of the box I. Discs of cardboard K strengthen the diaphragm. Two air channels, L and M, communicate with the two parts of I, and end at L^1, M^1, where the connecting tubes can be fixed. H^1 has only one communication, the

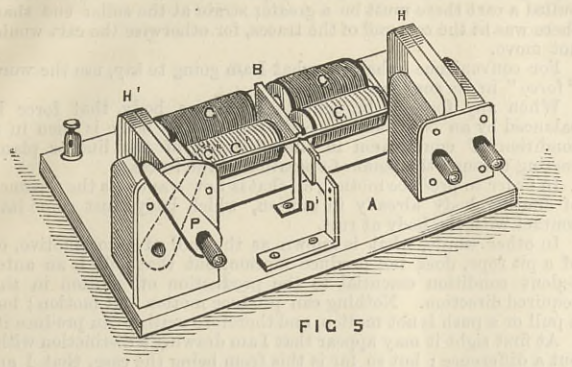
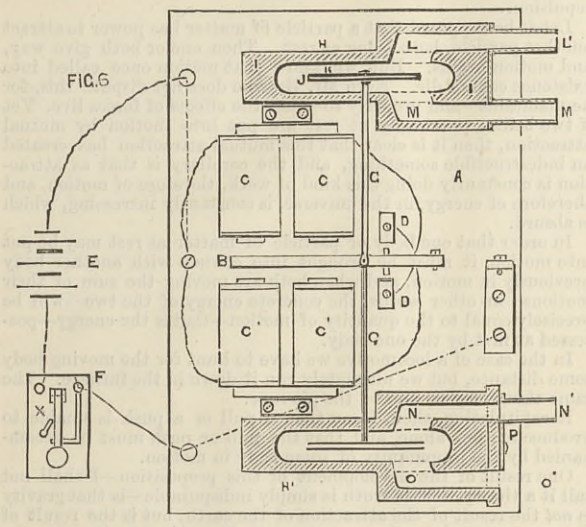


FIG 5

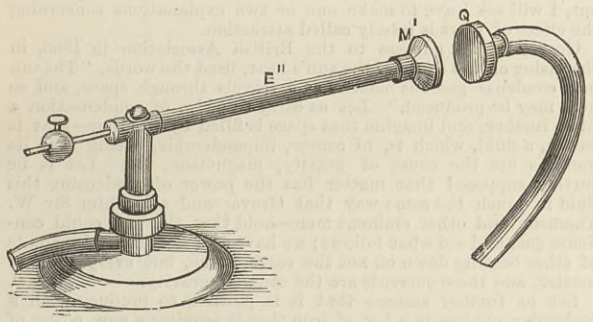
end being fixed on a brass lever P, Figs. 5 and 10, so that it can be shifted to or connected with either of the other ends. It is obvious that a movement of B in the direction



of the magnet C will cause air to be expelled from the air passages L and N, and at the same time to be sucked in by M and O, and *vice versâ*.

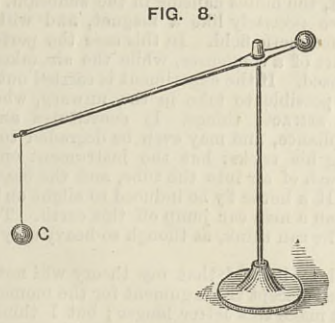
The phenomena of attraction and repulsion were shown in the most complete manner, and it was also shown that merely the approach of a body, such as a piece of carbon or a tracer near to the diaphragm of one tube caused it to be attracted just as a magnetic needle is by soft iron.

FIG. 7.



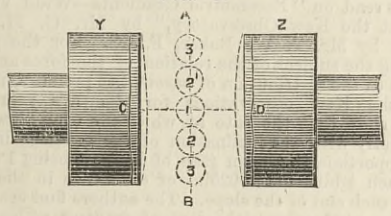
The tube in Fig. 2 may be straight as in Fig. 7. There are various ways of making the drums and of obtaining similar results which it is not necessary to do more than mention. It may be said here that according to Mr. Stroh's description the phenomenon of attraction due to vibrations is comparable with the magnetic phenomena of repulsion, and the mechanical repulsion with the magnetic attraction; that is when the diaphragms vibrate similarly or in the same phase attraction results, when they vibrate dissimilarly repulsion takes place. In the experiment next described the drums were fixed. The apparatus is shown in Fig. 11, and is almost the same as in Fig. 10, except that the board S replaces the balance. This board has two

FIG. 8.



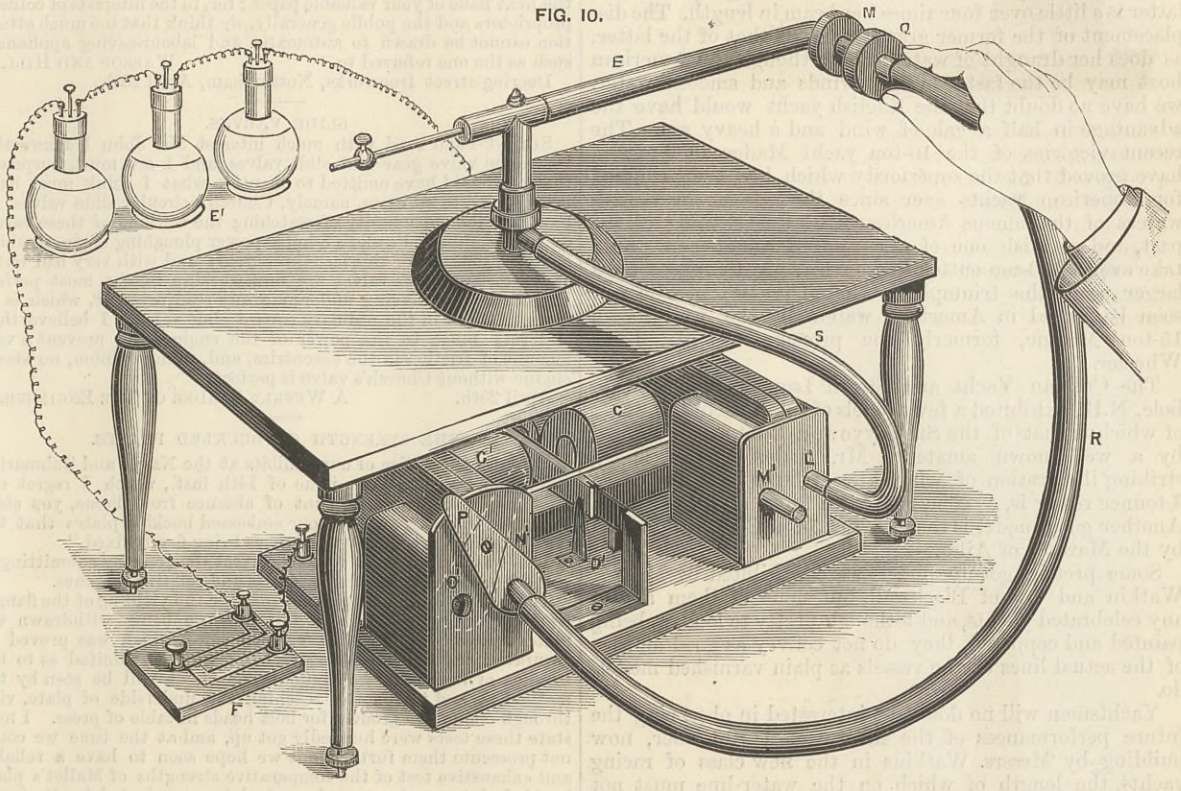
brass uprights T T^1 supporting by friction the brass tubes U U^1, the outer ends of which are connected with the flexible tubes R and S, while drums Y and Z are fixed to their inner ends. Taking a light cork ball C, suspended

FIG. 9.



as shown in Fig. 8 on a light rod resting on a pivot, it will be in certain positions attracted and repelled. Fig. 9 shows the drum as seen from above, and if the back is placed so as to move in the line *a b* it is attracted when the diaphragms vibrate in opposite phase to the central position 1; while when vibrating in similar phase it is attracted to 3 or 3^1. This experiment is analogous to one of Dr. Bjerkness' with a small piece of iron and bar magnets, the iron being placed on cork and floating in water

FIG. 10.



Thus far Mr. Stroh explained that he had followed and corroborated Professor Bjerkness, but his intention was to direct attention to phenomena which, while recognisable when the medium used was air, might be overlooked when the medium for carrying or transmitting the vibrations

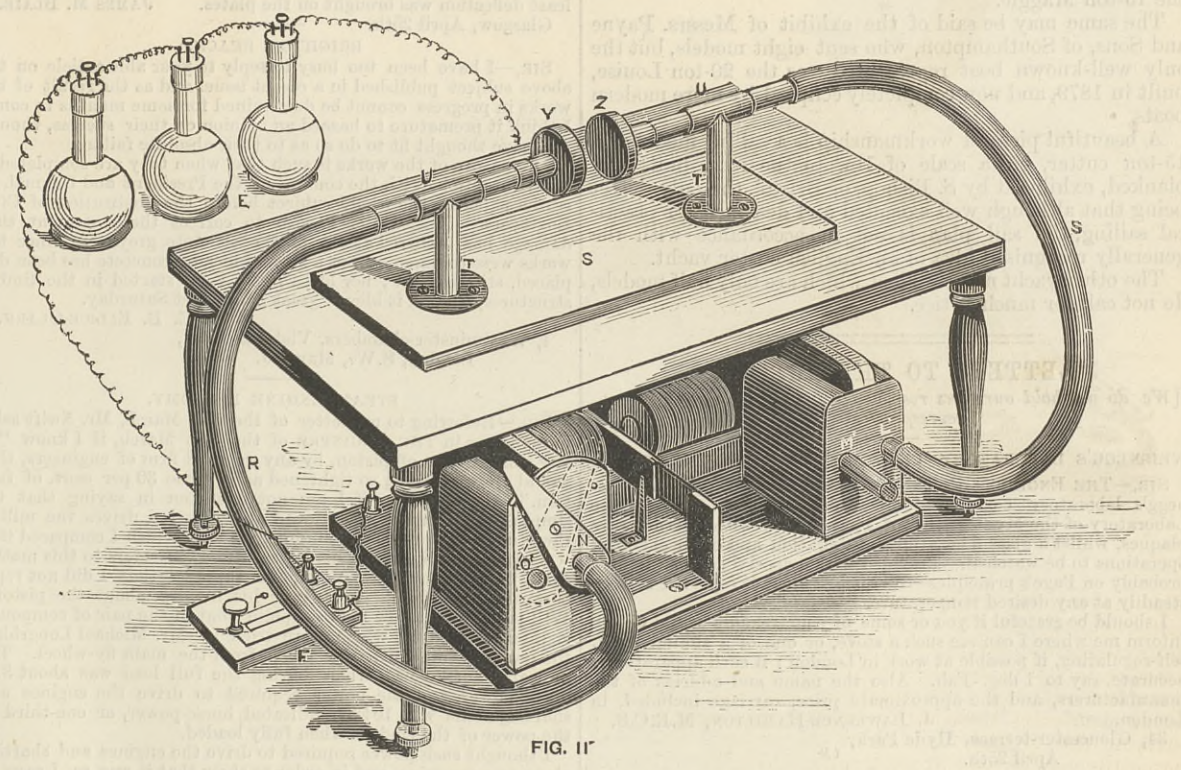


FIG. 11.

was water. The lecturer wanted to ascertain what the mechanical movements of the air were which cause this attraction and repulsion. The pole of a magnet, as is well known, causes some changes in the material in its immediate vicinity, and, in fact, causes what is termed a magnetic field, the entrance into which of metallic bodies induces certain phenomena to take place, such as in the case of a piece of iron becoming magnetic, or that of a wire moving through different parts of the field of an electric current. Similarly the vibrating diaphragms cause changes in their immediate neighbourhood. These changes can be investigated as regards direction and amplitude like any other forces, and Mr. Stroh's investigations have shown to him that the diagrams of the lines of vibrating force were very similar to the diagrams of the lines of magnetic force, except that the former were extremely feeble at a short distance from the diaphragms. The direction and amplitude of the vibrations were ascertained by means of a gas jet, the flame of which follows the vibrations of the air, and viewed from above its more luminous upper part forms straight or curved lines. [The diaphragms in Figs. 3 and 10 should not be connected, as incorrectly shown in the engravings.

YACHTS AT THE NAVAL AND SUBMARINE EXHIBITION.

THE display of models of yachts at this Exhibition was somewhat disappointing, many of the leading yacht designers and builders not contributing any specimens of their skill. This is much to be regretted, seeing what vast strides have been made in the last few years in the design of yachts intended solely for racing purposes, as it is notorious that vessels of comparatively recent construction are practically useless when any of the yachts built within the last two years are present to compete with them. As a proof of this statement we may mention the Miranda, which has practically destroyed schooner racing in the large class; the Samoena and Vanduara, the champion 90-ton cutters; the May, Annasona, and Sleuthhound, all built last year, and on whose appearance the existing 40-ton cutters had to retire from racing; the Freda and Amalthea, with whom no existing 20-tonners could compete; and the Neptune and Buttercup, who carried all before them in the 10-ton class. Not one of the above-named celebrated vessels was represented at the Naval and Submarine Exhibition, nor have their builders or designers sent any models to show what they propose to do in the future. Whether their absence is due to a disinclination to exhibit their designs to a discerning public, or whether they were reserving themselves for the exhibition of the Shipwrights' Company, now open, we cannot say; but must repeat that in an exhibition where everything else pertaining to naval architecture was so well represented, our pleasure navy was very inadequately illustrated.

The two most striking models of yachts were those of the Formosa, 103-ton cutter, formerly the property of the Prince of Wales, built by Ratsey, of Cowes, and modelled by a coast-guardsman named Henry J. Pope, of Hastings; and that of an American schooner yacht, built for speed, by G. A. Polhamens, Nyack, on the Hudson River, New Jersey, exhibited by Captain Barker of the Holborn Viaduct. Both models are fully rigged with canvas set, and are admirable specimens of workmanship and patience. The model of the Formosa is specially worthy of admiration, for the careful manner in which every detail is worked out; but it is doubtful whether the maker will ever be repaid for the enormous amount of time and trouble he has spent upon the model, as the price asked is one which few would be disposed to give for an article of no real utility except to place in a museum as a memento of what an English racing cutter of the present day really is; and our descendants might refer to such a model if placed in the South Kensington Museum, if the time ever arrives, as recently predicted by a contemporary, when steam yachts shall be paramount, and a revival of sailing yachts shall take place, similar to the recent revival of coaches after they had been driven off the road by the introduction of rail-

ways. The two models referred to are interesting as representing the distinct types of English and American yachts. The dimensions of the Formosa are—length, 84·50ft.; beam, 16·90ft.; depth of hold, 12·10ft. The dimensions of the American yacht are—length, 104ft.; beam, 23ft. 6in.; draught of water, 9ft., fitted with a centre board. The former is exactly five times her beam in length, while the latter is a little over four times her beam in length. The displacement of the former greatly exceeds that of the latter, as does her draught of water; and although the American boat may be the faster in light winds and smooth water, we have no doubt that the English yacht would have the advantage in half a gale of wind and a heavy sea. The recent victories of the 10-ton yacht Madge in America have proved that the superiority which has been claimed for American yachts ever since the advent in British waters of the famous America in 1851 is a thing of the past, and we wish one of our English yachtsmen would take over a 100-ton cutter and endeavour to repeat on a larger scale the triumphs of the little 10-ton, who will soon be joined in American waters by the well-known 15-ton Maggie, formerly the property of Mr. Luke Wheeler.

The Culzean Yacht and Steam Launch Works, Maybole, N.B., exhibited a few models of small yachts, the best of which is that of the Snarleyyow, a 3-tonner, designed by a well-known amateur, Mr. Baden Powell, and a striking illustration of what a very large boat a modern 3-tonner really is, as compared with those of former days. Another good model is that of the 5-ton Cocker, designed by the Marquis of Ailsa.

Some prettily got-up models were exhibited by Messrs. Watkin and Co., of Blackwall, but none of them are of any celebrated yachts, and although pretty to look at, being painted and coppered, they do not convey as good an idea of the actual lines of the vessels as plain varnished models do.

Yachtsmen will no doubt be interested in observing the future performances of the Mascotte, a 10-tonner, now building by Messrs. Watkins in the new class of racing yachts, the length of which on the water-line must not exceed 30ft., as the type is quite different from the long narrow boat now so much in vogue.

The models exhibited by Messrs. Hatcher, Clifford, and Co., of Southampton, are quite unworthy of the fame of the well-known name of Hatcher. The models are poor in execution, and the only celebrated vessel represented was the 15-ton Maggie.

The same may be said of the exhibit of Messrs. Payne and Sons, of Southampton, who sent eight models, but the only well-known boat represented was the 20-ton Louise, built in 1879, and now completely eclipsed by more modern boats.

A beautiful piece of workmanship is a sailing model of a 15-ton cutter, on a scale of 1in. to the foot, built and planked, exhibited by S. Bishop, of Bristol, the only defect being that although well executed and designed for practical sailing, the sail plan is not in accordance with the generally recognised idea of an English cutter yacht.

The other yacht models, all of which are only half models, do not call for much notice.

LETTERS TO THE EDITOR.

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

WEISNEGG'S LABORATORY CONSTANT TEMPERATURE STOVE

Sir,—The Engineer of 23rd December, 1881, describes Weisnegg's laboratory constant temperature stove—in use at the Laboratory of the Municipality of Paris—lined with earthenware plaques, whilst a glass door allows evaporation and other chemical operations to be watched. Provided with a special gas regulator—probably on Page's principles—Weisnegg's stove is reported to keep steadily at any desired temperature.

I should be grateful if you or some of your readers would kindly inform me where I can see such a stove, or one of a similar kind, self-regulating, if possible at work in London; if such apparatus be accurate, say to 1 deg. Fah. Also the name and address of the manufacturers, and the approximate price, carriage included, in London. J. Lawrence-Hamilton, M.R.C.S.

34, Gloucester-terrace, Hyde Park,
April 25th.

LOW'S DRAWING-BOARD.

Sir,—In your issue of 14th inst., Mr. Low, writing of my remarks on his drawing-board, very palpably distorts my words, and puts the cart before the horse. I did not say that the principle of my board followed that of Mr. Low's. I said distinctly, and I repeat it emphatically, that Mr. Low's closely follows mine, which is the natural order, seeing mine was in use years before his. If I modified Mr. Low's board, I would describe it as a modification or improvement on his.

Mr. Low says his wedges act, even when slack, by the contraction of the paper; this means that the paper must contract to an undefined extent before the wedges can jam tight, and his paper must be scarcely strained, or be very much wet at first—both objections. The advantage Mr. Low claims of removing his slips separately and putting on tracing paper is not confined to his board; I can remove my slips in like manner, and have often mounted a fresh sheet of double elephant over an unfinished drawing, the only difference being that there is more tendency for paper which is really strained to contract on the removal of a slip, than for paper which has already contracted, it may be considerably, before the wedge gets tight enough to hold it.

