery to the miners of South Staffordshire, the able lecturer said that first in the list of mortal foes to the miner was that which, in the Midland Counties, was called "sulphur," a gas which, notwithstanding that that name had been applied to it, did not contain a particle or trace of that remarkable element. There was often enough (too often) sulphur chemically and mechanically mixed with the coal that gave it out, but in the fire-damp itself, there was decidedly none at all. It was, however, more correctly termed subcarburetted hydrogen, or light carburetted hydrogen. It was abundantly given out in most coal mines, and belonged to an extensive section in chemistry known as hydrocarbons, or more correctly, as regarded its gases, the hydrocarburets. The whole class consisted of gases, liquids, and solids. Our coal mine gas, or so-called sulphur and olefiant gas, were the aeriform fluids of the family, and they both contained but two ingredients, carbon and hydrogen. Carbon was much disposed to mix itself with oxygen as well as with hydrogen, and hence the facility with which coal burned in a common fire-grate. When fuel was properly and effectually consumed, the two principal results were the vapour of water and carbonic acid. But with imperfect combustion the watery vapour and the gases became mixed up with an undue quantity of uncombined fuel, and formed the canopy of smoke which more or less hung over all large cities, notwithstanding the enforced "consumption of smoke." The Black Country—as South Staffordshire was called—was never without this dark Indian-ink-coloured covering. The quantity of unconsumed carbon which flew up the chimneys of Great Britain with the ascending gases, amounted to thousands of tons of coal per annum, which passed away into the atmosphere, and seriously contaminated it, without having secured any useful effect whatever. He need not point out to them that this was a great national loss of very valuable property. Unskilful furnace construction and ignorant or careless firing were the causes of the phenomenon which they termed smoke. If they went into Cornwall, where coal cost nearly a pound per ton, they but rarely witnessed enormous dark masses issuing from the steam-engine chimneys. In that country they took care to dissipate into space as little uncombined carbon as possible. Coal was too expensive in that part of the country to be treated in such an unworthy manner. Returning to his subject, Mr. Brough gave a chemical explanation of fire-damp, or sulphur, and then proceeded to mention another natural enemy to the miner, second in danger only to fire-damp itself, though destroying life in a totally different manner. The one burst into sudden flame and loud explosion, dealing out death in proportion to the quantity ignited and to the obstacles that intervened; the other did its work silently and in the dark, but, in far too many instances, with terrible and certain effect. There were but few miners who had not met with "black-damp," or, as it was sometimes called, "choke-damp;" and those who had been so unlucky never wished to fall in with it again. Its proper title was carbonic acid gas, and it performed important functions in the great economy of nature. It was altogether irrespirable. If an attempt were made to breathe it in its pure state, the epiglottis became spasmodically closed, and the air of the atmosphere was then prevented from entering the lungs, so that suffocation was the inevitable and immediate consequence. This gas was a combination of two of the known great leading elements, in the proportion of two atoms or equivalents of oxygen to one of carbon. It was more than half as heavy again as the air we breathed. Thus its tendency was to occupy the lower or more deep-seated parts of underground excavation. Fire-damp sought the pit-holes and upper parts of a mine; but their deathly "black-damp" was found under the level of ventilation; and if a candle were immersed therein, it would immediately be extinguished. As an approximate rule, when carbonic acid gas was mixed with atmospheric air in the proportion of from 5 to 10 per cent., the lights went out; and, at the latter point, death ensued. When they found a place a little bit "dampy," as the Midland folks termed it, they should get in a sweeping current of fresh air, and render the place, wherever it might be, clean and wholesome by powerful ventilation, for its presence was sometimes accompanied by an excess of nitrogen, another fatal gas. Colliers are too often troubled with carbonic acid gas; and it is under such circumstances that government-road workings are apt to fill up with the damp, unless the building is made up tight, and well rammed in. They would often find that, hold their candle as they would, they could hardly keep a light. Whenever that was the case, the part of the mine where such phenomenon occurred was not in a fit