I have not any commercial or monetary interest whatever in my board, and I do not wish to detract from Mr. Low's; on the contrary I shall be glad to hear it proves useful to many and a substantial success to him. I still think that when he uses his board as long as I have mine, he will find the slips get too slack but admitting this, I see no difficulty in renewing or repairing them.

F. G. M. Stoney.

4, Westminster Chambers, Victoria-street,
London, S.W., April 17th.

COLLIERY OUTPUTS AND UNLOADING PIT CAGES.

Sir,—In your issue of April 21st, 1882, we note an account given by your correspondent in South Wales of the immense output of coal, averaging 1500 tons per day, effected at the Cymmer Colliery, Pontypridd, where a novelty in the banking apparatus is in use, by means of which, no sooner has the cage settled on the props, than the full trams are unloaded from the cage, are on their way to the screens, and empty ones have taken their place on the cage, which is lowered almost instantaneously again into the pit, the whole operation of making the change being so rapid as scarcely to admit of the winding engines coming to rest.

Now, as this immense output has been obtained in a very large measure by the adoption and use of this patent banking apparatus—which is the invention of Mr. Henry Fisher, of the Clifton Collieries, near here, and where, amongst other collieries, the apparatus has been in work for some time—we, as the sole makers, think that this fact should be known in connection with these gratifying results, and a share of the honour given to whom it is due. Consequently we should be glad if you would insert this in the next issue of your valuable paper; for, in the interests of colliery proprietors and the public generally, we think that too much attention cannot be drawn to automatic and labour-saving appliances such as the one referred to. Warsop and Hill.

Deering-street Ironworks, Nottingham, April 25th.

SLIDE VALVES.

Sir,—I have read with much interest Mr. John Hackworth's lecture on valve gear and slide valves, and I am much surprised that he should have omitted to mention what I think must have proved good to all users, namely, Church's circular slide valves. I have had the opportunity of watching the working of these valves on two of Messrs. Fowler's 8-horse power ploughing engines, which have been in use for this last three years and with very bad water at times, but these valves are now working in the most perfect manner without having undergone any readjustment, which is so often required in the ordinary square slide valve. I believe they add very much to the power of the engine, and prevent a vast amount of friction in the excentrics, and, in my opinion, no steam engine without Church's valve is perfect.

April 25th. A Weekly Reader of The Engineer.

THE STRENGTH OF BUCKLED PLATES.

Sir,—In the notice of our exhibits at the Naval and Submarine Exhibition given in your issue of 14th inst., which I regret not having seen sooner on account of absence from home, you state regarding the tests made on our embossed buckled plates that the results given were with "the flanges being firmly fixed."

This was not so, and I wish to correct the error by submitting to you the enclosed table of test results and relative sketches.

These show in an exaggerated manner the yielding of the flanges from not being fixed, but on the pressure being withdrawn the plates recovered nearly their original form, which was proved by accurate measurements after testing. We were limited as to the amount of deflection we could bring on, as will be seen by the method we had to adopt of reaching the underside of plate, viz., through one of the grooves for bolt heads in table of press. I may state these tests were hurriedly got up, and at the time we could not prosecute them further, but we hope soon to have a reliable and exhaustive test of the comparative strengths of Mallet's plain buckled plates and our embossed plates, conducted by Professor Kennedy, of the London University. It may be said a hydraulic press will not give the actual loads brought to bear on the plates, but as both descriptions of buckled plates were tested under the same conditions, the results fairly show their comparative strengths. In taking those pressures from the gauge we had a movable index, which was fixed only when all was pressed up to position, and began to indicate from zero before any weight that would cause the least deflection was brought on the plates. James M. Blair.

Glasgow, April 25th.

BRIGHTON BEACH.

Sir,—I have been too busy to reply to your able article on the above subject published in a recent issue, and as the result of the works in progress cannot be determined for some months to come, I think it premature to hazard an opinion on their success, though you have thought fit to do so as to their absolute failure.

The nature of the works is such that when they are completed it is my intention, with the consent of the President and Council, to read a paper on the whole subject before the Institution of Civil Engineers. Meanwhile, I wish to correct the statement that damage has occurred at one of the concrete groynes. Since the works were commenced not a single block of concrete has been displaced, still less lost; nor has a plank been started in the timber structures, though it blew "great guns" last Saturday.

E. B. Ellice-Clark.

4, Westminster-chambers, Victoria-street,
London, S.W., May 3rd.

STEAM ENGINE ECONOMY.

Sir,—Referring to my letter of the 17th March, Mr. Swift asks, in his letter in The Engineer of the 31st March, if I know "of any construction of piston, by any reputed firm of engineers, that would allow of being so tightened as to cause 30 per cent. of friction." He also asks if I am not mistaken in saying that the simple Corliss engine, mentioned in my letter, drives the mill in the same way as the compound engine with which I compared it.

As I had not answered his letter Mr. Swift refers to this matter again in last week's Engineer, and supposes that I did not reply because I was unable to answer his inquiry about the pistons. Will you kindly allow me to explain that in the pair of compound engines referred to, which were tried by Mr. Michael Longridge, the power is transmitted by a belt from the main fly-wheel. The indicated horse-power when driving the full load was about 315-horse power, and the power required to drive the engines and shafting alone was 104·87 indicated horse-power, or one-third of the power of the engines when fully loaded.

I thought such power required to drive the engines and shafting alone was excessive, and in order to show that it was so, I gave an instance of a single-cylinder Corliss engine from which the power was also transmitted by belt from the main fly-wheel. This Corliss engine when fully loaded would indicate about 500-horse power, and 78·64-horse power was required to drive the engine and shafting alone—or, say, one-sixth of the full load power.

I gave another example of a single Corliss engine which drives a weaving shed, the power when fully loaded being 170·4 indicated horse-power, and when driving the engine and shafting alone one-sixth of this, or more exactly, 28·5 indicated horse-power.

In this case the power is transmitted by gearing. From these examples, and for other reasons stated in my letter, I concluded that the large power required to drive Mr. Longridge's trial compound engines and the shafting alone, was mainly owing to the lightness of one of the pistons, and I explained how the light piston, while wasting a lot of power, would heat up the walls of the cylinder in the same way, or even more than a steam jacket. As Mr. Longridge did not take this heating into account, his experiments and the conclusions he deduced from them, as regards the advantage or otherwise of steam jackets, were useless and misleading.

Respecting Mr. Swift's inquiry about light pistons and the makers of them, I may say that I have seen pistons so tightly packed that they would not move when steam of 30 lb. pressure per square inch was turned on to them. If Mr. Swift's wants some of this kind, any respectable maker of pistons can suit him if he will state with his order the degree of tightness he desires to have. William Inglis.

Bolton, April 18th.

THE FOUNDATIONS OF MECHANICS.

Sir,—Your correspondent Mr. Arthur Adams has gone so near to solving an important problem, without quite solving it, that it would be a pity to let him remain longer in doubt.

The problem is this—seeing that action and reaction are always equal and opposite, why is it that a body moves under the operation of a force?

Put in another way, as the pull on the draw-bar between an engine and a train is always precisely balanced by the resistance, why does the train follow the engine?

In a third shape; as the pulls at opposite ends of a pit rope are equal in amount and opposite in direction, why does a cage come up a shaft?

Now if we investigate all these cases, we shall find that we have something more to deal with than the pull. There is another element to consider. Newton's axiom that "action and reaction are equal and opposite," does not cover the whole ground; and it is just because he overlooked this fact that Mr. Browne, by what I am willing to believe was a slip of the pen, asserted that when a horse pulled a cart there must be a greater strain at the collar end than there was at the cart end of the traces, for otherwise the cart would not move.

For convenience I shall, in what I am going to say, use the word "force" in its conventional sense.

When any force is brought to bear on a body, that force is balanced by an equal and opposite force. The body is then in a condition of equilibrium in the direction of the line or plane passing through the point of operation of the forces.

In order to produce motion, all that is now wanted is the presence of another body already in motion, which body must come into contact with the body at rest.

In other words, what is known as the pull of a locomotive, or of a pit rope, does not produce motion, but that pull is an antecedent condition essential to the production of motion in the required direction. Nothing can produce motion but motion; but a pull or a push is not motion, and therefore neither can produce it.

At first sight it may appear that I am drawing a distinction without a difference; but so far is this from being the case, that I am really laying down the fundamental proposition on which the whole theory of the conservation of energy is based. Nay, more, if I am right, my proposition effectually demolishes the whole hypothesis of "action at a distance," and slays the theories of attraction and repulsion.

Let it be supposed that a particle of matter has power to attract another particle, both being at rest. Then one or both give way, and motion begins. But we know that motion once called into existence cannot die. Even Mr. Browne does not dispute this, for he maintains—and properly so—that the effects of forces live. Yet if two bodies previously at rest are put into motion by mutual attraction, then it is clear that this mutual attraction has created an indestructible something, and the corollary is that as attraction is constantly doing this kind of work, the store of motion, and therefore of energy, in the universe, is constantly increasing, which is absurd.

In order that one body or particle of matter at rest may be put into motion, it must be brought into contact with another body previously in motion, and when both are moving the sum of their motions—in other words, the concrete energy of the two—will be precisely equal to the quantity of motion—that is the energy—possessed at first by the one body.

In the case of a locomotive we have to hunt for the moving body some distance, but we ultimately run it down in the furnace. The same thing may be said of the pit rope.

Recapitulating, then, I say that a pull or a push is unable to produce motion alone, and that the pull or push must be accompanied by the propinquity of some body in motion.

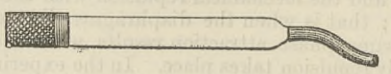
One result of the development of this proposition—I shall not call it a theory, for its truth is simply indisputable—is that gravity is *not* the result of the attraction of the earth, but is the result of the motion of some form of matter. It follows in like manner that electrical "attraction" and "repulsion" are also the result of the motion of some form of matter, and it is no small pleasure to me to find scientific opinion gradually drifting in this direction. When we are once clear of "attraction," "action at a distance," and such old-time fallacies, we shall get on much faster towards a rational conception of what is really going on around us. The labours of such men as Bjerkness and Stroh are doing much to help on the good work.

Of course I cannot venture to ask you, Sir, for space to enunciate my views fully. It is enough for me if I can sketch them now and then; but, even at the risk of tiring your patience out, I will ask leave to make one or two explanations concerning the effect of what is falsely called attraction.

Grove, in his address to the British Association in 1866, in theorising on the cause of the sun's heat, used the words, "The sun may condense gaseous matters as it travels through space, and so heat may be produced." Let us carry this idea of condensation a little further, and imagine that space is filled by an ether—that is to say, a fluid, which is, of course, imponderable, seeing that its motions are the cause of gravity, magnetism, &c. Let it be further supposed that matter has the power of condensing this fluid in much the same way that Grove—and after him Sir W. Thomson and other eminent men—hold that the sun could condense gas, and see what follows; we have at once a rush of currents of ether beating down on not the earth alone, but every form of matter, and these currents are the cause of gravity.

Let us further assume that it is possible to produce such a molecular change in a bar of iron that it acquires a new power of condensation, and we have at once a magnet. Steel makes a permanent magnet because the re-arrangement of the particles once effected, the material is so rigid that this arrangement remains. But not so with soft iron; therein the arrangement is not permanent. Hence, soft iron makes a temporary magnet.

A very simple and interesting experiment will illustrate quite clearly what I mean. To the end of a small tube let a very fine wire gauze mouthpiece or cap be fitted, as in the sketch. To the



other end drawn down is tied a bit of flexible tubing. This is to be coupled on to an air pump, or some other means of exhausting the tube. It will now be found by operating on dry fine sawdust, cotton fluff, the motes dancing in the sunbeam, &c., that the tube will behave precisely like a magnet, and will possess the equivalent of a magnetic field. In this case the perforated gauze end plays the part of a condenser, while the air takes the part of the ether condensed. If the experiment is carried out with a little care, it is quite possible to take in the unwary, who will assert that the tube attracts things. It constitutes an interesting lecture-table appliance, and may even be degraded to aid the conjurer in playing his tricks; but the instrument operates solely because of the rush of air into the tube, and the beating down of currents on it. If a house fly be induced to alight on it, he can no more leave it than a man can jump off this earth. To himself he must appear, if he can think, as though so heavy a fly never before existed.

I am prepared to be told that my theory will not account for repulsion. I must accept the argument for the moment in silence, because I cannot make this letter longer; but I think an answer will be found in the results of the investigations being made by Mr. Stroh, of which much more will yet be heard.

London, May 1st. Φ. Π.

Wind Velocity and Direction at the Kew Observatory.—At the meeting of the Meteorological Society on the 19th inst., a paper was read on "Barometric Gradients—Wind Velocity and Direction at the Kew Observatory," by Mr. G. M. Whipple, B.Sc., and by Mr. T. W. Baker, F.M.S. For the purpose of investigating the subject of the relation of the force and direction of the wind to the distribution of barometric pressure, the authors discussed the Kew observations for the five years 1875-79. The results show that the rate at which the wind blows increases almost directly with the inclination of the gradient in an arithmetrical proportion, the mean rate of increase being 1·85 mile per hour for each additional ·0025in. of difference in the barometer readings at each end of the slope. The authors find that the angle at which the wind crosses the line of gradient at Kew does not vary with either the steepness of the gradient or the velocity of the wind to any material extent, and also that the angle is found generally to lie between 40 deg. and 60 deg., the average of the whole series of observations giving a deviation of 52 deg.

RAILWAY MATTERS.

A NEW railway has been opened from Grafton station, in Wilts, to Andover Junction, in Hants. This is a section of the Swindon, Marlborough, and Andover line.

TWO reports on accidents during heavy fogs last February have recently been published by the Board of Trade, both of the collisions being on the London, Brighton, and South Coast line, and both due to drivers not stopping when they ran over fog signals.

A RUMOUR was current in Cardiff this week that the Rhymney Railway had been leased to the Taff Vale, and 10 per cent. guaranteed. We cannot vouch for a settlement having been arrived at, or the terms, but it is certain that negotiations have been for some time in progress.

IT is said that a scheme for an electric railway, thirty-six miles in length, in the South of England, is being organised. The railway will run through a district in which there are several watercourses, which will be employed for driving the necessary dynamo machines.

THE proposed railway from Silloth to Maryport, *vid* Allonby, will open out new coalfields to the west of Allonby. The coal-pits to the south of Allonby are now nearly exhausted. The route of the proposed railway was inspected many years ago by the late Sir Thomas Bouch, C.E., the estimated cost being about £400 per mile.

THE largest increase in the make of steel ingots and rails in 1881 appears in the Cleveland district, where 264,986 tons of ingots were obtained with fourteen converters, being an advance of 120,986 tons on the production of the preceding year. Of these fourteen converters, four were working for only a part of the year, and two for only a few months.

THE production of Bessemer steel rails amounted during last year to 1,023,740 tons, being an increase of 283,830 tons, or 38 per cent., on the output of 1880. Of these rails 594,419 tons were exported. Seventy per cent. of the Bessemer ingots made in 1881 were manufactured into rails. This is exactly the proportion which the one bore to the other in 1880.

THE new branch of the North-Eastern Railway from Scarborough to Pickering, and thence to Whitby, has been opened. The line, which is a little more than sixteen miles in length, passes through one of the most beautiful districts in Yorkshire, and opens out a rich agricultural locality. It brings Scarborough into more direct communication with Whitby and the North of England.

A PAPER on "Our Iron Highways" was read last week before the Liberal Social Union by Mr. E. J. Watherston, who is still under the impression that we should be better off for cheap railway transport and communication if the railways belonged to the State. Foreign experience points exactly the other way, and our own experience with the telegraphs does the same. We should have had 6d. telegrams ere this if the lines had belonged to the companies, but the cost of working by the State has prevented any reduction in price for over a dozen years.

IF the profits earned by the South-Eastern Railway were at all in proportion to the company's liberality in providing for the comfort of its passengers at some of its stations, the shareholders would not have much trouble in counting their dividends. As an instance, a correspondent writes that in going by the South-Eastern railway on the Bromley line passengers, on many trains, have to change at Grove Park. Here then, where changes have to be made and passengers have to wait, one would expect to find some shelter, but the company which is led into spending many thousands on the boring at Folkestone, can only afford about as much shelter for down trains at Grove Park as a farmer would put out in a field for half-a-dozen cows where there were no large hedges or trees for them to shelter under. The miserable open shed there, is only about two carriages in length, if it is that, and here ladies have to change in a drenching, driving rain like that of last Saturday from a carriage a long way perhaps from the thing that marks a stopping place, but which cannot be called a shelter.

IF our railway companies would employ a forester and gardener or two, they might employ their thousands of acres of waste lands for crops, grass, fruit trees, and so on, with profit, so that they could afford to refuse to be any longer in the position of the poor shopkeeper or barber who fills his shop and pastes his walls over with advertisements and placards because he cannot make two ends meet without the small sums obtained by this disfigurement. At present our railway companies allow their stations and bridges to be so hideously pasted and papered over that the property has the appearance of the last stages of struggling poverty. In many parts of Belgium the land has been planted with fruit trees and other things many years, and in Wurtemburg, for about twelve years past, a forester has had charge of the lands. He pays particular attention to planting the slopes of excavations and embankments to prevent washing and slipping, grows quick fences, and where practicable fruit and timber trees. The gardens at the stations are largely devoted to fruit, and so made useful and ornamental at once. A profit of about 14s. an acre has, it is said, been made for the past five years on the ground so utilised. Why should it not be done in England?

A CORRESPONDENT of the *Railroad Gazette* says:—"There are thirty-three 'railroad schools' in Russia for the instruction of *employés*, established because not very long ago it was impossible to get Russians with education enough to be entrusted with the higher places, and even at this day one-half of all the locomotive engineers in Russia are Germans. Twenty years ago of four road-masters on a line about twenty-five miles long two did not know their letters, and had clerks to write their reports. Machinists and locomotive engineers were created out of cooks and others who had been in the personal service of the engineers. The schools turn out chiefly enginemen and firemen, road-masters, and telegraphers, most of them sons of railroad *employés*. The course of study extends over three years, with a two years 'practice course' in some cases, and there is a preparatory course of one year probably for those who have not learned to read. Graduates of most of the schools are bound to spend two years at least in the service of the railroad which supports the school. The schools are hardly yet out of the experimental stage. One of the oldest, founded in 1874, has so far twenty-five graduates in railroad service."

IN the course of a comparison of the new Berlin elevated railroad with the New York roads, the *Railroad Gazette* said that probably four times as many men are required for the ticket service in Berlin as in New York. The *Journal* of the German Railroad Union objects to the statement, saying that with any ticket system it is necessary to have the tickets examined on entering and leaving the train and during the trips, and that this is all that is done on the Berlin road. "Yet," the *Gazette* says, "this is three times as much as is done on the New York roads, where the passenger buys a ticket at a window, and a few feet further on, at the entrance to the station platform, puts it in a glass box under the eyes of the gateman, and that is the end of the ticket inspection. If there were more than one class of tickets and cars the work would be at least doubled; for it would then be necessary to see that those who entered first-class cars had first-class tickets, and if there were different rates for different distances, still more labour would be required, for it would be necessary to see that the passenger did not ride further than his ticket entitled him to, which might be done on the train, or by inspecting the tickets at the station where the passenger left the train. But the New York roads are only concerned to make sure that no passenger can get on a train without a ticket. As all tickets are alike, they do not care what car he gets into, or at what station he gets off. The largest business of a station is done by two ticket sellers and one gateman." This seems to be a boast that a less complete and less comfortable system costs less than one that ensures passengers every comfort. The one-class arrangement would not suit in Germany any more than in this country.

NOTES AND MEMORANDA.

IT has been found that the passage of an electric current through hard wire mellows it.

THE boiling point of zinc was determined by Becquerel, who gave it as 932 deg. M. Tiolle has recently carried out experiments on the subject, and his redetermination puts the temperature at 933 deg., thus practically confirming Becquerel.

REFERRING to a paragraph in our last impression giving the length of some large bridges, a correspondent—Mr. Wilfred Bailey—writes that the Victoria Bridge at Montreal—at the time of its construction the longest bridge in the world—is 1993 metres in length, ironwork only, exclusive of abutments, &c., instead of 1500, as stated. The International Bridge across the Niagara at Buffalo also deserves a place on the list, the length of ironwork being 575 metres, or considerably more than some of those mentioned.

THE Adalbert silver mine in Przibram, Bohemia, has now been excavated to a depth of 1032 metres, and is thus one of the deepest mines in the world. It had been said that the heat made it impossible to proceed, but Professor Hoefer, residing at Przibram, writes that, "At the greatest depth—some 1000 metres below the surface of the earth—the heat is anything but excessive, the temperature of the rock being 24·4 deg. C.—75·9 deg. Fah.—and the temperature of the atmosphere 24·6 deg. C.—76·3 deg. Fah.—so that the natural means of ventilation heretofore employed fully suffice for all purposes," facts of considerable interest in the physics of the earth's crust.

THE Sheffield district shows an advance for the year 1881 of 119,447 tons in the make of ingots and of 94,285 tons in the production of rails, the total yield of 392,812 tons of ingots having been obtained with twenty-six converters, of which, however, six were inoperative for a part of the year. With the same number of converters working as in 1880, South Wales has obtained an increase of 76,423 tons on the production of that year, the aggregate make of ingots having been 384,656 tons, and of rails 305,043 tons. The three districts—Cleveland, Sheffield, and South Wales—produced last year 1,042,254 tons of ingots, or 70 per cent. of the total make of the United Kingdom.

THE rapid extension of electrical requirements has caused a great demand for a really good insulating material, fire-proof, damp-proof, not costly, and having good mechanical properties. According to the *Electrician*, this seems now to have been met by the recent invention of a material called "insulite." The inventor has discovered a process by which wood, sawdust, cotton-waste, paper pulp, and other fibrous materials can be converted into a material perfectly impervious to moisture and acids, easily moulded under pressure into any shape, and capable of being worked or cut into any form. This material is an excellent non-conductor of electricity, and can be used for all forms of battery-cells, telegraph insulators, supports for electric light leads, and telephone work. It affords the means of securing perfect insulation at a very much less cost than ebonite or gutta-percha.

A SIMPLE new thermometer, said to be very sensitive, has been described by Mr. Michelson. It depends on the expansion of hardened caoutchouc by heat. It is thus described by *Nature*:—A very thin strip of the substance is attached to a similar strip of copper. The lower end of the double strip is fixed, and the other end has attached to it a fine glass fibre bent at a right angle, through which, as the strip bends under heat, motion is imparted to a very light silvered-glass mirror, hung by a cocoon fibre. The displacement of the mirror is observed with a telescope and reflected scale, or by the movement of a spot of light. To avoid sudden changes of temperature, the double strip is inclosed in a metallic case having a slit opposite the strip. In a modification, which the author has not yet tried, the strip is reversed, and the lower end enters a highly resistant liquid, in which it faces a metallic point; the two serve as electrodes, connected with a galvanometer and a Wheatstone bridge.

WHILE many electricians are struggling with new dynamo-machines, new lamps and other parts of electric lighting plant, some few are quietly doing a good business in making the carbons for the lamps already made. Much of the process by which these are made is kept secret. In America it is said that many of the best are made from the carbon obtained from petroleum refuse. M. Gaudoin is said to make them from wood sticks placed in plumbago retorts and slowly heated to drive off the volatile matter. The sticks are then soaked in acid solutions to remove impurities and the final desiccation then made in a very high temperature in a reducing atmosphere. The carbonised wood is then soaked in the carbides of hydrogen and the chlorides of carbon under pressure until their pores are completely filled with a homogeneous deposit of nearly pure carbon. The principal difficulty attending the manufacture of carbons from various materials is the purification of these, but with care finely pulverised retort carbon mixed with perhaps a little coal dust and tar may be employed with very good results.

THE following tables from the Board of Trade shipbuilding returns for 1881 just published, contain figures interesting as showing:—1. The number of vessels of all kinds, and their tonnage, built in the United Kingdom, from 1872 to 1881. The figures do not include any vessels built for foreigners, but do include many which have been registered first as English ships, and immediately afterwards transferred to a foreign flag. A larger tonnage was turned out last year than any previous year except 1874, when the production was 20,000 tons more than in 1881. 2. The total tonnage owned in the whole British Empire, and under the British flag for each of the past five years. These figures show a progressive but not a rapid increase, except in 1880. The differences are shown in 3 for the United Kingdom only. The increase for 1881 is not so great as in some previous years:—

1.			2.		3.		
Year.	No.	Tons.	Year.	Tons.	Year.	Increase.	Dec.
1872	911	392,971	1877	8,133,837	1877	138,392	—
1876	1007	360,365	1878	8,329,421	1878	155,761	—
1877	1092	433,650	1879	8,462,364	1879	29,168	—
1879	807	356,837	1880	8,447,171	1880	—	1517
1880	822	403,841	1881	8,575,560	1881	121,495	—
1881	845	501,184	—	—	—	—	—

A COMMUNICATION on "The Relative Resistances of Land and Water to Wind Currents" has been sent to *Nature* by Mr. Thomas Stevenson. In 1878 he received a grant from the Government Research Fund for the purpose of ascertaining the law of variation of wind velocities at different heights, and he found that the curves traced out by the velocities in relation to the heights were most nearly represented by the formula $V = v\sqrt{\frac{H+72}{h+72}}$, where H and h represent respectively the heights in feet of the high and low-level stations above the ground, and V and v the respective velocities at those levels. Since then he has been making observations with the view of ascertaining the relative resistance of land and water to the aërial currents. These observations are very far from being complete, but he gives the following results in the meantime, as they may be interesting:—

	Sand.	Water.		
6in. waves	12·8	13·8	miles per hour	= 1 : 1·08
6in. ,,	13·65	14·375	,, ,,	= 1 : 1·06
3in. ,,	7·96	9·19	,, ,,	= 1 : 1·155
	Grass.	Water.		
9in. ,,	8·4	10·7	,, ,,	= 1 : 1·274
3in. ,,	10·13	14·75	,, ,,	= 1 : 1·456

The velocities given are the means of observations taken every five minutes for about an hour. From this it will be seen that the resistance is least for water, somewhat greater for smooth sand, and greater still for grass. Further observations are not only required on this subject, but also on the velocity of the wind over the water in relation to the height of the waves.

MISCELLANEA.

THE average net realised price of steel rails at works during 1870 was £10 10s. In 1881 the price was £6.

THE average number of Chinese immigrants arriving in Victoria, British Columbia, weekly, is said to be 700.

AN electrical exhibition is to be opened on the 16th September in Munich, and to remain open about a month.

THE tidal range at Kingston, Jamaica, is only from 8in. to 9in., and in some way objections to a proposed dry dock are being founded on this. A hydraulic dock will overcome all shortness of tidal range.

THE progress at Colombo breakwater during March was greater than during any other month since the work commenced, 202ft. having been added to the length of the breakwater, the total length being now 3362ft.

MESSRS. MERRYWEATHER have just supplied an additional steam fire engine to the Metropolitan Fire Brigade. It has patent ball valves with large openings with a door passage. One man only is required to attend both boiler, engine, and maniputlate the suction and hose pipes.

MR. H. SAUNDERS, chief electrician of the Eastern Telegraph Company, has sent a communication to the *Electrician*, describing the effects of the late magnetic storm which caused so much delay in the despatch of messages. He shows that this storm was almost universal, and one of the greatest on record, and that a difference of potential of no less than 40 volts was registered in 25 minutes.

MR. J. K. FOSTER, Bolton, proposes to extinguish fires by blowing into a burning building the vitiated atmosphere or products of combustion of coal or other fuel in the furnace of a portable boiler to which a fan is attached. It is said that experiments prove that the air may be sufficiently deprived of its oxygen in this way to stop combustion. It is proposed to eject steam generated by the same boiler into the building with the vitiated air.

SOME large special machines for cutting loaf sugar and for coffee roasting have been recently erected in new premises in Cork for Messrs. Newson and Sons by Messrs. Waygood and Co., London The sugar loaves are placed upon a saw table, and held by forks and sawn into slabs; they then pass to another machine, and are cut into cubes at the rate of a ton and a-half per day. The different parts of the building are in communication by a large safety hoist by the same makers.

THE quantity of shedding required for the Royal Agricultural Show at Reading, though not equal to that of some previous years before the weeding out of the endless collections of irrelevant exhibits as in 1876-9, is a good deal above that required in 1880 and 1881. At Derby last year 12,751ft. of shedding was required, whilst at Reading this year there will be some 13,017ft. wanted. Owing to the railway accommodation by three different lines, namely, the Great Western, South-Western, and South-Eastern, the Reading show is likely to be a very good one.

GAS-MAKING by the Corporation at Walsall has proved such a good investment that the appropriation to town purposes, of the profits now standing to the credit of the concern, will enable the Council to levy no borough rate for the present year. The annual average profits in the three years preceding 1880 were £5500, but last year that average was exceeded by about £2000. But for this good fortune a borough rate of 1s. 6d. in the pound must have been made. It is an interesting fact that the works have cost altogether £113,000, while the debts now stand at £92,000.

HER Majesty's Government have, according to the *Standard*, resolved to co-operate with the other nations in establishing a chain of circumpolar magnetical and meteorological observatories. The locality selected for a British station is Fort Rae, in the north of Canada, and the general superintendence of the work will be entrusted to a committee of the Royal Society, the Royal Geographical Society being asked to co-operate as far as regards the promotion of their special studies. The *personnel* of the expedition has not yet been selected. The Swedes have chosen Wyde Bay, in West Spitzbergen, for the site of their station, which will be manned by thirteen attendants, and is established at the cost of Mr. L. O. Smith, a merchant, who has placed £3333, or 60,000 crowns, at the disposal of the Academy of Science for this purpose.

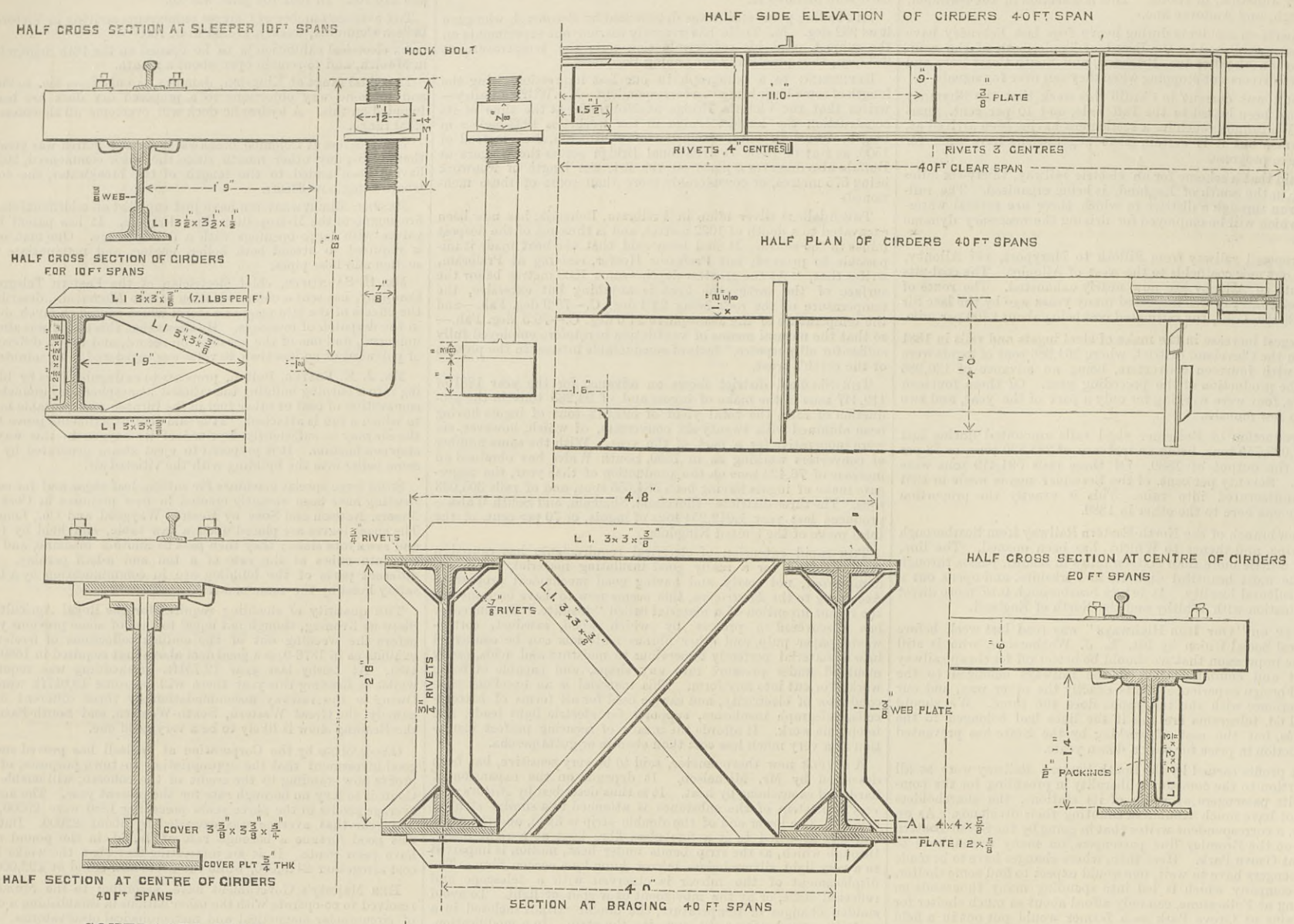
A PAPER was read on Monday before the South Staffordshire Institute of Mining Engineers, at Dudley, on "Lishman and Young's Patent Air Locomotive," which was read by Mr. Henry Lawrence, of the Grange Ironworks, Durham. The engines, it was stated, were specially adapted for underground haulage, owing to their small size and the perfect control which the driver had over them. Incidentally Mr. Lawrence mentioned their use in fiery mines, and showed how a patent metal had to be used to prevent sparks from being emitted from the wheels when the engine surged at an incline. He submitted for the consideration of the members —(1) Whether sparks would fire gas in a pit, and (2) whether copper rammers were therefore safe, inasmuch as copper could give off sparks. The Government allowed copper stemmers and rammers, and yet these gave off fire upon being struck.

DR. SIEMENS proposes to defend the Channel tunnel, if constructed, from hostile invasion, by placing the shore ends in communication with chambers filled with lumps of chalk, and to connect each of them by means of a pipe with a large cistern filled with dilute muriatic acid. Upon opening the communication this acid would flow into the upper portion of one of the chambers, and be distributed by perforated pipes over the chalk, giving rise to a rapid generation of carbonic acid gas, which would for half a mile or more form an insuperable barrier to the passage of human beings through the tunnel. The valves by which the acid was turned upon the chalk might, it is proposed, be worked from a safe distance by electricity. The committee will probably not see why this should always be quite ready and not be unworkable just when it is wanted any more than any other scheme, and it would be rather awkward if the acid got to the chalk before those passengers who like fresh air best had reached the surface.

A JOINT committee, representing the Purchase of Property Committee, the Gas Committee, the Free Library Committee, and the Leeds Council generally, was recently appointed by the Leeds Town Council to inquire into and report upon electric lighting. The report of this committee has been compiled by Mr. C. C. Jolliffe, deputy town clerk, and is now published. It represents a great deal of carefully-performed work, and is very useful as an unbiassed description by a layman of the different systems of lighting, care being taken to explain some of the necessary descriptive terms, as arc, incandescent lamp, &c. The committee suggests that the new municipal buildings, and especially the library and reading-room, could be successfully lighted by incandescent lamps, which give a pure light free from heat and from the destructive products of the combustion of gas, but in view of the improvements which are being continually made the committee decline to recommend any system at present.

A DISPLAY of incandescent electric lighting was made last week at a fancy dress ball given by the bachelors in the Assembly Rooms, Manchester. The rooms were lit by the British Electric Light Company, with their British lamps and Gramme machines. In the ball-room were 150 lamps intermingled in the glass chandeliers, which had a novel and brilliant effect, showing off the dresses and flowers to great perfection, while the room remained cool compared with the temperature when lit by gas—an important feature in ball-room lighting. In the refreshment room thirty-two lamps hung in Venetian shades of different colours, and the reception room was lighted by an electric chandelier designed for the occasion. The power for driving the dynamo machines was obtained from Messrs. Marshall and Sons' portable engines placed in the yard, and the whole of the arrangements were carried out by Messrs. H. Bury and G. Tyndall, the company's representatives for the district, in the short space of eight days.

GIRDERS FOR INDIAN STATE RAILWAYS.



CONTRACTS OPEN.

IRONWORK FOR INDIAN STATE RAILWAYS.

Tenders are required for ironwork for bridges for the Rangoon and Sittang Valley Metre Gauge Railway. The work required under this specification comprises the construction, supply, and delivery in England, at one or more of the ports named in the conditions and tender, of the whole of the ironwork for eighty plate-girder spans, of 10ft. in the clear; seventy-seven ditto ditto, of 20ft. in the clear; fifty ditto ditto, of 40ft. in the clear, including 30 per cent. extra on all rivets required for erecting the bridges in India.

Hook bolts, in number sufficient to provide for the sleepers being placed 18in. apart, centre and centre, and including an allowance for loss, are to be supplied with each span, viz., with each 10ft. span forty bolts, with each 20ft. span seventy bolts, and with each 40ft. span 120 bolts. The timber work and permanent way are not included in the contract. The accompanying engravings supply the principal particulars concerning these girders. The wrought iron must be of such strength and quality as to be equal to the following tensional strains, and to indicate the following percentage of contraction of the tested area at the point of fracture :—

	Tensional strains, per square inch, tons.	Percentage of contraction.
Round and square bars	24	20
Angle, T, and flat bars	22	15
Plates	21	10
Plates across grain	18	5

The iron intended to be used for the rivets must, whilst cold, be capable of being bent double without showing signs of failure.