state for men and horses to work in. If it did not kill at once, it still had a material effect on the health of living creatures. It was not uncommon in Staffordshire, upon visiting a colliery, to find the band stopped from the pit being "a little dampy this morning." All hands were at play, watching for a change in the weather, or for the wind to chop about to another quarter. This little "dampiness" was a source of discomfort and danger to the men, and of great loss to the master. Yet there was no reason whatever why such a state of circumstances should prevail. If the roads were but large enough, the sides of work well open, and the wind-ways all clear, there should be no stoppage on account of "black-damp." A good furnace, and the air pulled sharp through all the openings, would cause the noxious gas to mix with the atmosphere under ground; and it would be sent flying through the upcast, just in proportion to the rarefaction that increased temperature will be sure to occasion. "I do not like (said Mr. Brough) to see a lot of naturally industrious colliers playing on the bank because the pit is a little 'dampy.' It is true that you cannot prevent carbonic acid gas from generating, but it is equally true that you can do away with its accumulating in dangerous quantities." The lecturer then enumerated some gases that involved difficulty as to any reliable statement of their comparative quantity and degree of danger under ground. He noticed, first, one that in many counties was called "white damp," and in Staffordshire it was known by the name of "white sulphur." This gas was remarkable for its fetid odour, and it proved fatal when the lungs inhaled it. It was inflammable, and consequently dangerous from that cause as well as from its poisonous quality. Its weight, which was rather heavier than the air we breathed, would sometimes be an indication of its position in a heading or stall. After this came the byhydrocarbon, commonly called olefiant gas, and consisted of two volumes of hydrogen and two of carbon. Its specific gravity very nearly approached that of our own natural atmosphere. It was inflammable and irrespirable. The next gas met with was nitrogen, which extinguished flame, and was wholly incapable of supporting animal life. It was more especially present in a coal mine after an explosion of fire-damp. There was yet another gas which had been stated to have been found under ground, though he must altogether doubt its frequency. It was called "carbonic oxide," and was the gas forming a portion of the flame seen issuing from the tunnel heads of blast furnaces, and also might often be observed in the night-time flickering about the coke beds of an ironwork, exhibiting a beautiful blue flame. Its composition was one of carbon to one of oxygen. "Not long since (continued Mr. Brough) a coal mine that had a steam engine at work underground was the scene of a terrible calamity. By some careless act a door was left open, and consequently the products of combustion of the engine fire were diverted into a wrong channel and got amongst the workmen, ten of whom unfortunately lost their lives. Although carbonic acid gas had something to do with this fatal occurrence, I myself believe that the carbonic oxide generated by the burning of the coals under the boiler was the principal agent in this deplorable event." He had now exhibited a formidable catalogue of dangers; carburetted hydrogen and choke-damp were, however, the most dangerous foes to the miner. At the same time the only remedy for all the six gaseous compounds that he had described was, thorough, searching ventilation. If a mine was properly laid out, and an adequate furnace or furnaces kept constantly fed and burning clear, the chances were entirely on the side of safety. The men had their duties to perform as well as the masters. One act of carelessness or temerity might, in a moment, undo that which had cost great labour and a vast sum of money to accomplish. If the viewer was skilful, the overman diligent, and the workmen obedient, mining might be rendered almost as safe as surface operations. Mr. Brough concluded his highly valuable lecture with some well-digested remarks upon the value and use of the safety-lamp, respecting which it was not, he said, too much to say, that if we should now be deprived of its use, the result would be a material check on the prosperity of the whole kingdom; indeed, of all the civilised portion of the globe. "Sir Humphry (Mr. Brough said) determined, with his usual felicity, that a lamp with less than twenty-four wires to the inch was positively dangerous. This may really be said to be the principle of the lamp; and it is one you must never forget. Many lamps have been manufactured with twenty-six wires, or 676 openings, and I do not say that they are unsafe; but I do say and believe that at twenty-eight the lamp is far more trustworthy."

NOTES FROM THE NORTHERN AND EASTERN COUNTIES.

(*From our own Correspondent.*)

The Electoral Convulsion—The Barnsley Mining District—The Manchester Post-office Question—Geological Features of the Manchester District—Isle of Man Telegraph—The Locomotive and Railway Carriages for the Pacha of Egypt—Smoke Consumption on Railways—The Atlantic Telegraph—Liverpool Matters: *The Dock Board an Offshoot of the Social Science Association*—East Suffolk Railway—Agricultural Railway Traffic: *The Bread-and-Cheese Railway*—Sheffield Trade—Boydell's Traction Engines—Manchester Mechanics' Institution—Railway Carriages on Fire—Lifeboats.

The political struggle with which the provinces are now convulsed, engrosses men's minds to the exclusion of almost every other topic.

The Barnsley mining district is reported to be in anything but a satisfactory state as regards the feeling between masters and workmen. A year since a union was formed amongst the miners; but as an opinion began to prevail that it was losing ground, a meeting was held on Friday on the subject. Mr. Richard Mitchell, secretary to the Miners' Association, was called to the chair, and in opening the meeting said, it was well known that the miners produced a great deal of the wealth of the nation, but out of every twelve hours' labour eight of them went into the pockets of the capitalists. Before the workmen could elevate themselves they must be better informed. The wealth produced by the miners was enormous, and it was well known that they were not sufficiently remunerated for their labour, nor were they properly treated by their masters. It was labour that produced capital, and the reason that the workmen were not possessed of capital was because they had not sufficient knowledge and were not properly organised. Mr. Davies moved a resolution to the effect that a firm organisation should be maintained by the different mining districts in the kingdom. Mr. Davies denounced the truck system, and asked why it was not prohibited? It was because the poor miner was kept in ignorance, and had not the opportunity of judging and thinking for himself. In order to place themselves in a position to get better remuneration for their labour they ought, to organise, and if they only organised and were men of principle they might adopt means to enable them to obtain and maintain the rights of labour. He hoped they would be determined to give their support to the Union, not neglect their payments, and then eventually they might be able to resist the system of oppression to which they were subjected. The reason workmen could not achieve this was because they did not combine together, and had not a proper amount of confidence in each other. The resolution was adopted, and also another declaring "that making ourselves working capitalists by mutual co-operation is the only means by which the full reward of our labour can be secured or enjoyed by us." One of the supporters of this second resolution said he considered that the enormous sums collected to support strikes were so much money thrown away.

The Postmaster-General, in his elaborate report on the working of his department during the past year, observes with reference to the Manchester post-office question:—"A site has also been obtained for the erection of a large new office at Manchester; but, in deference to the wishes of many of the leading inhabitants, it has been determined to ascertain whether it is practicable to procure, on such terms as the case will warrant, a site in substitution for this in another part of the town, which it has been represented would be more convenient to the inhabitants generally."

At the last meeting of the Manchester Geological Society, Mr. E. W. Binney produced a geological map of Manchester and the district, coloured by himself, on which he pointed out the principal geological features of the country. Mr. Binney stated that the geology was chiefly trias in the neighbourhood of the city, with bits of permian in the valley of the Irk, at Newtown and Collyhurst; magnesian marls, and the lower red sandstone. In the rocks below Smedley Old Hall he had found a good deal of fossil wood, not in a very good state, but worth collecting. Those probably would be the only places where fossils would be found on that side of Manchester. The Manchester coal-field contained plenty of fossils, and an abundance of the remains of fish. Going up the river Medlock, at Mr. Wood's weir, Philip's Park, he had found shales full of fish remains; whether they remained now he could not say.

The Committee of the Isle of Man Telegraph Company have accepted the tender sent in by Messrs. Glass and Elliott for manufacturing and laying down a submarine cable between the island and England.

The Otodine has shipped the splendid locomotive and railway carriages, built by Messrs. R. Stephenson and Co., and Messrs. J. and H. Burnup, for the Pacha of Egypt. They are, it is stated, the largest parcel of machinery ever shipped from the Tyne.