All rivet holes to be filled in India are to be drilled. All other rivet holes may be either drilled or punched, at the option of the contractor, but any plate or bar in which the holes are not accurately in place will be rejected. The holes through which any one rivet passes must correspond in any number of plates or bars. In all cover plates, except in webs, the fibre of the iron must run in the direction of the length of the span. The main girders of the 40ft. spans are to be built with a camber of 1in., in the arc of a circle, the upper members being proportionately longer than the lower, and those of the 20ft. and 10ft. spans without camber. The joints to be rivetted in India must be chipped and filed so as to butt with perfect accuracy over the whole of the meeting surfaces to the true radius necessary for the specified camber. The ends of the girders intended to rest on the masonry are to be perfectly level, and the rivets countersunk. The head and body of all bolts are to be forged out of one piece of rod or bar iron. The nuts are to be square, and must fit too tightly to be turned by hand. All bolts are to be screwed for a length of at least three diameters to Whitworth's standard thread.

All the spans are to be temporarily erected complete, so that accuracy of fit and perfection of workmanship may be assured.

The girders of the 40ft. spans are to be sent out in two parts, each rivetted up complete.

Supposed quantities in one span of 10ft.

	Cwt.	qr.	lb.
Web plates	3	1	11
Resting plates	0	2	19
Angle iron in flanges (11 lb. per foot)	9	3	8
Ditto in stiffeners (5·8 lb. per foot)	0	3	22
Ditto in bracing (7·1 lb. per foot)	1	3	10
Packings	0	1	7
	16	3	21
Rivet heads and spare rivets, say 6 per cent.	1	0	7
	18	0	0
No. 40 hook bolts	1	0	24
Total	19	0	24

Supposed quantities of one span of 20ft.

	Ton	cwt.	qr.	lb.
Flat bars in booms	0	17	0	12
Angle irons in ditto (9·2 lb. per foot)	0	15	0	13
Web plates	0	8	0	24
Stiffeners (7·1 lb. per foot)	0	2	0	26
Packings	0	1	0	6
Angle iron bracings (7·1 lb. per foot)	0	2	0	18
	2	5	3	15
Rivet heads and spare rivets, say 6 per cent.	0	2	3	0
	2	8	2	15
No. 70 hook bolts	0	2	0	14
Total	2	10	3	1

Supposed quantities in one span of 40ft.

	Ton	cwt.	qr.	lb.
Boom plates	2	5	3	10
Web plates	1	11	1	20
Boom angle irons (15·4 lb. per foot)	2	8	1	17
Stiffeners (7·1 lb. per foot)	0	6	0	10
Bracing angle irons (7·1 lb. per foot)	0	4	2	0
Boom covers	0	3	2	18
Angle iron ditto (15 lb. per foot)	0	3	0	4
Web ditto	0	2	0	1
End plates	0	1	1	16
	7	6	1	12
Rivet heads and spare rivets, say 6 per cent.	0	9	0	16
	7	15	2	0
No. 120 hook bolts	0	3	2	16
Total	7	19	0	16

Tenders are to be delivered at the Store Department, in the India Office, Westminster, S.W., on Tuesday, 9th May, 1882, before two p.m., after which hour no tender will be received. They are to be addressed to the Secretary of State for India in Council, with the words "Tender for ironwork for 10ft., 20ft., and 40ft. spans," on the left-hand corner of the envelope, and are to be placed in a box provided for that purpose in the store department.

THE JOINTING OF ROCKS.

The following abstract of a paper on "The Jointing of Rocks," in relation to engineering, especially the tunnelling of the Strait of Dover, by Professor William King, D.Sc., professor of mineralogy and geology, Queen's College, Galway, possesses some interest. The writer referring in the first instance to his "Report on Jointing," published in vol. xxv.—1875—of the "Transactions" of the Royal Irish Academy, in which the subject is treated of in its purely geological aspect, remarked that his investigations in connection with it entitle him to take a part in the discussion of a question in engineering which public enterprise has of late elevated to one of international importance. At the outset, however, he feels himself compelled to express his doubts that rock-joining has been sufficiently attended to by the active promoters of the proposed Channel tunnel.

The remarkable divisional structure under consideration, often taken to be analogous to ordinary cracks or fractures due to rock-disruption, is, in the opinion of Professor King, a phenomenon having only a distant relation in its origin to the latter. In its normal state, jointing is a fissured condition of rocks—the fissures presenting even, smooth, regular, and close-fitting conjunctive planes, often standing vertically or in an inclined position. Where the fissures have been affected by stratic disturbances, or have been acted on by water and other erosive agencies, they are more or less open, thereby converted into crevices. It divides both sedimentary beds and igneous masses; and is separable into two or more series or systems, each having its respective fissures running in parallelism, also in a definite and an independent direction, over areas hundreds of miles in extent; and descending to considerable depths below the earth's surface. The fissures vary in their distance from one another from under an inch to two or more feet.

That jointing demands the closest attention on the part of engineers engaged in sub-aqueous works, requires no other proof than the fact of the utter failure which attended the scheme for opening out, during the famine of 1845-48, a water communication, about four miles in length, between Lough Corrib and Lough Mask, in the West of Ireland. After an expenditure of £40,000, it was found that the jointing in the carboniferous limestone, through which the excavation had been made, carried off all the water. The work had, therefore, to be abandoned; thus resulting in nothing more than a dry ditch. As regards the chalk and other rocks to be penetrated for the Channel tunnel, Professor King admits that they may not be so highly jointed as the much older carboniferous limestone; nevertheless, he shows that the former deposits are not altogether free from dangers which, to be overcome, require the closest attention.

From the numerous occurrences, noticed by writers and observed by himself, of faults, true jointing,* ordinary disruptive fractures, tilted bedding openings, dry submarine swallow-holes of Pliocene age—now filled with clay, sand, gravel, in some cases containing sea shells—and rock porosity in the chalk formations of Kent, Professor King infers that these detriments are equally present in the same deposits, well known to exist at the bottom of the Channel; where some of them cannot but turn out to be sources of water leakage, greatly interfering with the success of the proposed Channel tunnel. Precisely similar detriments, giving rise to the same apprehensions, are to be met with on the opposite seaboard of France. Reference may be made to the great lines of fracture which have moulded the river-drainage system of the Bas Boulonnais; and especially to the marvellous jointing—lately represented by the distinguished geologist, M. Daubré, in his "Synthétiques de Géologie," parte prem. The latter vertically intersects the chalk cliffs near Tréport, north of Dieppe.

Still such serious drawbacks Professor King admits must not be held as insurmountable. He is fully satisfied that engineering in the present day is quite able to cope with them; but only by an enormous expenditure. It has been proposed to line the tunnel with concrete; but in his opinion it is absolutely necessary that nothing short of lining it, and in its entire length, with the most resisting, impervious, and endurable stone should be attempted.

The Thomas and Gilchrist Process.—At the Society of Arts last week, a paper was read by Messrs. Sid. Gilchrist Thomas and Percy C. Gilchrist "On the Manufacture of Steel and Ingot Iron from Phosphoric Pig Iron." The authors, after stating that nearly nine-tenths of the iron ores of Europe were so phosphoric as to produce a pig iron unfit for steel making without a process of dephosphorisation, showed that by the new lime process perfect dephosphorisation was produced, so that the steel made from phosphoric pig was actually purer than that made from hematite iron. They then instituted a comparison between the basic Bessemer process and the puddling process, pointing out that the former process was peculiarly adapted to the manufacture of soft weldable steel, having all the characteristics of puddled iron with considerably greater strength, elasticity, and ductility. It was stated that this soft basic Bessemer steel could be made for some shillings a ton less than ordinary puddled iron, while an economy of 7s. a ton was gained n its subsequent treatment by the smaller loss which it undergoes in rolling. The authors stated that nearly half a-million tons a year of the new dephosphorised metal were now being made, and that on the Continent works were erecting having a capacity of a further half million tons a year, while in England the new special works erecting had only a capacity of under 200,000 tons a year. The paper concluded by querying the wisdom of allowing continental ironmasters to push so far ahead of us in the production of this new ingot iron, which was not only cheaper, but immensely superior to puddled iron.

* The "many small faults," and "very marked and constant joints"—the latter sometimes containing infiltrated flint—which characterises "the cliffs in many places near Margate" (Whitaker), must be familiar to numbers of the citizens of the metropolis. "Numerous vertical crevices," doubtless originally jointing, intersect a bed of chalk 50ft. thick close to Dover at the base of Shakespeare's Cliff (W. Phillips).

HYDRAULIC LIFTS FOR PASSENGERS AND GOODS.

(For description see page 324.)

Fig. 1.

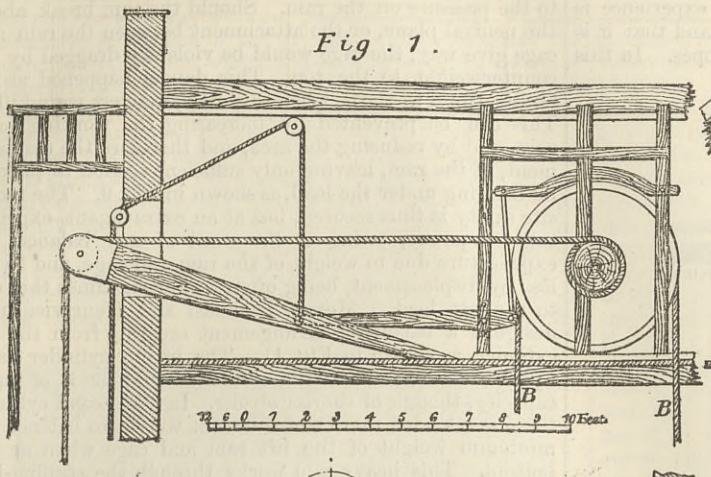


Fig. 2.

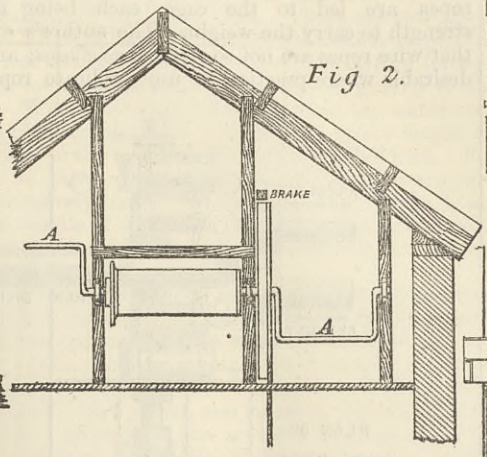


Fig. 3.

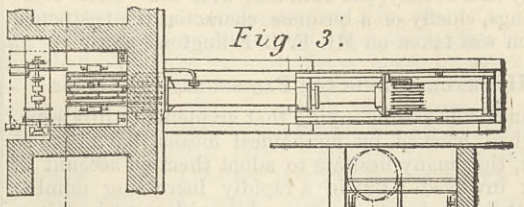


Fig. 4.

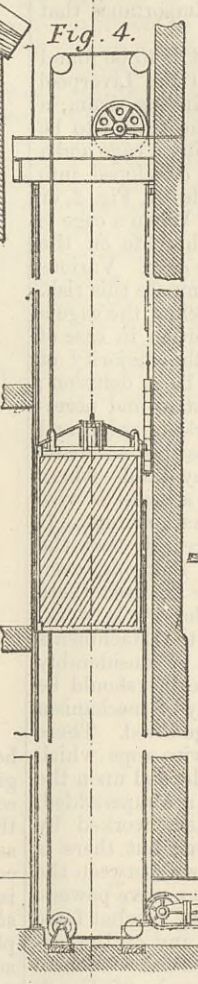


Fig. 5.

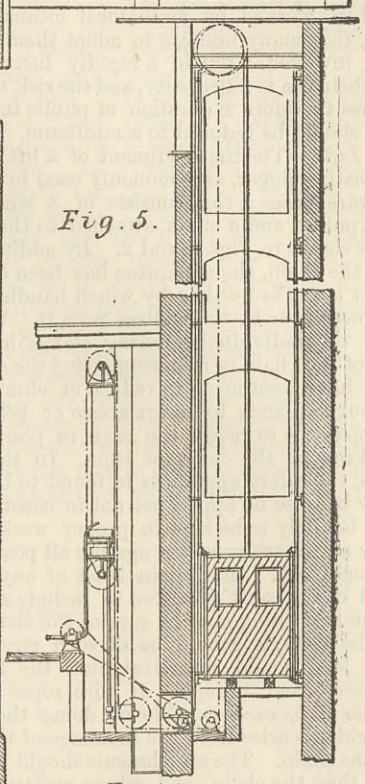


Fig. 6.

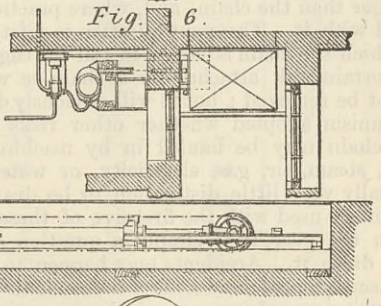


Fig. 7.

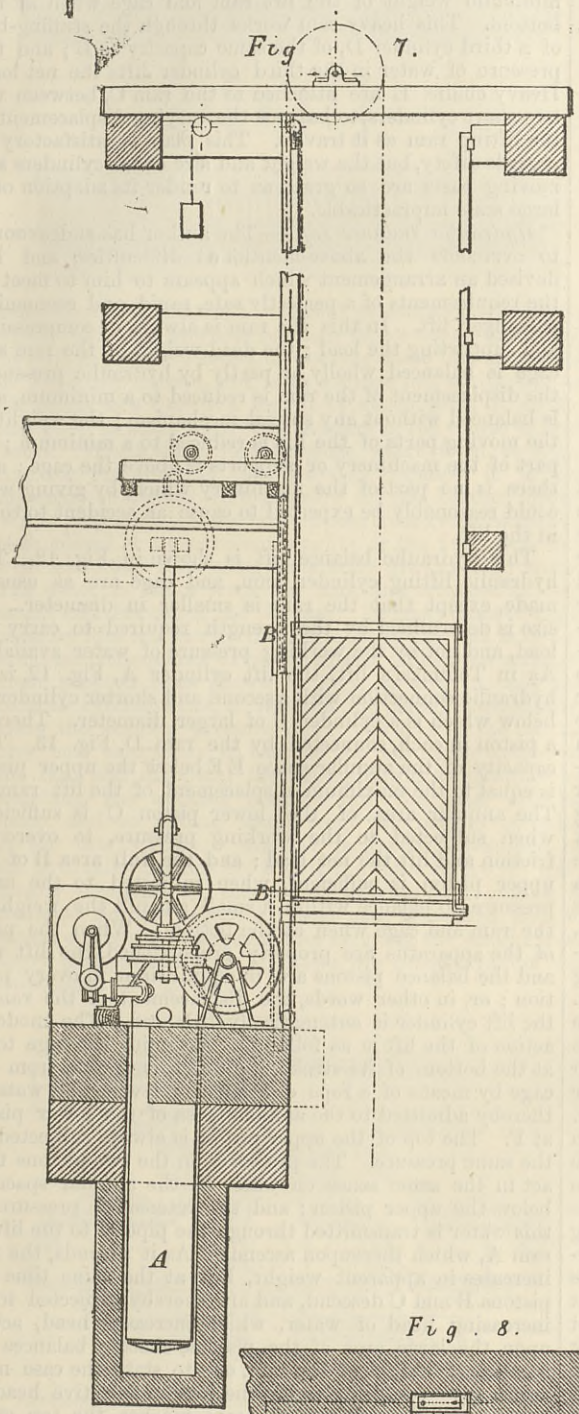


Fig. 8.

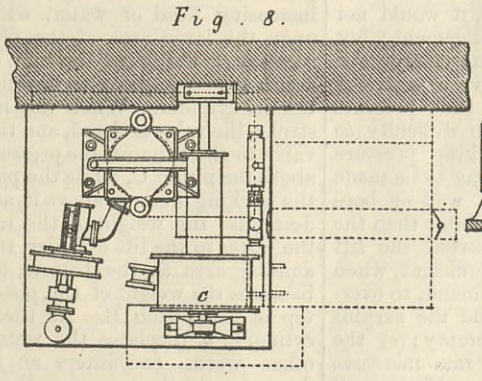


Fig. 9.

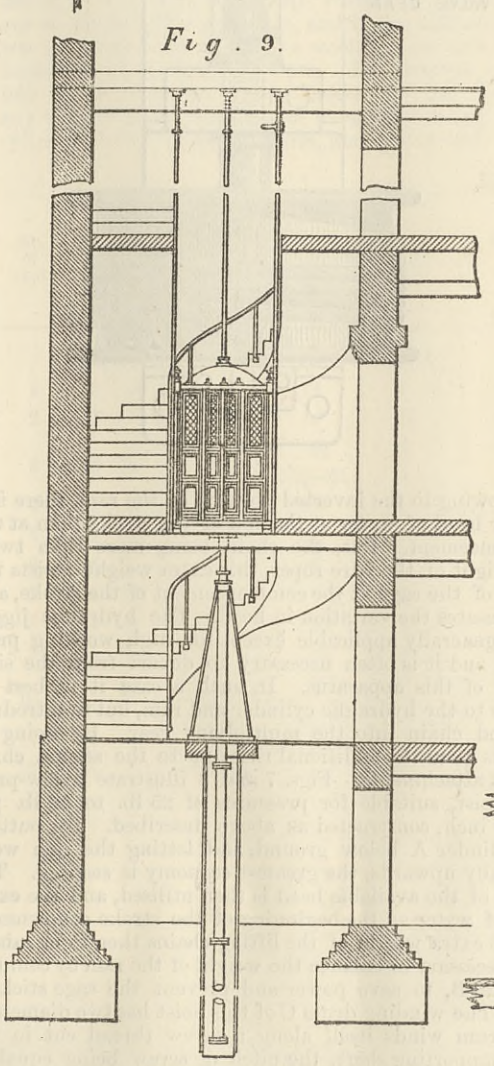


Fig. 10.

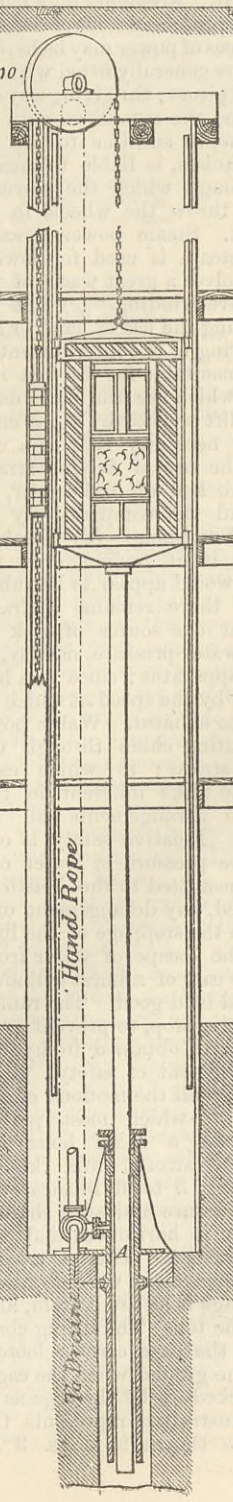


Fig. 11.