At Grimsby, the Manchester, Sheffield, and Lincolnshire Railway Company have again been fined £5 by the local magistrates for not consuming the smoke caused by the use of coal instead of coke on their locomotives. [The Eastern Counties engines frequently send forth a good deal of smoke, but the nuisance is allowed to pass unnoticed.] The company afterwards attacked a man for not consuming *his* smoke, or, speaking more strictly, smoking a pipe on the new dock, contrary to their bye-laws. The defendant was fined £1 and costs. It appears the company are determined to make an example of all persons smoking on their works, in consequence of their having upwards of half a million of property, chiefly cotton, under their care.

At a meeting of shareholders in the Atlantic Telegraph Company, held a day or two since in Liverpool, Mr. Stuart Wortley presiding, the chairman described the present position of the company, and pointed out the various applications that had been made to the Government for guarantees of a similar character to that granted with such success to the Red Sea and Indian Telegraph Company. The terms offered were as follow:—A guarantee of 8 per cent. upon the capital to be employed, not exceeding £600,000. This guarantee to be for twenty-five years, conditional upon the successful working of the cable, at the rate of not less than one hundred words per hour. A postal contract of not less than £20,000 per annum for the business of the Government; any excess of work to be paid for at the company's ordinary tariff. The company's contract with the American Government, whereby a further minimum sum of £14,500 is secured to the company, is to be allowed to subsist. So that, by this arrangement, the guaranteed revenue of the company, independent altogether of mercantile support, will be £34,500 per annum. The Government to allow £20,000 of the guaranteed capital to be expended in efforts to resuscitate the old cable. The company to transfer to Government that portion of their privileges under the agreement between themselves which contained the exclusive right to land cables from Europe on the shores of Newfoundland. It was proposed to issue the new capital in shares of £5 each, with a view to popularise and extend the interest in the undertaking; and that the summary of what the directors would offer to the public over and above the national character of the work and its value as a commercial and imperial agent, would be as follows:—1st. A capital of £600,000, in 8 per cent. preference shares of £5 each, guaranteed by the Government, contingent on success. 2nd. A guaranteed minimum income of £34,000 per annum in support of such preference, independent of public support. 3rd. A policy of insurance upon the successful extension of the cable from the shores of Great Britain and Newfoundland. 4th. A guarantee for careful management and electrical success under a contract similar to the one just described, whereby the interests of the contractor are involved absolutely in those of the company. A resolution was adopted, approving of the policy sketched out by the chairman.

At the last meeting of the Liverpool Docks and Harbour Board, the engineer was requested to order eight sets of Morse's telegraph instruments, eight tons of iron-wire, and 5,000 glass insulators, for the Holyhead and Liverpool Dock Telegraph. The chairman said the bill promoted by the dock board in Parliament had passed the third reading, and received the royal assent before the prorogation. Mr. MacIver asked whether, that being so, the docks and quays and works committee would reconsider their determination as to the proposed steam-dock off the Huskisson Dock, and make it 300 ft. instead of only 150 ft. wide. The chairman said the best way would be for Mr. MacIver to communicate with the works committee on the subject.

At the last meeting of the Liverpool Architectural Society, Mr. Chantrell exhibited a model of a furnace for re-burning animal charcoal. Mr. Chantrell stated that the peculiarity of the furnace was that brick chambers had been introduced, by which a great saving in fuel was effected; it would also, he said, be a very cheap way of producing peat charcoal for sanitary purposes.

A local committee established at Liverpool, in connection with the National Association for Promoting Social Science, have held a meeting to consider the subjects and allot the task of preparing such papers as it might be deemed desirable to present, regarding the interests of the locality, at the next annual meeting of the general association. Mr. Joseph Hubback presided, and said it was expected that the association in Liverpool should do exactly that which the association at large had done for the country; and, in order to effect this purpose, the committee decided to direct attention to four departments. The subjects of inquiry were thus explained in the address which had been circulated:—1. To collect information as to existing (local) social evils and their fit remedies, and the available means and best methods of applying such remedies. 2. To afford a centre of communication to which such information may be imparted, and from which it may be drawn. 3. To provide a medium through which means of social reform, suggested by the experience of other localities, may be published and made available in this; and, 4. To afford, annually, an opportunity of considering, as far as may be in the presence of the parties immediately concerned, such portions of the information thus obtained as it may be expedient to impart to the association at large, at its next annual gathering. In the discussion which followed, Mr. Higginson spoke on the question of public health, directing his remarks to the subject of infant mortality. In Liverpool they had not the temptation which existed in some manufacturing districts, to leave children at home, under the influence of narcotics, whilst the parents went out to work. He thought means should be provided to enable working men just recovering from sickness to have the benefits of fresh air out of town. He highly approved of the drainage works which had lately been constructed in Liverpool, his conviction being that it contrasted most favourably with the pound foolishness of the old system. Mr. T. Rathbone spoke on the registration of lodging-houses, and advised the substitution of Lord Shaftesbury's measure for the local act. Mr. P. Rathbone spoke on the question of social economy, and said a great step had been made in the right direction by the "cental" in Liverpool. Alluding to trades' unions, he said the general association, feeling the importance of the subject, had appointed sub-committees in various towns to report on the subject. Mr. T. Rathbone regretted the decision of the commissioner on decimal coinage; but congratulated the Liverpool corn trade on having adopted the cental. Dr. Gee congratulated the town on the greatly improved condition of its working classes, as evidenced by the great decrease in zymotic diseases. That fact showed that the sanitary operations of the town had been successful. Mr. Danson moved:—"That this meeting, deeming it of the highest importance to the social interests of Liverpool and its vicinity, as well as of the kingdom at large, that the circumstances affecting and determining the social condition of that great and growing community now assembled on the banks of the Mersey should be adequately and systematically investigated, invite all persons disposed to take part in or to aid such investigation to communicate with the local committee, in order that their several labours may, by due co-operation, be the better directed to the attainment of the common object." The motion was unanimously adopted.

Monday, May 2, is now named as the opening day of the East Suffolk Railway. It is feared, however, that the whole system will not be ready for traffic on that day. The delay is expected to occur between Woodbridge and Ipswich—a dozen miles or so, which have been more than four years on hand.

This is one version of the matter; but Mr. Ayres, the secretary of the Eastern Union Company, who undertook the construction of the Woodbridge section, writes to a local paper:—"During the past week the works have so far advanced that their completion is now a question only of a few days; and as notice has been given to the Board of Trade for the customary Government inspection, the line may be expected to be certified as ready for public traffic within a fortnight of this time. I will just add a few words as to the works upon the line, which must be measured, in regard to time of completion, not by its length, but by the time required to complete any particular portion. For months past most persons residing in the counties of Suffolk and Norfolk have heard trumpeted forth from time to time of the satisfactory progress made with the East Suffolk line, and of the unsatisfactory progress made with this company's Woodbridge line. The works upon the two undertakings appear to me to admit of no comparison, as the East Suffolk line traverses for its greatest extent an easy country, the works upon which are light and in many parts insignificant, whilst the works upon the Woodbridge line are excessively heavy throughout, the manual labour being immense; in addition to which there have been almost insurmountable difficulties to grapple with from landslips and other causes. Notwithstanding the difficulties briefly adverted to, it is doubtful—seeing that the East Suffolk line was inspected by the Government officer about a month since, and the usual certificate for its opening has not, I believe, yet been granted—whether the certificate for the opening of this company's Woodbridge line will not be first obtained."

With reference to a paragraph which appeared in The Engineer of last week headed "Agricultural Railway Traffic," it is right to correct an erratum. The paragraph, which otherwise deals with totals of large magnitude, states that the Eastern Counties Railway carried 550 sacks of flour during the last twelve months. This should have been 550,000 sacks. The flour trade on the Eastern Counties is a large and lucrative branch of the traffic on that railway, which was rightly designated by a former chairman a "bread and cheese line."

The *Sheffield Independent* has the following on the trade of that town:—"With one or two pleasing exceptions, we hear on all sides complaints of the flatness which prevails in most of our staple branches. Those firms who, from the extensive nature of their operations, may be relied on for correct information, express decided opinions that the state of trade is not so encouraging as it was at the opening of the year. While some of our rolling mills are but partially employed, others are moderately off for work on sheets and crinoline steel, especially the latter, the demand for which keeps up wonderfully. There is more activity in the spade and shovel trade. The pearl handle cutters are busy, all the trade being for a time, from peculiar circumstances, in the hands of a very few individuals. As may be expected, from the unfavourable state of the continental dispute, the orders from all parts are very restricted; and there is no strong desire on the part of our manufacturers to undertake any but most limited contracts."