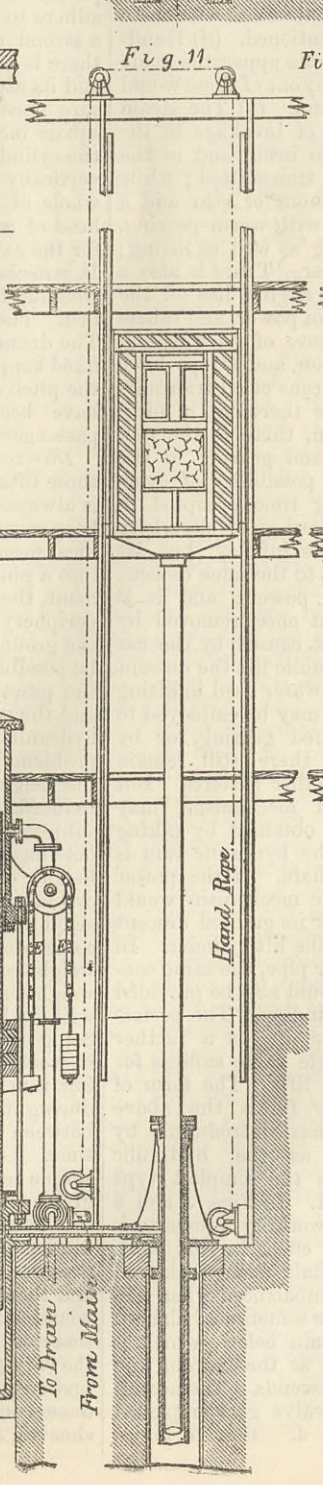


Fig. 13.

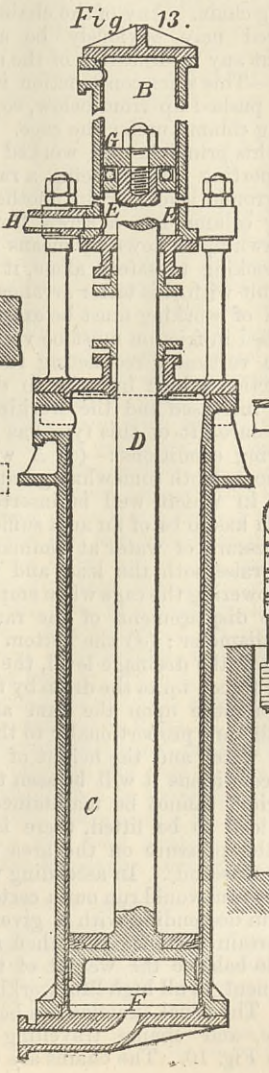
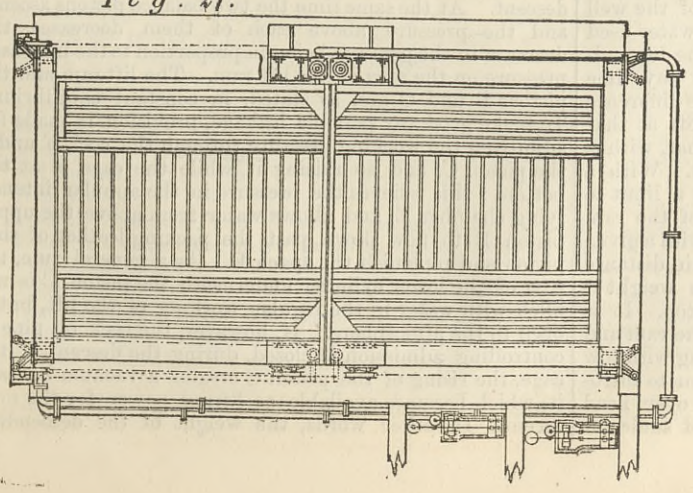


Fig. 21.



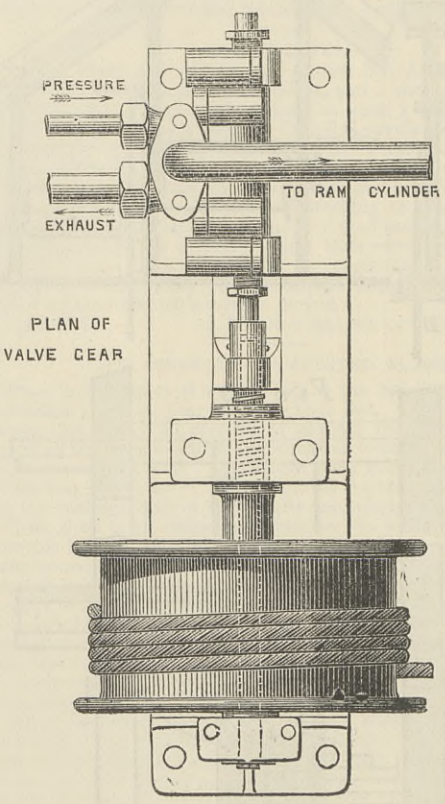
THE INSTITUTION OF MECHANICAL ENGINEERS.

The spring meeting of this Institution took place on Thursday and Friday, the 20th and 21st ult. After some proceedings, chiefly of a business character, the postponed discussion was taken on Mr. E. B. Ellington's paper

On Hydraulic Lifts for Passengers and Goods.

The author began by saying that accidents to lifts, especially when worked by mechanical means, have been so frequent, that many hesitate to adopt them on account of the risk involved. But in a rapidly increasing number of cases their use is a necessity, and the risk must be taken. It becomes therefore a question of public importance that this risk should be reduced to a minimum.

Chain Lifts.—The first rudiment of a lift is to be found n the hoisting jigger, as commonly used in the Liverpool otton warehouses; this consists of a winding drum, a at-head pulley, and a chain attached to the article to be aised, as shown in Figs. 1 and 2. By adding a cage and a guide to the chain, the apparatus has been developed into a lift. It is worked either by winch handles A, Fig. 2, or from a lower floor by the endless rope B. When a cage is attached the individual entering stakes his life on the security of the chain or rope supporting the cage. Various attempts have been made to reduce or eliminate this risk. The favourite plan is to insert above or below the cage a safety apparatus to retain the cage in position in case of the breaking of the chain or rope. In the majority of instances, the safety apparatus is found to be a delusion; generally because no apparatus not in constant and necessary use is likely to be kept in proper working order, and no safety apparatus provides against all possible accidents to the machinery. In a chain hoist of any kind—where the word chain must be taken to include a hemp or wire rope—the first thing is to be sure of the chain or rope. If a chain be used, it should be of such strength that the ordinary load would not straighten the link out, even if it were cracked through. If wire ropes are used there should be two, each capable of doing the whole work. More accidents arise from the breakage of the attachments than of the chain. The attachments should be considerably stronger than the chain, and, where practicable, should be tested with it. The next question is safety of mechanism by which the chain is hauled in and the cage lifted. There is a certain risk attached to a chain or wire rope which cannot be removed; but it will obviously depend upon the mechanism adopted whether other risks are superadded. The chain may be hauled in by machinery worked by hand, steam, air, gas, electricity, or water; but there is generally very little distinction to be drawn between the machinery used with the first five of these motive powers. Given the gear, it is simply a question as to what force shall drive it. Accidents may happen to any of the mechanisms adopted; and some of the elements of risk with these various sources of power may be here mentioned. (*a*) Hand-power lifts are generally fitted with a brake apparatus made up of several pieces; the giving way of any one of these would probably send the cage down with a run. (*b*) The steam or air engine, in addition to the risk of breakage in the brake mechanism, is liable to breakage itself, and in the gearing through which the power is transmitted; while clutches to throw the wheels in and out of gear add a further risk. Steam power is safer with worm gearing, and where steam is used for lowering as well as lifting; but this involves a great waste of power. There is also a danger of overwinding. (*c*) The gas engine has all the risks attending the use of hand or steam power, and others besides; owing to the intermittent nature of its working, gearing is unsuitable for the first motion, and straps have to be used, which are the most dangerous of all transmitters. In a lift worked by a gas engine therefore, in addition to the necessary risk of a chain, there is the risk attending the use of driving straps and gearing in the working crab and of brake gear, the possibility of overwinding, and the comparatively long time occupied in starting and stopping. (*d*) The application of electricity to hoisting is at present only in its infancy, but its application would appear to be subject to the same defects. (*e*) Finally there remains hydraulic power; and it is obvious that one source of risk is at once removed by employing water-pressure, namely, that caused by the use of a brake apparatus; since in a hydraulic lift the descent is regulated by the speed at which the water used in lifting is allowed to exhaust. Water power may be employed to haul the lifting chain through toothed gearing, or by means of straps; in which cases there still remain some of the risks inherent in the other systems. But by suitable arrangements all such mechanisms may be avoided. Relative safety is only obtained by taking care that the pressure of water on the hydraulic ram is directly transmitted to the hoisting chain. If the power is so applied, any derangement of the mechanism would either mean the stoppage of the lift, or its gradual descent owing to the escape of water from the lift cylinder. In the possible case of a burst cylinder or pipe, the same condition would hold good. The ram should also be provided with a positive stop, to prevent overwinding. The perfection of control obtained in hydraulic lifts is a further important element of safety. A single valve suffices for the control of all the motions of such lifts. The form of hydraulic lift which most perfectly fulfils the above conditions for a chain hoist is that introduced by Sir W. Armstrong, and known as the hydraulic jigger. Figs. 3 to 6 illustrate this the simplest type of a high-pressure hydraulic chain lift. In Figs. 3 and 4 the cylinder is horizontal, and the working pressure is therefore constant. There is a loss of effect in this hoist, in consequence of the weight of the chain being balanced when the cage is at the bottom, and unbalanced when the cage is at the top. The lifting chain is sometimes balanced by letting the cage carry a loose chain below, which is coiled on the ground when the cage is at the bottom, and which is picked up by the cage as it ascends. The accompanying illustration represents the valve gear employed in the lifts shown at Figs. 3 and 4. Fig. 5 is an illustration of a hydraulic jigger hoist suitable for moderate pressures. The ram is inverted, and its weight partly balances the weight of the cage. The chain is attached at one end to the cylinder, at the other to the counterweights. From the counterweights two wire ropes are led to the cage, each being of sufficient strength to carry the weight. The author's experience is that wire ropes are not so reliable as chains, and that it is desirable where practical to use duplicate ropes. In this



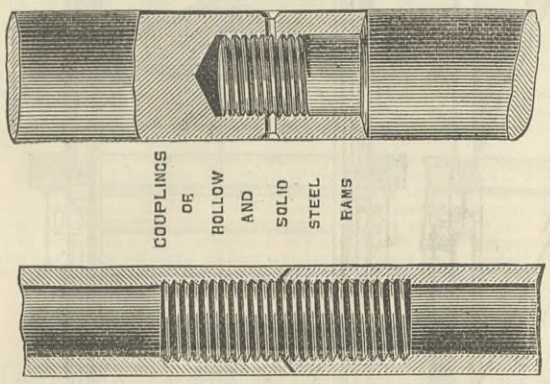
hoist, owing to the inverted position of the ram, there is a greater head of water at the end of the stroke than at the commencement. But, the chain being more than twice the weight of the wire ropes, this extra weight assists the ascent of the cage at the commencement of the stroke, and compensates the variation in head. The hydraulic jigger is not generally applicable except for high working pressures; and it is often necessary to depart from the simplicity of this apparatus. In such a case it is best to adhere to the hydraulic cylinder and ram, but to introduce a second chain into the multiplying gear. By doing so there is then the additional risk due to the second chain and its attachments. Figs. 7 and 8 illustrate a low-pressure hoist, suitable for pressures of 25 lb. to 50 lb. per square inch, constructed as above described. By putting the cylinder A below ground, and letting the ram work vertically upwards, the greatest economy is secured. The whole of the available head is then utilised, and the extra head of water at the beginning of the stroke compensates for the extra weight of the lifting chains then to be raised. It is necessary to balance the weight of the ram by counterweights B, to save power and prevent the cage sticking fast. The winding drum C of this hoist has two diameters. The drum winds itself along a screw thread cut in the fixed supporting shaft, the pitch of screw being equal to the pitch of the lifting chain. Any of the chain lifts which have been considered may obviously be adapted for passenger use, without any modification of the mechanism.

Direct-acting Lifts.—This safer construction is found in those lifts which are pushed up from below, so that there is always a supporting column under the cage. Lifts have been constructed on this principle and worked by mechanical means, the supporting column being a rack, gearing into a pinion at the ground level; or, in another arrangement, the supporting column has a screw thread on its periphery, and is drawn up or down by means of a nut at the ground level. Looking to safety alone, it would not be possible to find fault with this latter arrangement; but the practicable speed of working must be extremely slow, and the power absorbed in friction must be very great. A hydraulic lift, with a vertical direct-acting ram, presents problems in construction which increase in difficulty as the height of lift is increased and the working pressure reduced. A low-pressure lift of this type has to be made subject to the following conditions:—(*a*) A well or bore hole has to be sunk to a depth somewhat greater than the height of the lift, in which well is inserted the lift cylinder; (*b*) the ram has to be of an area sufficient, when acted upon by the pressure of water at command, to overcome friction, and to raise both the load and the surplus weight required for lowering the cage when empty; (*c*) the weight, and also the displacement, of the ram increases with its height and diameter; (*d*) the bottom of the well being usually far below the drainage level, the water used in working has to be forced up to the drain by the descending ram; (*e*) the pressure upon the ram at any time during its motion will vary proportionally to the difference between the head of water and the height of lift at that time. Under these conditions it will be seen that, with a simple ram, equilibrium cannot be maintained. With a given pressure and load to be lifted, there is a limit to the height of lift, the pressure on the area of the ram diminishing as the ram ascends. In ascending with a given pressure of water, the ram would run out a certain distance and then stop; and in descending with a given weight it would descend a certain distance and then stop. It is therefore necessary to balance the weight of the ram and the varying displacement, in all high lifts working with low pressures of water. The usual practice has been to introduce counterweights, and chains travelling over head sheaves, as shown in Fig. 10. The chains are of sufficient weight to balance the displacement of the ram. For a considerable portion of its distance from the top, the ram instead of supporting the cage as a column, is thus really hanging from it; part of the ram is always in tension, and another part is always in compression, while the neutral plane varies in position according to the pressure on the ram. Should the ram break above the neutral plane, or the attachment between the ram and cage give way, the cage would be violently dragged by the counterweight to the top. This danger happened at the Grand Hotel in Paris, when several passengers were killed. This can be prevented by increasing the working pressure, and by reducing the area, and therefore the displacement, of the ram, leaving only sufficient section to prevent its bending under the load, as shown in Fig. 9. The requisite safety is thus secured, but at an extravagant expenditure of power, owing to the want of any balance, the expenditure due to weight of the ram and cage, and to the loss by displacement, being often five or six times that due to the net load. Messrs. Tommasi and Heurtvisé have designed a balancing arrangement separate from the lift cylinder, as shown in Fig. 11. The lifting cylinder is in hydraulic connection with a second cylinder B of equal capacity, though of shorter stroke. In the second cylinder there is a loaded ram C, of sufficient weight to balance the minimum weight of the lift ram and cage when at the bottom. This heavy ram works through the stuffing-box of a third cylinder D, of the same capacity as B; and the pressure of water in the third cylinder lifts the net load. Heavy chains E are attached to the ram C, between the two short cylinders, to balance the varying displacement of the lifting ram as it travels. This plan is satisfactory as regards safety, but the weight and size of the cylinders and moving parts are so great as to render its adoption on a large scale impracticable.

Hydraulic Balance Lifts.—The author has endeavoured to overcome the above-mentioned difficulties, and has devised an arrangement which appears to him to meet all the requirements of a perfectly safe, rapid, and economical passenger lift. In this the ram is always in compression, and supporting the load; the dead weight of the ram and cage is balanced wholly or partly by hydraulic pressure; the displacement of the ram is reduced to a minimum, and is balanced without any special mechanism; the weight of the moving parts of the lift is reduced to a minimum; no part of the machinery or supports is above the cage; and there is no part of the machinery which, by giving way, could reasonably be expected to cause an accident to those in the lift.

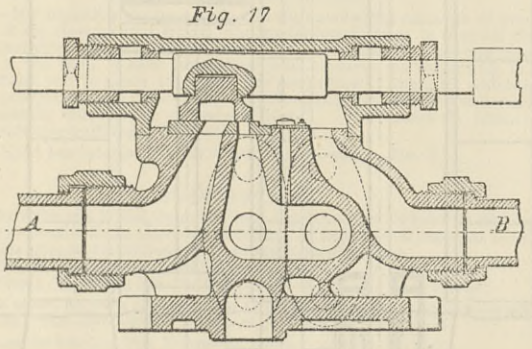
This hydraulic balance lift is shown in Fig. 12. The hydraulic lifting cylinder, ram, and cage are as usually made, except that the ram is smaller in diameter. Its size is determined by the strength required to carry the load, and not by the working pressure of water available. As in Tommasi's lift, the lift cylinder A, Fig. 12, is in hydraulic connection with a second and shorter cylinder B, below which is a cylinder C of larger diameter. There is a piston in each, connected by the ram D, Fig. 13. The capacity of the annular space E E below the upper piston is equal to the maximum displacement of the lift ram A. The annular area of the lower piston C is sufficient, when subjected to the working pressure, to overcome friction and lift the net load; and the full area B of the upper piston is sufficient, when subjected to the same pressure, to balance within a small amount the weight of the ram and cage when at the bottom. When the parts of the apparatus are properly proportioned, the lift ram and the balance pistons are in equilibrium in every position; or, in other words, the displacement of the ram of the lift cylinder is automatically balanced. The mode of action of the lift is as follows: Assuming the cage to be at the bottom of its stroke, the valve is opened from the cage by means of a rope or system of levers, and water is thereby admitted to the annular area of the lower piston at F. The top of the upper piston is always subjected to the same pressure. The pressures on the two pistons thus act in the same sense on water in the annular space E, below the upper piston; and the intensified pressure of this water is transmitted through the pipe H to the lifting ram A, which thereupon ascends. As it ascends, the ram increases in apparent weight, but at the same time the pistons B and C descend, and are thereby subjected to an increasing head of water, which increased head, acting upon the large area of the pistons, exactly balances the increase of weight of the ram, or—to state the case more accurately—compensates for the loss of effective head in the lift cylinder. When the ram reaches the top of its stroke, the valve is closed, and the lift stops. On opening the valve to the exhaust, the pressure is relieved from the space above the piston C, while the piston B remains subjected to the working pressure above it, as in ascending. The lift now descends: the weight of the ram and cage, pressing upon the water in the lift cylinder, transmits the pressure to the annular area at the bottom of the piston B, and overbalances the weight of the pistons and the pressure on the top of the piston B. As the lift ram descends into its cylinder, it displaces the water and loses weight, or, in other words, encounters an increased resistance to its descent. At the same time the two balance pistons ascend, and the pressure above each of them decreases, the decrease in the pressure being in proportion to the increased pressure on the area of the lift ram. The lift ram and the pistons B and C are, as stated, in constant equilibrium. To make good any possible leakage, provision is made for admitting the working pressure through the cock F under the piston C, and so raising it, while the cage is at the bottom; this relieves the pressure in the annular intensifying chamber E, and allows water from above the upper piston B to flow down past the packing leather of that piston and replenish the space E. As a general rule, the part of the lower cylinder underneath the piston C is not filled with water in the regular working of the lift, but is open to the atmosphere. If, however, the cock on pipe F controlling admission is closed, during the descent of the cage, the rising of the piston C creates a vacuum beneath it, which becomes available as lifting power for the next ascent. In other words, the weight of the descending

load is by this means utilised to augment the lifting power in the next ascent of the loaded lift; or, if the lift is being used for the purpose of lowering goods, the vacuum supplies power enough for raising the empty lift without the expenditure of any water at all. The author's hydraulic balance lift permits of great variety of application; and the proportions of the balance cylinders may be adjusted to suit any working pressure available, without alteration to the size of the lift ram. This facilitates the employment of high working pressures; and the system is therefore particularly adapted for use in connection with public distribution of hydraulic power on the high-pressure or accumulator system, where economy in the use of the power is of vital importance. When working the lift with high pressure, the balance cylinders may be temporarily disconnected, and the pressure used direct from the accumulator. The increase of the working pressure reduces the size of the lift cylinder, and also much increases the speed of the lift—a matter of much consequence in public offices and other places where large numbers of passengers have to be accommodated. The author has for



some time past adopted a working pressure of 200 lb. per square inch and upwards for high direct-acting lifts; and by so doing has succeeded in working these lifts at a speed of 200ft. per minute, and, with a single lift, taking five or six people at a time to a height of about 40ft., in accommodating as many as 3000 passengers in the course of nine hours. When using high-pressure water from an accumulator for working the hydraulic balance, it is not necessary to use the high-pressure for the balance piston. Water may be taken for this purpose from a supplementary tank, placed at a convenient height; or the fluid used may with advantage have a higher specific gravity than water. The water is taken from the tank and returned at each ascent and descent of the lift cage. In many cases of high-pressure lifts the loss by displacement of the ram is not of sufficient consequence to be considered. Then the arrangement adopted is as shown in Figs. 14 and 15, and the balance cylinders can, if desirable, be placed horizontally. Here the working pressure due to the area of the central pipe acts constantly to balance the minimum weight of the ram and cage, and the lifting power is obtained by admitting the working pressure into the outer annular space, and so forcing water from the bottom cylinder to the lift cylinder. Another incidental advantage of the hydraulic balance lift is that the space in the lift well, usually occupied by the counterweights and guides, is available for the cage. All head gear is avoided, and no special structural arrangement for carrying the weight from above is required. Fig. 17 shows the construction of the valve chest of Fig. 14.