Boydell's traction engines seem to be meeting with a fair amount of attention. It is understood that Mr. Burrell, of the St. Nicholas Works, Thetford, Norfolk, has been lately engaged with two of the engines for the Indian Government, while another has been ordered for the Government establishments at Woolwich, and a fourth is about to be despatched for the Pacha of Egypt. It was stated some months since that Mr. Boydell had expended a very large sum, some £15,000, in maturing his invention, and it is, therefore, high time that he should begin to reap his reward.

The directors of the Manchester Mechanics' Institution are advertising for a secretary, to enter upon the duties of the office in June next. This step has been necessitated by the resignation during the past week of Mr. E. Hutchings, who has for about seven years held the secretaryship.

Two other disagreeable instances of railway carriages becoming on fire are reported. Just as the train which left London at 10 a.m. on Friday, was approaching Warrington, those persons standing on the platform discovered flames rising up from the last carriage. By gesticulating violently, the porters succeeded in attracting the attention of the engine driver. The speed was suddenly slackened, and the burning carriage run under the waterspout which supplies the engines, the affrighted inmates of the carriage escaping from their imminent peril. The whole of the luggage packed on the top of the carriage was on fire, the flames only being got under with considerable difficulty.—As the parliamentary train which leaves London at 7 a.m. was midway between Atherstone and Nuneaton, on Thursday, the passengers in one of the third-class carriages were alarmed by signs of fire in the roof of the carriage. The attention of the guard (whose van was immediately following the carriage) was arrested, the guard in advance signalled, and the train stopped. The luggage at the top of the carriage had become ignited, most probably by a spark or cinder from the engine, and on the removal of the coverings the whole was discovered in flames. The passengers in the carriage were speedily removed, and the burning luggage was quickly thrown off, though not before part of the carriage was in flames. A goods train came up in the opposite direction at the time, and by the aid of water from the tender of the engine the flames were extinguished.

It was stated recently in these columns that the beachmen at Yarmouth—and, it may be added, at one or two other places on the east coast—entertained objections to the new life-boats with hooded ends supplied by the National Institution. At a meeting at Yarmouth last week, attended by Captain Ward, the society's inspector, it was decided, after a long consultation, that Mr. Beeching, who obtained the prize offered by the Duke of Northumberland on the subject, should prepare a plan of a life-boat, and consult the beachmen with the view of meeting their views as far as possible—the plan to be delivered to the inspector in a few days.

London Mechanics' Institution.—Upwards of £2,000 are reported in the *Times* as having been already subscribed towards the purchase of the building and relief of the trustees. £3,500 are required.

Exports for March.—The Board of Trade returns for March show an increase in our exportations equal to that presented in the preceding month, the excess over the total for the corresponding month of last year being £2,312,954, while as compared with March, 1857, when the false inflation of trade was at its height, there is also the large augmentation of £856,880. The exports for March, 1859, were of the value of £11,313,228, and for March, 1858, £9,000,274. The aggregate value of our exports during the first three months of the year has been £30,520,794, against £23,510,290 in the corresponding period of 1858, showing an increase of £7,010,504, or 30 per cent., which has occurred as follows:—

January	£2,371,823
February	2,325,727
March	2,312,954

Compared with the same period of 1857, there has been an increase of £1,693,301, or nearly 6 per cent.

SCOTCH PIG IRON REPORT.

No. 1 Gartsherrie	54s. 9d. f.o.b.	Glasgow.
„ 1 G.M.B.	50s. 9d. „	do.
„ 3 Do.	50s. 9d. „	do.
M. Nos. Do.	50s. 9d. „	do.

WARRANTS.