Fig. 17



Economy of Hydraulic Lifts.—Hydraulic apparatus, as used in hydraulic lifts, forms a system of mechanism for the transmission of power. A steam engine working an accumulator gives an efficiency of 75 to 80 per cent. The loss between the work stored in the accumulator and the work done by a direct-acting ram may be taken at 5 to 10 per cent., which would give a final efficiency of, say, 70 per cent. No geared lifting machinery, driven direct by a steam engine, gives anything approaching so high an efficiency; and the efficiency would again be much lowered if, as in the generality of cases, the steam engine had to be kept constantly moving. The loss from this latter cause is much greater than the loss arising from the invariability of the hydraulic lifting power. Moreover, though the power of hydraulic lifts is invariable, yet when lifting light loads there is a gain of speed.

Lifts of Large Power.—Fig. 18 and 19 illustrate the direct-acting hydraulic lifts erected at Seacombe pier on the Mersey to take the carts and wagons from the floating landing stage to the high level. The height of lift is 32ft., and the net load 20 tons. The lifts were designed by Mr. Wm. Carson, M. Inst. C.E., to avoid the long approaches used at Woodside, and at the Liverpool landing stage. There is a connecting valve between the two lifts, so that a descending load in one lift may raise the other cage. The hoists are made to accommodate railway coal wagons. The platform upon the cage is double; the upper portion slides longitudinally upon the lower, and is guided to the radius of the bridge connecting the floating stage with the upper pier. This bridge is hinged at both ends, and the guiding ares, Fig. 19, are struck with a radius of 160ft., equal the length between hinges. Fig. 20, 21, 22 illustrates another arrangement of wagon hoists, constructed for the Midland Railway Company at Whitecross-street Station on the Metropolitan Railway. The object of the arrangement was to get a direct-acting hoist without sinking a well, the condition being that the concrete floor of the station should not be touched. There are two lifting rams at each side, placed in hydraulic connection diagonally, so that either two or four can be used, the lifting force in either case passing through the centre of gravity of the platform. When lowering loaded wagons, the water used to lift the platform alone, or with only an empty wagon on it, is returned to the reservoir by the descending load. For such lifts as these, direct-acting hydraulic rams are now almost exclusively used. In the appended Table I. are given the results of a number of observation on the relative economy of hydraulic lifts of different kinds, and working at different pressures.*

In the discussion Mr. Walker said he did know of instances in which life of workmen had been saved by safety apparatus, though the author said they were not to be trusted, and if that was so in one case it might be so in many. Worm gearing, he said, might be used without much loss by friction if used at a high speed, and its advantage as to safety was obvious. In reply to the author's remarks upon the use of belts to work hoists, Mr. Walker said he had erected one so worked fifty years ago, and it was still at work. It was in a very high shaft in a woollen mill, and there are hundreds of the kind at work. He referred to the flat link pitch chain as much better for the work than any welded chain, and might be as safe as any hydraulic cylinder, as the latter did burst, and joints did blow out. being quite high enough. He had not found the friction of a ram very great. A 9in. ram with 110ft. head of water gave only 2 lb. per square inch friction, as shown by the counterbalances. He thought gas engines could be usefully employed for lift purposes. He preferred low-pressure to high-pressure lifts, as with an elevated tank the lifts could be used when the engine had stopped. He did not like working lifts or hoists by worm gearing.

Mr. A. Davis referred to the safety air-tight well at the bottom of the lift by which the descent of a cage was gradually checked on the cushion of air so enclosed, a very important form of safety appliance not referred to in the paper. Mr. Tweddel thought that it might be said Mr. Ellington had rather over-advocated one system at the expense of others. He did not agree with the doubt expressed as to chains generally. When accidents happened it was often due to using chains with too small or no margin of safety. In French lifts there was still a large quantity of chain used, but English engineers had greatly simplified lifts of all kinds. He did not agree with the author's remark that the hemp packing acted as a brake if a hydraulic cylinder burst. That must be very expensive packing, as it would act always as a brake. His experience with wire rope for lifts had been unsatisfactory. The ratio of length of the author's lift column to diameter of table was very great, and was calculated to throw great strain on the column, especially if the table were to jamb by any cause. Mr. Rich thought that Mr. Ellington had gone in the wrong direction in introducing five times more packings in his new lift than were required in the ordinary ram lift. He had four in his accumulating apparatus, two stuffing boxes and two pistons, besides the ram, and these

Hydraulic Lifts.—Table I.

No. of expt.	Description of lift.	Pressure of water.	Diameter of ram.	Stroke of ram.	Height of lift.	Ratio of height of lift to stroke of ram.	Net load lifted.	Speed of ascent. Cage loaded.	Speed of ascent. Cage empty.	Speed of descent. Cage empty.	Efficiency of machine, ascending with full load.
	Plate. Fig.	lb. p. sq. in.	In.	ft. in.	ft. in.		Cwt. qr. lb.	Ft. per min.	Ft. per min.	Ft. per min.	Per cent.
1	12 7	28	14	7 6	43 6	5·8	3 2 0	40	136	112	76·3
2	12 7	30	18	9 0	45 0	5	7 2 0	28	96	66	77·5
3	16 16	33½	3½ / 21¾—11	50 6 / 8 2	50 6	1 / 6·2	8 0 0	35	138	47	80·0
4	12 7	34	23	7 2	57 4	8	9 0 0	29	107	62	78·5
5	12 7	39	17	9 2	72 4	7·9	6 0 0	55	145	98	79·9
6	14 11	39½	6	49 6	49 6	1	5 0 23	30	103	57	76·1
7	14 11	40	8 15/16	73 6	73 6	1	12 2 20	19	68	71	78·1
8	12 6	190	13½	9 0	90 0	10	13 0 0	57	222	62	76·8
9	14 11	200	4¼	79 0	79 0	1	15 2 0	47	235	156	80·6
10	17 18	640	3 31/32 / 11¼—6⅝	57 0 / 7 1½	57 0	1 / 8	32 2 0	60	265	48	85·0
11	11 3	740	4¾	6 9	54 0	8	8 0 0	60	648	81	77·5
12	11 3	790	5	7 2	71 8	10	7 3 18	53	427	82	78·5

LIFTS REFERRED TO IN TABLE.

Experiment No. 1.—Fig. 7.—Chain lift with balance weight. No safety gear.
Experiment No. 2.—Fig. 7.—Chain lift with balance weight. With safety gear.
Experiment No. 3.—Fig. 16.—Direct-acting ram. Author's hydraulic balance lift. (Low pressure.)
Experiment No. 4.—Fig. 7.—Chain lift with balance weight. Safety gear. No winding drum.
Experiment No. 5.—Fig. 7.—Chain lift with balance weight. No safety gear. Rollers to cage.
Experiment No. 6.—Fig. 11.—Direct-acting ram, with balance chain and weight.
Experiment No. 7.—Fig. 11.—Direct-acting ram, with balance chain and weight.
Experiment No. 8.—Fig. 6.—Chain lift with balance weight.
Experiment No. 9.—Fig. 11.—Direct acting ram, with balance wire ropes and weight.
Experiment No. 10.—Fig. 18.—Direct-acting ram. Author's hydraulic balance lift. (High pressure.)
Experiment No. 11.—Fig. 3.—Chain lift with balance weight. Safety gear. Vertical cylinder.
Experiment No. 12.—Fig. 3.—Chain lift with balance weight. No safety gear. Horizontal cylinders.

Mr. F. Collyer said experience had taught him that it was practically impossible to make chain goods lifts absolutely safe, and workmen should not be allowed to use them, even when the lifts were fitted with safety apparatus. He had found a modification of the safety apparatus introduced by Sir W. Armstrong, namely, a cam and rack, very satisfactory. If two wire ropes were used as suggested in the paper, both should be adjusted to the same tension, as if a tight one broke and the load came on the slack one, it would be likely to break it. In many instances the attachment between rope and cage was the cause of accident. There need be no loss by steam hoists in working when the load was descending, as by means of a valve box between the cylinders the descent might be controlled without the use of steam, and that with only one lever. Mr. Collyer did not fully describe the arrangement. He said he was constantly using hoists running at 250ft. to 300ft. per minute, and he used an arrangement that threw the lift out of gear when it reached the top, and so overwinding was prevented, and with the safety apparatus to which he referred the fall was not more than from 3in. to 5in. Overwinding, as in the case of the fatal accident at the Grand Hotel, Paris, might be prevented by winding off the chain as it wound on in the ascent of the lift, by using a large drum below and winding off from the bottom of the cage as winding went on at the top. The cage would be thus approximately balanced at any position. Wire ropes should not pass over pulleys less than 14in. to 18in. diameter. Any height of lift by direct-acting ram could be effected by providing a second lift, commencing from the upper level of the first. Referring to the breaking of balance chains, and to the separation of the cage from the hydraulic ram, as at Paris, he knew no instance in which that occurred with a well-made lift, and that at Paris was, as most often is the case in France, badly constructed. Chains should not be connected at the centre of the cage. He thought the author's arrangement complicated, while simplicity was most essential. He thought 200ft. per minute for passenger lifts far too high, from 100 to 150 in practice would be a cause of much trouble, and he should think not more than 60 per cent. efficiency would be obtained. Heurtvise had gone in the same direction but only half as far. The lift was exposed to too much risk in the case of the bursting of a cylinder. He agreed that to prevent workmen using goods hoists would cause inconvenience, but people now must be wary of trusting their servants' lives in lifts which they thought unsafe for passenger purposes. He had never known of a case where an accident was prevented by a safety catch. Geared lifts generally broke at some distant part of the mechanism, and left some residual strain on the rope or chain which prevented the safety gear from coming into play. For efficiencies of 76 to 80 per cent. were mentioned, but these must be with very slow speeds; for high speed and high efficiency very large pipes must be used. Mr. Gregory was surprised to find from the remarks of Mr. Davis that the safety air cushion well was so much in use in the States. He knew of one case where the well was not made strong enough, as was found by some friends of his who tried it experimentally, and "were taken out to the nearest hospital for which they had any preference." This showed that the well needs to be strongly made.

Mr. Head referred to steam cylinder lifts used in foundries, and said that the objection to them was that if by any cause the lift stuck at one part of the stroke the pressure increased and the lift ran away, perhaps with bad results, and a case had happened of sticking when coming down. Steam had been turned off, and presently the lift dropped with a crash. Such a thing, he said, could not happen with water. He then described a blast furnace lift, with a separate engine and rope gear, used by Messrs. Samuelson and Co., double ropes being used.

Mr. Ellington replied to the discussion, and the President summed it up in remarks which, briefly, were to the effect that most accidents were due to insufficient strength of parts and inefficient inspection and maintenance. His experience with catches had not destroyed his faith in them, and lifts were now being made with a chain for lifting the load, and having a wire rope running alongside over separate pulleys, the wire rope being attached to the safety apparatus—an arrangement which gave additional safety. A paper was then read "On Appliances for Working Under Water or in Irrespirable Gas," by Mr. W. A. Gorman. It was announced by the President that the summer meeting of the Institution will take place in Leeds, commencing on Tuesday, the 15th August.

* The efficiency of the machine $= \frac{\text{Weight lifted} \times \text{height}}{\text{Pressure} \times \text{area of ram} \times \text{stroke}}$

There are, however, three elements to be considered:—(1) The friction of the machine during ascent; (2) the net load lifted; (3) the friction of the machine during descent, represented by the additional load lifted in the unbalanced weight of the cage. If, in calculating the efficiency as above, the net load only is taken, the total loss by friction both in ascending and descending is debited to the ascent alone. The percentage of efficiency in the table assumes the friction during ascent and descent to be equal, and gives the efficiency during ascent only.

HYDRAULIC LIFTS FOR PASSENGERS AND GOODS.

(For description see page 324.)

Fig. 12.

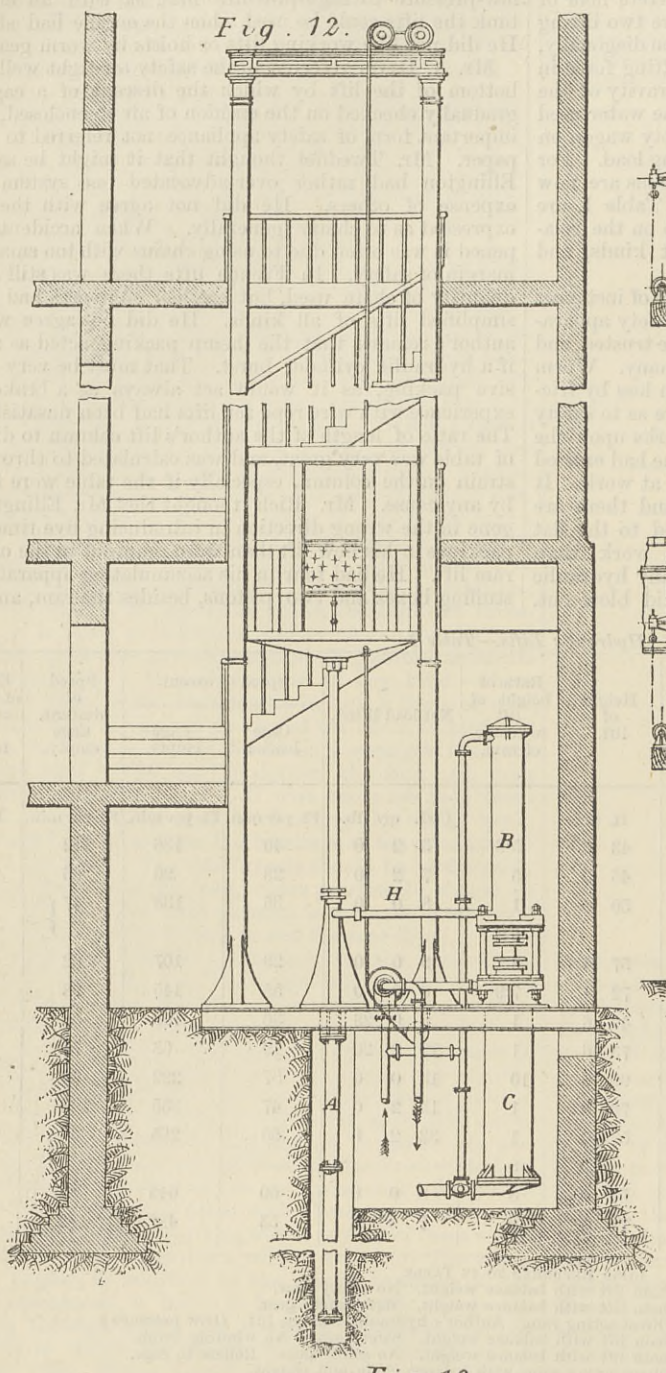


Fig. 20.

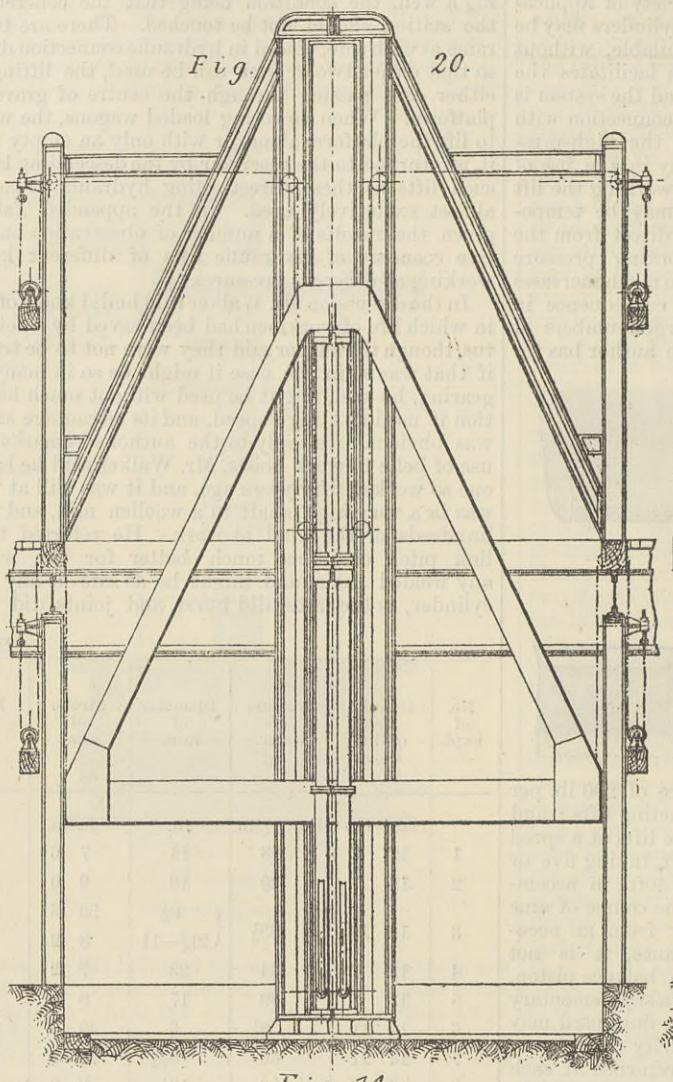


Fig. 22.

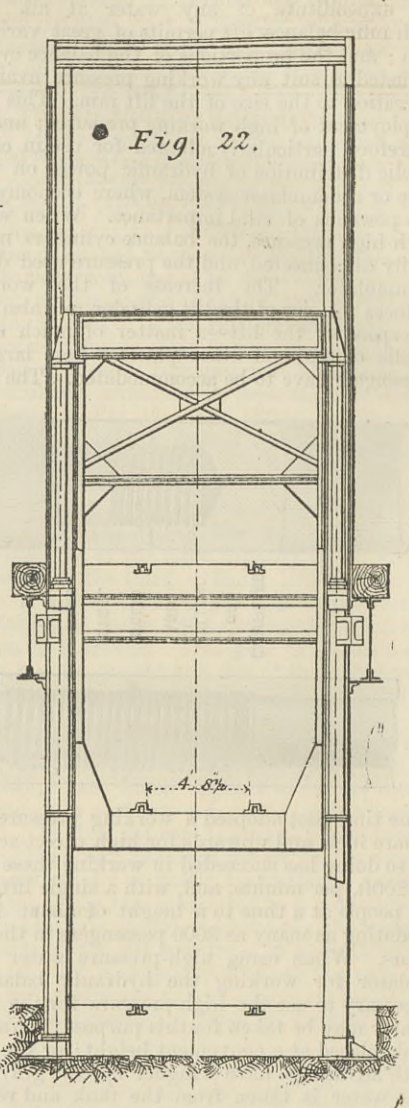


Fig. 14.

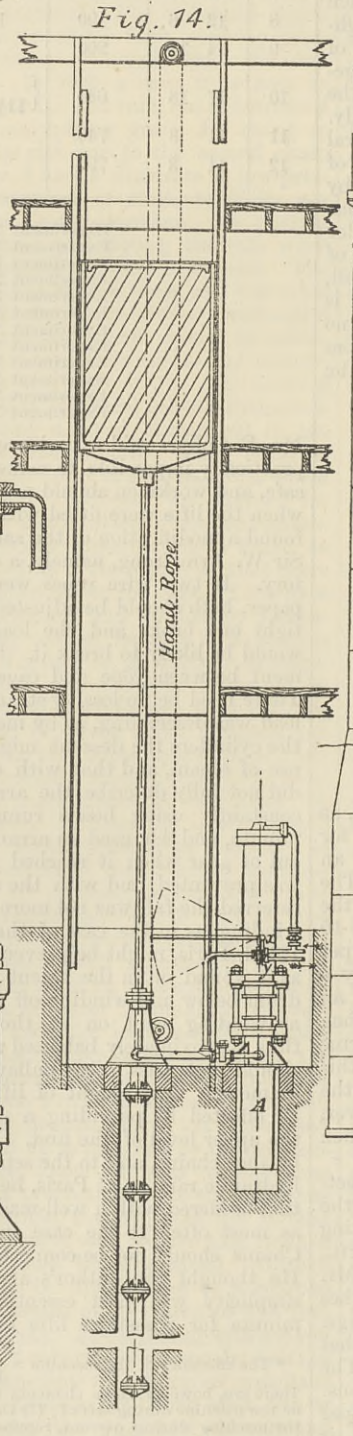


Fig. 18.

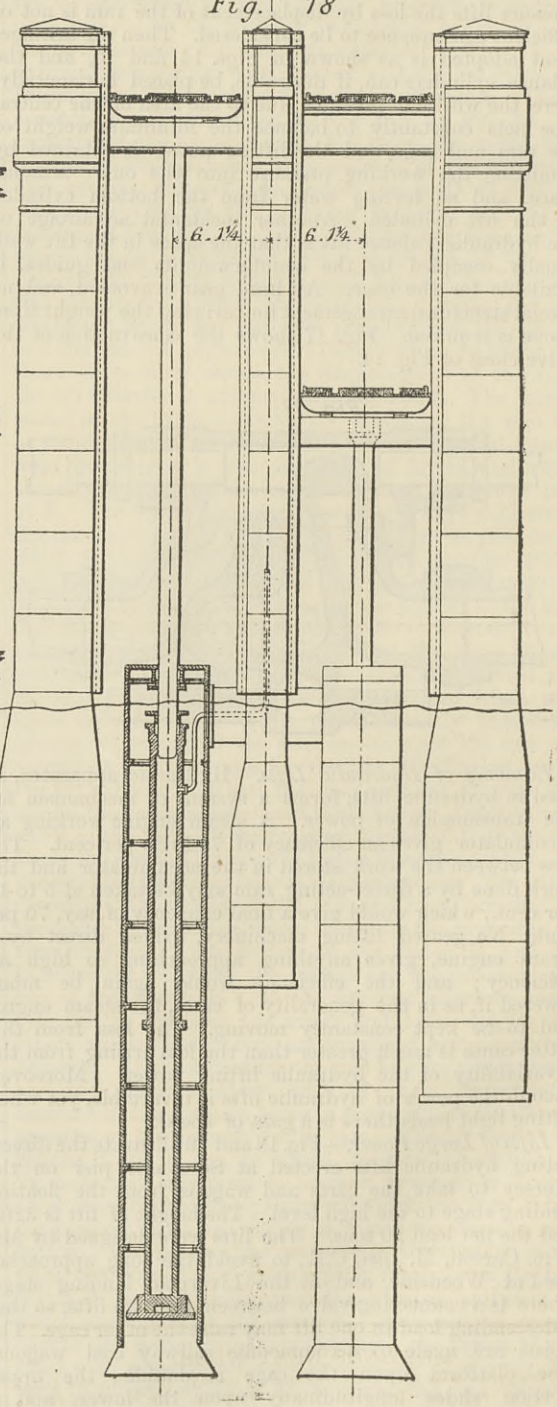


Fig. 19.

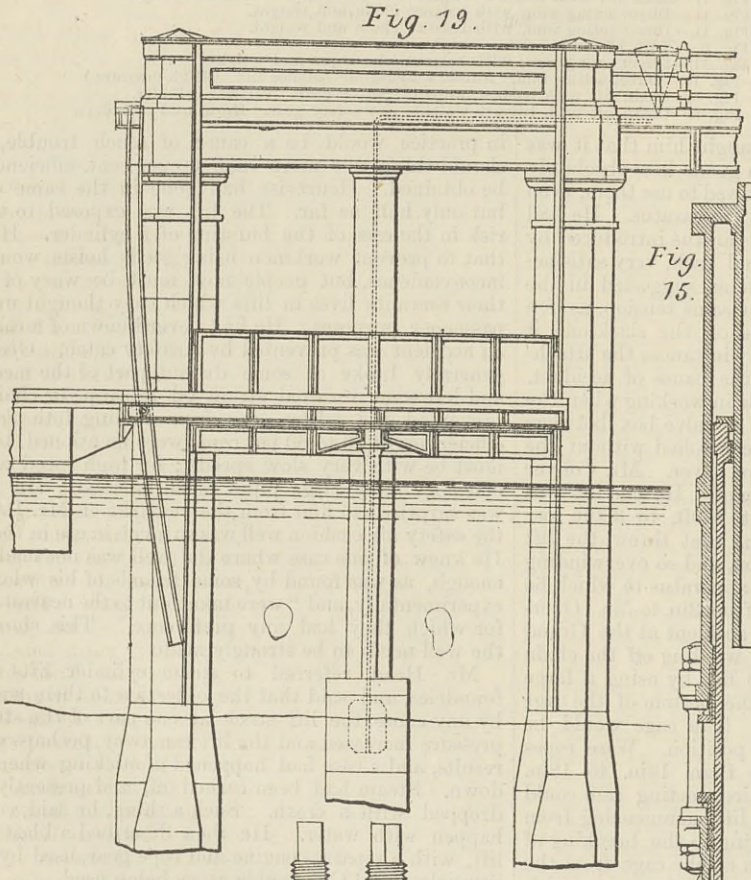


Fig. 15.

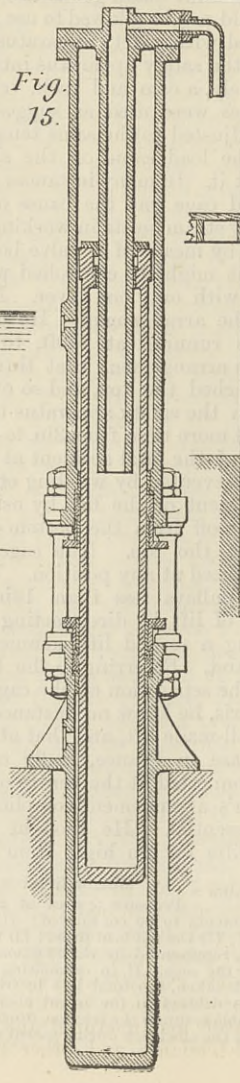
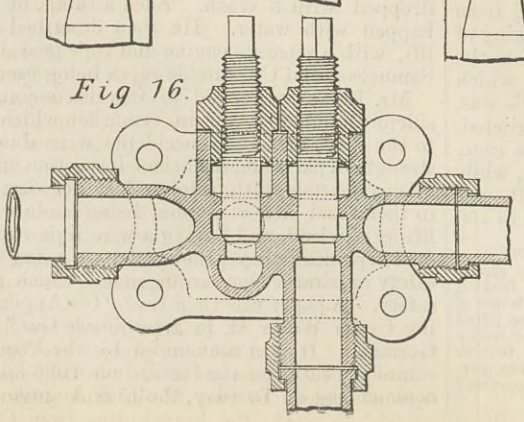


Fig. 16.



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R. J. K.—*We cannot do better than advise you to read the cheap and excellent little work by Box "On Mill Gearing," published by Messrs. Spon, of Charing-cross.*

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ROPE DRIVING GEAR.

(*To the Editor of The Engineer.*)

SIR,—I should esteem it a favour if any of your numerous readers would give me the power of a 2in. rope running upon grooved pulleys 4ft. 10in. diameter, to centre of rope, and making 105 revolutions per minute, the horizontal distance between centre of pulleys being 21ft., and the vertical distance 9ft. B. A.

Huddersfield, May 3rd.

MAIGNEN'S HYDRAULIC JACK.

(*To the Editor of The Engineer.*)

SIR,—In your issue of April 28th, under the heading of "Miscellaneous Exhibits at the Naval and Submarine Exhibition," mention is made of the sliding hydraulic jack bearing my name. I should esteem it a favour if you would allow me to say in your columns that the credit of this invention is not entirely due to me. In fact, the original idea was conceived and communicated by my friend M. A. Malé. P. A. MAIGNEN.

22 and 23, Great Tower-street, London, April 28th.

A GREAT PLATE MILL.

(*To the Editor of The Engineer.*)

SIR,—In your notice of "A Great Plate Mill," p. 308, in your issue of April 28th, there is a slight misdescription. The blooming mill referred to was made by us, and not by the Lilleshall Company. The bevel wheel reversing gear for this blooming mill was, however, supplied by the Lilleshall Company. The massive 28in. plate mill, with the powerful reversing gear for same, complete, were also supplied by us.

TAYLOR AND FARLEY.

Summit Foundry, West Bromwich, May 2nd.

SCREW PROPELLERS.

(*To the Editor of The Engineer.*)

SIR,—Owing to an error in your abstract of the specification No. 4009 in last week's number, the description given is rendered either unintelligible or misleading. The device is that of a fixed "run," not "rim," behind the propeller boss, and is intended to facilitate the use of large bosses with their well-known concomitant advantages, as it forms an easy "exit" without "suck" behind the boss. The idea, however, has proved not to be original with me, hence the abandonment of the patent at an early stage. R. M. STEELE.

33, Sutherland-gardens, Harrow-road, W., May 3rd.

KIDD'S WATER ELEVATOR.

(*To the Editor of The Engineer.*)

SIR,—My attention has been called to the concluding remarks of your notice of my elevator by a friend who understands from it that all the parts, including the double-beat valve, act automatically after one revolution of the cam. I have not taken your remarks in this light, but understand you to mean that after one revolution of the cam, which is left in position to hold the double-beat valve open, the elevator will work automatically much as the pulsometer does. JOHN H. KIDD.

Westminster-buildings, Wrexham, May 2nd.

[Mr. Kidd has interpreted our meaning accurately.—ED. E.]

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

MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, May 9th, at 8 p.m.: Paper to be read and discussed, "Coal Washing," by Mr. Thomas F. Harvey, Assoc. M. Inst. C.E.

THE IRON AND STEEL INSTITUTE.—Wednesday, Thursday, and Friday, May 10th, 11th, and 12th, at 10 a.m.: Meeting of Council in the Council-room, 25, Great George-street. At 10.30 a.m.: General meeting of members in the hall of the Institution of Civil Engineers. The annual report of the Council and the financial statement for 1881 will be presented. Scrutineers will be appointed to examine the voting list. The Bessemer Medal for 1882 will be presented to Mr. A. L. Holley, New York. A selection of papers will be read and discussed.

SOCIETY OF TELEGRAPH ENGINEERS.—Thursday, May 11th, at 8 p.m. the following papers will be read:—(1) Measuring Instruments Used in Electric Lighting and Transmission of Power;" (2) "The Technical Education of an Electrical Engineer," by Professors W. E. Ayrton and John Perry.

SOCIETY OF ARTS.—Monday, May 8th, at 8 p.m.: Cantor Lectures, "Book Illustration: Old and New," by Mr. J. Comyns Carr. Lecture I. The proper relation of printed text and illustrated designs. History of the art. Early wood engraving. Wednesday, May 10th, at 8 p.m.: Twenty-first ordinary meeting, "The Fish Supply of London," by Mr. Spencer Walpole, late H.M. Chief Inspector of Salmon Fisheries. Mr. Edward Birkbeck, M.P., will preside. Thursday, May 11th, at 8 p.m.: Applied Chemistry and Physics Section, "The Recovery of Sulphur from Alkali Waste—Schaffner's Process—a Record of Recent Results," by Mr. Alexander M. Chance, of Birmingham. Prof. F. A. Abel, C.B., F.R.S., will preside.

THE ENGINEER.

MAY 5, 1882.

PLOUGH AND PLOUGH FITTING MARKS.

A CASE of very considerable importance to agricultural implement makers, great and small, has been decided last week by the judgment given by Vice-Chancellor Bacon in the case of Ransome *v.* Graham, which lasted ten days. It is a decision under the law of trade marks and concerns agricultural engineers and implement makers in particular, and one which must affect the procedure of many local founders who now manufacture wearing parts to fit ploughs by celebrated makers, and marked with the marks of these makers. Messrs. Ransomes, Head, and Jefferies were the plaintiffs, and the defendants were Messrs. Graham and Joslin, ironmongers and founders, Hadleigh. The defendants had been, like many others, in the habit of making the shares, lands or slades, rests, and other wearing parts to fit various ploughs made by Messrs. Ransomes, Head, and Jeffries, and they had cast upon or in these parts, the letters and figures which the plaintiffs had from the first manufacture of these ploughs used to designate and distinguish them as their manufacture and from each other. The various marks so adopted by the plaintiffs had become their trade marks, and they had a significance which does not attach to all trade marks, as they not only served as systematic marks by which the ploughs and their fittings and duplicate fittings could always be distinguished, but they indicated the form purpose, and date of origin of these ploughs. In the case just decided, the well-known Newcastle series of ploughs and their marks were typically the ground of action, the marks being "R N D," "R N E," "R N D H," "R N F," "W R N E," and so on. "R" signifying to the makers the name Ransome, "N" Newcastle, "W" wood, and the "D," "E," "F," and "H" signifying the particular purpose for which the ploughs marked with these letters were designed, as for instance, for light land, for heavy land, for general purposes, for deep ploughing, and so on. This particular series of ploughs, five in number, came out at the Newcastle meeting of the Royal Agricultural Society in 1864, and there won four out of the six first prizes offered by the Society, and in 1868 they won a prize in each of the seven divisions in which prizes were given; and besides these prizes they have taken a great many elsewhere. These facts alone gave the ploughs great celebrity amongst all vendors and users of agricultural implements, and to speak of an "R N F" plough was to speak of the ploughs made at the Orwell Works. This has been the case with other of the Ipswich ploughs, and notably so for nearly forty years of the remarkably successful "Y L" plough. The marks thus not only gave indication of the particular order of the ploughs and of the marks of their fittings, but indicated also the name of the makers. They are thus distinctly trade marks, and in their various combinations were registered in 1877 as such under the Trade Marks Registration Act of 1875. At various times the plaintiffs had warned agricultural implement makers and founders that these marks were their property under the Act, and had in their catalogues warned farmers against purchasing wearing parts not made by them, as they could not be responsible for their quality or accuracy of fitting. The defendants, however, continued to make these parts and to mark them with the same marks as those used by the plaintiffs, and thus farmers could not tell whether they obtained the plaintiffs' or other makes of parts. The plaintiffs alleged that owing to the manufacture of badly fitting and improperly chilled shares, or shares and other parts made of improperly selected metal, but still having their marks, their reputation had been damaged, and they, therefore, for these reasons and those already referred to brought the action "to restrain the defendants, their agents, servants, and workmen, from making, or causing to be made, any ploughs or parts of ploughs marked with combinations of the letters "R N F," or with any other letters figures, signs, or marks which are or purport to represent that they are made by the plaintiffs, and from selling any ploughs or parts of ploughs marked with any such combinations of letters, except such as have been made by the plaintiffs; and also from in any manner imitating or counterfeiting upon ploughs or parts of ploughs made by the defendants the said combinations of letters, or any letters or figures or marks used by the plaintiffs upon ploughs or parts of ploughs made by the plaintiffs, and from parting with out of the defendants' possession any ploughs or parts of ploughs made by the defendants which have thereon such combinations of letters and figures or marks as aforesaid."

The defendants contended that the marks were not trade marks, and that they only signified that a plough was of a particular pattern and shape, and not that it was manufactured by any particular maker. They further contended that wearing parts marked with similar combinations of letters had for years been openly and with full knowledge of the plaintiffs manufactured and sold in large quantities by the defendants and other firms in various parts of the country. The defendants also moved to rectify the register of trade marks by striking out those trade marks which they were said to have infringed as being *publici juris* and improperly registered. The action and the motion were heard together, and the evidence and numerous affidavits on both sides were very voluminous. Mr. Howard and many other well-known manufacturers of ploughs were examined, and at the conclusion of the trial, which, as we have said, occupied ten days, the Vice-Chancellor reserved judgment.