3-5ths No. 1 and 2-5ths „ 3 ..	Cash prompt	50s. 6d.	per ton.
	1 mo., open, ...	50s. 9d.	do.
	2 mos., „	51s. 0d.	do.
G. M. B. ..	3 „ „	51s. 3d.	do.

MANUFACTURED IRON.

Bars, Govan	£8 0s. less 3 per cent.
Common	£7 5s. less 4 per cent.
Plates and sheets	£9 to £10.
Rails	£7 2s. 6d. per ton.
Pipes	£5 5s. per ton.
Chairs	£4 2s. 6d. per ton. Nett cash.

Glasgow, 27th April, 1859.

Our pig iron market since this day week was comparatively inactive up to this morning, the price vacillating 3d. on either side of 51s.; but the foreign news this morning causing considerable uneasiness, sellers became more anxious, and a large business was done in warrants at 50s. 6d. cash and 51s. three months open, closing very heavy at these rates.

The demand for shipment has been good, and last week the exports were 16,504 tons against 15,146 tons same week last year.

Shaw and Thomson, Metal Brokers.

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	pr tn	7 0 0	3
in Wales	„	6 0 0	„
in Liverpool	„	6 10 0	„
Deliv. into boats at works: Staffordshire Bars (Nom. rates last qr. day for favourite brands)	„	8 0 0	1½
Sheet, Sngl.	„	9 10 0	„
Dbl.	„	11 0 0	„
Hoop	„	9 0 0	„
Rod, round	„	8 0 0	„
Nail Rod, sq.	„	9 0 0	„
SHIPPING IRON, Staffordsh. Bars (Delivered in Liverpool 10s. per ton less)	„	8 0 0	2½
Sheet, Single	„	9 10 0	„
Double	„	11 0 0	„
Hoop	„	9 0 0	„
Rod, Round	„	8 0 0	„
Nail Rod, Square	„	9 0 0	„
IRON, Rails, in Wales, cash	„	6 5 0	nett
„ „ 6 months	„	6 10 0	„
in Staffordshire	„	7 0 0	„
Railway Chairs, in Wales	„	4 5 0	„
„ in Clyde	„	4 5 0	„
Pig No. 1, in Clyde	„	2 10 0	
3-5ths No. 1 & 2-5ths No. 3	„	2 10 0	„
No. 1, in Wales	„	—	„
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.	„	—	„
Acadian Pig, Charcoal	„	8 15 0	„
Scotch Pig, No. 1, in London	„	3 10 0	„

		£ s. d.	Dis. p.ct.
IRON, Swedish, Indian assortments	pr tn	13 10 0	2½
Russian C C N D „	„	17 0 0	„
STEEL, Swedish Keg, nom.	„	21 0 0	„
Ditto Rolled	„	19 10 0	„
Faggot	„	22 0 0	„
SPELTER, on the spot	„	20 0 0	nett
To arrive	„	20 0 0	„
ZINC, in sheets	„	30 0 0	1
COPPER, Tile, 14 to 28 lb.	„	112 10 0	3
Tough Cake	„	112 10 0	„
Sheathing and Bolts	pr lb.	0 0 12½	„
Sheet	„	0 0 12½	„
Bottoms	„	0 1 1	„
Old	„	0 0 11½	„
Yellow Metal	„	0 0 10½	„
Burra Burra	pr tn	114 10 0	
Russian	„	122 0 0	
LEAD, British Pig	„	22 10 0	2½
Spanish	„	22 0 0	„
W. B. at Newcastle	„	—	
Sheet	„	23 10 0	„
TIN, English Block, nom.	„	129 0 0	„
Bar „	„	130 0 0	„
Refined „	„	137 0 0	„
Foreign Banca	„	135 0 0	nett
Straits	„	133 0 0	„
TIN PLATES, Charcoal, IC	pr bx	1 13 0	3
Ditto IX	„	1 16 0	„
Coke, IC	„	1 6 6	„
Ditto IX	„	1 12 6	„
Do. at Newport, 1s. pr bx. less		—	„
Do. at L'pool, 6d. „		—	
CANADA, Plates	pr tn	13 0 0	0
QUICKSILVER	pr bottle	7 0 0	3

Rails are without alteration, the nearest quotation for cash being about £6 5s. per ton f.o.b. in Wales. Fishing prices £7 10s. to £7 15s.; and cast iron chairs £4 per ton.

Scotch Pig Iron has been exceedingly dull during the past week, owing to the state of political affairs on the continent, and a decline has taken place in price from 51s. 6d. to 50s. per ton cash, which is the nominal closing price for mixed Nos. warrants f.o.b. at Glasgow. The shipments last week were 16,500 tons against 15,100 tons corresponding week last year.

Spelter has fallen nearly £2 per ton during the week, and the market is very languid.

Tin: Banca and Straits are quoted £1 per ton lower.

MOATE and CO., Brokers,
April 28, 1859. 65, Old Broad-street, London.

TIMBER.

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

per load—	1858. £ s.	£ s.	1859. £ s.	£ s.
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	0 0
St. Petersburg, yel.	11 0	12 10	9 10	12 0
Finland	9 0	10 10	9 0	11 0
Memel	10 0	15 0	9 0	14 0
Gothenburg, yellow	9 10	12 0	9 0	12 0
white	9 0	11 0	10 0	11 0
Gefle, yellow	11 10	12 10	11 0	11 10
Soderhamn	11 0	12 10	10 10	0 0
Christiania, per C. 12 ft. by 3 by 9 in. yellow	20 0	27 0	0 0	0 0
Deck Plank, Dntz. 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	200 0	220 0	160 0	165 0

Glycerine.—Under a process lately patented in England, this substance is stated to be obtained from spent soap-lees, by forcing dry steam of a temperature of 400 deg. Fah. through them. By this means the glycerine is evaporated, and condensed in a separate vessel, upon the common principle of distillation. Glycerine has also been used lately in England mixed with paper pulp, whereby the paper so made is rendered soft and pliable, and especially useful for some kinds of wrapping paper.—*Scientific American*.—[Further than this, glycerine thus employed in the manufacture of paper enables it to be printed upon when dry, and the impressions are even more sharp and require less time to dry than upon ordinary damped paper.]

Sheffield and Halifax.—Sheffield also was noted for its whittles even in the time of Chaucer, as it now gives steel to all the world—the blade to the Briton for his beef, and the savage for his "long-pig"—to the Red Indian for scalping a foe, and the civilised American for "solving a difficulty"—to the brigand for cutting a throat, the sailor his tobacco, the priest his sacramental bread. One great branch of Sheffield's industry in these days consists in the manufacture of that mysterious article of feminine apparel which is used to give the female form its full development, and endow it with the essential bulginess. Sheffield thrives on the new fashion, which almost makes up to it for the decline in the tomahawk business consequent on the evangelisation of Polynesia. Halifax is another of the old industrial towns, now hardly able to hold its own against its younger rivals. It is noted as the largest parish in England, and otherwise by its name of terror to thieves. "From Hell, Hull, and Halifax, good Lord deliver us!" was a part of the ancient thieves' litany, the last being dreaded the most for its bloody law, by which felons taken within the liberty, either "hand-habend, back-berand, or confessand," as to any commodity of the value of thirteenpence-halfpenny, were liable to be beheaded within three days by a species of guillotine. Not the least important of the manufacturing towns is Batley, the chief seat of that great latter-day staple of England—shoddy. This is the famous rag capital—the tatter metropolis, whither every beggar in Europe sends his cast-off clothes, to be made into sham broadcloth for cheap gentility. Of moth-eaten coats, frowzy jackets, reecky linen, effusive cotton, and old worsted stockings, this is the last destination. Reduced to filament and a greasy pulp by mighty toothed-cylinders, the much-vexed fabrics re-enter life in the most brilliant forms—from solid pilot cloth to silky mohair and glossiest Tweed. Thus, the tail coat rejected by the Irish peasant—the gaberdine too foul for the Polish beggar—are turned again to shining uses, reappearing, it may be, in the lustrous paletot of the sporting dandy, the delicate riding-habit of the Belgravian belle, or the sad-sleek garment of her confessor.—*Westminster Review*.