This was given on Saturday last, and although the question to be determined was simply whether or not the plaintiffs were entitled to the exclusive use of the combinations of letters which they have so long used, and now claimed as their trade mark, it was not a simple matter to determine, and the Vice-Chancellor's judgment, which glanced over the whole of the main features of the very extensive evidence, would occupy nearly two of our pages if we could spare the space. He considered that the plaintiffs had proved that they always used these marks as trade marks, and had established their right to these combinations of letters as their trade marks. He therefore ruled that they were entitled to the relief they sought from the defendants, and with costs against them. The motion he also dismissed with costs to be paid by defendants, whom he also ruled should pay the plaintiffs the cost of the action up to the hearing.

Part of the evidence for the defendants was meant to show that the plaintiffs had abandoned their right or acquiesced in their infringement; but this broke down because it was proved that the plaintiffs had constantly in their catalogues asserted it and had previously obtained an injunction against a founder for the same infringement. Another point of their evidence was to show that the plaintiffs had fraudulently attached the word "patent" to their ploughs. This the defendants urged with the intention of disentitling the plaintiffs from the relief which they might otherwise have obtained; but it was shown that the word had only been used on parts of ploughs which were the subject of a patent, and they were entitled to place the word on the shares, as Robert Ransome had, in 1803, received grants of letters patent for making cast iron chilled shares as now generally made. It was also argued on the part of the defendants that to grant the plaintiffs the relief they claimed would be to put a stop to the business of the defendants and other manufacturers who had for a long time been in the habit of doing that of which the plaintiffs complained In remarking upon this part of the defence, his lordship said:—"No doubt if this were the necessary effect of granting the relief sought it would deserve serious consideration, but there is really as little ground for this as for any other of the topics of the defence; for if it be true, as one of the defendants had said, that some farmers or purchasers of parts of ploughs prefer those made by the defendants to those of the plaintiffs, the defendants are not likely to lose such customers, while as to all the rest of the world they may make and sell as many parts of ploughs as they can, of such material and of such weight as they think fit, with no other restriction than that they must not for the future put upon their goods the marks by which the plaintiffs' manufacture is distinguished and known by the buyers."

The judgment in this case thus determines that any founders may make the wearing parts for the ploughs of any manufacturer, providing that such founders do not use the distinctive mark, letters, or combination of letters used by the manufacturer of the ploughs, and also, of course, provided that the parts are not the subject of an unexpired patent.

THE VENTILATION OF THE ST. GOTHARD TUNNEL.

WHILE the theoretical aspect of the problem of ventilating long tunnels has been fully investigated, there is little practical information on the subject extant; simply because the number of really long tunnels requiring special arrangements for ventilating them is comparatively few. The subject possesses a special interest just now while the Channel tunnel is under consideration. The St. Gothard tunnel, short as is the time during which it has been opened, supplies some of the practical information which is so much needed, and we may add that the results obtained are anything but encouraging for Sir Edward Watkin. M. Bridel, engineer-in-chief to the St. Gothard Railway Company, has just made public in the *Revue Générale des Chemins de fer*, a report on the working of the tunnel, to which we shall come in a moment; but in the first instance it will be well to refresh our readers' memory concerning the tunnel, and the railway of which it forms the most important part. There are no fewer than fifty tunnels on the St. Gothard Railway proper, some of them over 2000 yards long. The Oelberg tunnel is 6400ft. long. Between Erstfield and Gœschenen there are sixteen tunnels, 4⅓ miles in combined length, in a distance of twenty-eight miles. In the Wasen district the line rises 446ft. by means of three "spiral" tunnels — that is to say, curved tunnels — respectively 4800ft., 3375ft., and 3590ft. long. The radius of curvature is 1312ft., and the incline averages about 1 in 42. The great tunnel passes through the Alps between Gœschenen on the north and Airolo on the south. It serves to unite the railways of Upper Italy with those of Switzerland. Its total length is 9·2585 miles. The line rises to a summit level within the tunnel 190 yards long, which is about 360ft. above the level of the sea. It is 47·46 yards above Gœschenen, and 8·09 yards above Airolo. The northern gradient is at the rate of 1 in 172, and the southern at the rate of 1 in 1000. This system of construction was adopted for the sake of drainage, and the conditions are very similar to those which must obtain in the Channel tunnel, for the same reasons. The conditions are, however, unfavourable to ventilation.

Returning now to M. Bridel's report we find that the traffic through the tunnel is at present very small, because the lines giving access to it are not fully opened. It is worked at present by two 12-ton tank engines, intended ultimately to work the branch line from Cadenazzo to

Locarno, which is 7½ miles long and has a ruling gradient of 1 in 528. These two engines are found quite powerful enough for the work at present being done. They take four trains each way through the tunnel during each twenty-four hours, and the ventilation is found to be very good. M. Bridel estimates the number of travellers for January as 3277, for February as 4300, and for March as 9100, and that about thirty trains per day will traverse the tunnel, and he hopes that the work can be done without trouble by locomotives with large fire-boxes, to be well closed up during the time the tunnel is being run through. This seems to be hoping a great deal, for it is scarcely possible that an engine can haul a heavy passenger train for nine miles without drawing breath, if we may use the words. That M. Bridel is not too confident that he will realise his hopes is, however, proved by the fact that he is casting about for a substitute for the ordinary engine. He has tried a compressed air engine, the capacity of which was 7·6 cubic metres, while that of its tender was 18·15 cubic metres. The pressure was 180 lb. This sufficed to take a train of 50 tons a distance of but little over a mile. Here a reservoir was provided with a capacity of 60 cubic metres. The pressure was restored by drawing from this reservoir, and the engine then ran another mile, when a second reservoir permitted a total distance of about 6000 yards to be traversed. It is quite evident that such mechanism as this will not answer. A much higher pressure must be carried, but then the weight of the engine and its tender must be much increased. M. Bridel has practically rejected compressed air, and turned his attention to electricity. He has communicated with Messrs. Siemens, and after a long correspondence these gentlemen suggest the erection within the tunnel of a copper rod or rail about 1in. in diameter, on which shall run a little chariot, connected with the electrical motor carriage or dynamo engine. Through this copper rod a current is to be sent obtained from an installation of dynamos worked by turbines supplied with water by the mountain torrents. The rails will make the return circuit. The little chariot will, of course, be the contact maker on the positive side. The arrangement is, in short, very similar to that employed in the Berlin Electric Railway. Each dynamo engine is to be of about 100 indicated horse-power, and two, three, or more are to be attached to each train, as required. Messrs. Siemens believe that they can guarantee a return of 50 per cent. of the whole power expended in useful effect. The length in the tunnel is to be 15 kilos., or 9·3 miles, the copper rod is to weigh 4·25 kilos. per metre, and will cost, with its insulating supports, about 180,000f. In case the scheme does not succeed, the loss will amount to 80,000f. only, Messrs. Siemens, we presume, taking the plant off the hands of the railway company.

M. Bridel holds that the work can be carried on with ordinary locomotives until the system of haulage by electricity has been brought to perfection, or at least reduced into a thoroughly practical shape. In the tunnels to which we have already referred, the difficulty of providing ventilation will, it is stated, be even greater than in the long tunnel, because in them two engines must always be used, one at each end of the train, and the inclines being very heavy, the engines will be worked to full power. The drivers of the engines at the tail end of the trains will be worst off, and M. Bridel will adopt a plan in daily use on other continental lines, and fit his engines with reservoirs of pure air, from which the drivers and stokers will draw breath through flexible pipes and mouthpieces. M. Bridel states that in winter the tunnel is filled with a dense fog. The air entering at one opening and moving slowly through the tunnel at first becomes heated, but it rapidly cools down again as it nears the exit. Moisture is precipitated, as we have said, in the form of a dense cloud; and the fog, M. Bridel believes, will always be present in winter, no matter what mode of locomotion is provided.

Here, then, we find that in practice a tunnel of over nine miles long can be readily worked at the rate of four trains a day without any inconvenience, but when this number is increased to thirty trains per day the engineer-in-chief anticipates trouble. But thirty trains per day is little more than one per hour, and bearing in mind that the St. Gothard tunnel is not half the length of that to be made under the Channel, and that it is placed high up in the mountains, where strong breezes will blow across or into its mouths, so giving it a chance of being naturally ventilated, it will be seen that all the conditions are very much more favourable than those which can obtain in the case of the low-lying Channel tunnel. The experience acquired in the Mont Cenis tunnel again is very unfavourable. M. Kossuth, in the *Annales des Mines*, has published a long paper on the ventilation of this tunnel, in which he suggests the utilisation of the abundant water power in driving ventilating mechanism. M. Pessel's views on the subject we have referred to in our first impression for this year. On the Paris, Lyons, and Mediterranean Railway the ventilation in the long tunnels is so bad that the engines working in them are all fitted with Rouquairolle's air reservoir apparatus for the protection of the drivers and firemen. All the practical evidence to be obtained goes to the same point, namely, that the Channel tunnel could not possibly be worked with ordinary locomotives. But all the world knows that no attempt has been made to prove that other means of working it at moderate cost are ready to hand. The choice is limited; we have electricity and compressed air. While the work of boring is suspended in obedience to the wishes of Parliament, Sir Edward Watkin would do well to expend some of his surplus energy in explaining definitely how the line is to be worked if it should be made.

ESTIMATING THE WEIGHTS OF GIRDERS.

The estimation of the approximate weight of a framed structure from a strain diagram of the structure assumed in the first instance weightless, has occupied the attention of several authorities on bridge strains during the past few months, and since Mr. Am Ende's paper on the subject to which we referred in our impression of the 3rd of June, 1881, p. 411, Mr. Stoney has returned to the subject, and Mr. J. H. W. Buck has sent a short paper to the Institution of Civil Engineers, which has been printed with the papers that were not read. After reviewing the methods of Mr. W. Anderson, Professor Unwin, Mr. B. Baker, and Mr. B. B. Stoney, he comes to the conclusion that the formulæ proposed by either of these are very restricted in their scope. Instead, therefore, of offering formulæ for approximating in the first instance to the weight of a bridge for given work, and subsequently readjusting the weights and strains, he proposes a system by which during the process of designing the structure it may be given the necessary strength in its members by successive accretions. His formula is based upon the following considerations:—Let the fixed distributed load = W and W Q, the weight of a girder of the proposed type of the strength required to carry W, but not its own weight in addition. Making $a = W Q$, then the total weight of a girder to carry W and its own weight $= \frac{W a}{W - a}$. Now let b = the weight of the additional material necessary to enable the girder to carry the moving load, but not the weight b in addition, then $\frac{(W+b)\,a}{W-a}$ = the weight of a girder of the strength required to carry $W+b$ and its own weight in addition. The increment b, hitherto only considered as part of the fixed load, has now to be considered in respect of the moving load. The total weight thus becomes $\frac{W\,(a+b)}{W-a}$. Now, neglecting some of the steps, we have the following application when there is no moving load: (1) Find the dimensions of each part of a girder of the strength necessary to carry the fixed load W, but not its own weight in addition, and note the sectional area of each member. Let the weight of this girder $= a$. (2) Multiply the sectional area of each member by $\frac{W}{W-a}$. When there is a moving load or wind pressure acting longitudinally, as in the case of a roof principal of large dimensions:—(1) Find the dimensions as in the above case, including in a bridge its proportion of the floor, lateral bracing rails, &c. (2) Multiply the sectional area of each member by $\frac{W}{W-a}$. (3) Find the additional material required in each member to enable the girder to carry the moving load—in a roof to resist the action of the wind—and also in any new members which may be required for the same purpose, and note the sectional area of each member. Let the total weight of this additional material $= b$—not to be added. (4) Multiply the sectional area of every member, except the new ones, by $\frac{W+b}{W}$. (5) Add the additional material found in (3), assigning to each member the increment of sectional area due to it, and inserting the new members, if any. For small structures: (1) Find the dimensions of each part of a girder of the strength required to carry the moving load, but not its own weight in addition, and note the sectional area of each member. Let the weight of this girder $= b$—merely note this. (2) Find the dimensions of each part of a girder of the strength required to carry $W+b$, but not its own weight in addition. Let the weight of this girder $= c$. (3) Multiply the sectional area of each member as found in (2) by $\frac{W+b}{(W+b)-c}$. (4) Add the material found in (1), allotting to each member the increment of sectional area due to it. If (1) has more members than (2), insert the additional members.

NORTHERN MINERAL PROPERTIES.

The sale of the Rosedale estate, with its vast and valuable beds of minerals, is another indication of the revival of the mining and metallurgical industries of the North. After the briskness of eight years ago many of the companies that had been formed collapsed, and the works—mines, furnaces, and forges—stood idle for years. It is one of the greatest of the proofs of the revival that one by one these properties are now finding purchasers. During the last three weeks the commencement or sale of three such concerns has been reported—the sale of the West Hartlepool Blast Furnaces, the recommencement of the North Yorkshire Ironworks, and the sale now of the great mineral estate of Rosedale Abbey. Indeed, with perhaps three comparatively small exceptions, it may be said that the whole of the collapsed estates and works have found purchasers, and it is evident that they have been sold at prices that must make their profitable working much more sure than those prices at which nine years ago some of the companies purchased them. At the same time in many of these instances it will be a considerable period before the property an become productive, though there is no doubt that as the demand increases there will be preparations to make them increase the output of mineral and of metal. It remains to be seen how far that demand will rise, and how far the conditions of price will be altered so as to allow of the extension of the output. More and more the metal trades seem to be moving to the coast, and hence the mines, the furnaces, and the forges, which are on navigable waters or near them would seem to be likely to have a longer lease of prosperity than others. As prices rise, of course, furnaces that have been idle can be economically put into blast, but this is not in the immediate future a consideration that seems likely to much affect the output of the mines or the iron-producing establishments. But the North is increasingly becoming the great reservoir from which is drawn a very large proportion of the crude iron of the world, and hence its mineral and metallurgical properties will be increasingly esteemed as the years pass by. The mineral estates that have been yielding such very large outputs for the past thirty years must at least be approaching nearer exhaustion, and hence the probability is that the mines will be drawn more upon that are now opened out—mines such as those to the east of those earliest opened, as well as others such as Rosedale. It is true that in some of what are called old mines there is ironstone to yield years of output, but at the same time the fact that they are now considered old bespeaks the time when they will cease to produce, and gives to the mines that have long been idle a greater value because of the approaching need to draw upon their resources.

LITERATURE.

The Preservation of Life and Property from Fire. By J. H. Heathman. London: Simpkin, Marshall, and Co., 1882.

The author of this little volume has added another to the numerous branches of the engineering profession, namely, that of a "fire engineer." Most engineers of considerable experience in the construction of buildings would be considered competent to advise on the means to be adopted to prevent loss of life and property from fire, but Mr. Heathman's book shows that on this subject, as on others, the engineer who devotes his attention almost exclusively to one thing is very likely to acquire information and practical experience not to be obtained otherwise even by the most competent men. His book may be described as a collection of observations or hints on apparently every possible cause and means of preventing fire; the modes of extinguishing fire; and on the precautions which should be taken by engineers and architects, householders, and property owners, in order to prevent fires as far as possible, or to reduce the loss of life and property when fires do break out. It is thus a book which architects, engineers, and builders should read, in order that many of the hints which could be most inexpensively carried out when designing new buildings should be known to them, and which property owners and householders should read, so as to be conversant with the means of reducing fire risks. Section I. of the book is on "precautions to which attention should be given generally in order to reduce the risk of fire." Section II. is "concerning the preservation of life from fire, aiding endangered persons to escape from burning buildings." Section III. is on "the prevention of outbreaks of fire from resulting in extensive conflagrations." Section IV. contains "useful information concerning artificial illuminating agents and the action of heat." An appendix consists of a general code of instructions for the attention of *employés* in business and other premises, and a form page is given to be filled up by the owner of the book, with the addresses of the nearest fire-engine station, salvage corps station, fire escape, waterworks or turncock, chimney sweep, medical man, and hospital. Even this last is a useful part of the book, for as the binding is a bright red, and the title is printed in large letters on the back, it is a work easily to be distinguished from others, so that with this page well marked and properly filled up, loss of time in finding the required addresses in case of fire should be avoided. In the section dealing with the use of iron in the construction of buildings there is a collection of useful information or "reminders" which will, if acted upon, prevent anyone from using light iron joists, girders, or columns unprotected by plaster, brickwork, or concrete from the action of fire. It is often remarked that it is the fireproof buildings that are burnt to the ground, while those which do not pretend to be fireproof often come out of a fire with but comparatively small damage. This has arisen from the fact that comparatively little heating will so decrease the strength of insufficiently covered iron joists and beams or bressummers, that soon after a fire has fairly broken out the floors and other parts fall down. Some figures are given by the author showing the loss of transverse strength of cast and wrought iron when heated. Readers must observe that the temperatures are given in Centigrade degrees, which, perhaps, is a mistake, as many of those to whom the book appeals are not familiarly acquainted with this scale. It is also a mistake to say that wrought iron plates attain their maximum strength at 16 deg., while with wrought iron rods the temperature is 160 deg. without some qualification, for the statement is obviously untrue, unless the plates are subject to buckling strains and the rods to tension or direct compression. This happens to be generally the case in buildings, but it should be so stated, otherwise the remark is misleading. Another reason for the easy failure of modern so-called fire-proof buildings is the fact that so many of them are fitted with shafts for lifts, which act as furnace flues for rapidly heating the joists and other ironwork about them. Some useful remarks are made concerning these lift shafts and openings. The author seems to agree with Captain Shaw in his remarks concerning the use of timber and iron beams, and says that heavy timber, especially hard timber, is probably more trustworthy in case of fire than iron, unless the latter is well protected. Heavy wood beams are not easily ignited, and even when ignited take a long time to burn away so as to be dangerously weakened, especially if the wood is rendered incombustible by solutions, of which one and its application is described, while they are not injured by water as is cast iron.

The Naval Architects' and Shipbuilders' Pocket-book of Rules, Formulæ, and Tables. By Clement Mackrow, M.I.N.A. Second Edition. London: Crosby Lockwood and Co.

Molesworth's pocket-book of engineering formulæ is so well known that if we say that this new pocket-book is to the naval architect and shipbuilder what the former is to the engineer, we shall probably sufficiently indicate its character. In the first parts it is more of an educational or elementary character than Molesworth's book, and in the latter part it contains more special information for marine engineers, and tables of weights of materials as used in ships; and a useful vocabulary of technical terms used in shipbuilding in French and English. It is a book which represents an immense amount of labour, and will be of great service to engineers as well as those for whom it is particularly compiled.

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LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

(*Before Mr.* JUSTICE FRY.)

UNITED TELEPHONE COMPANY *v.* HARRISON.

THIS is an action brought by the United Telephone Company, Limited, against Messrs. Harrison, Cox-Walker, and Co., who carry on business as telegraph engineers and manufacturers at Darlington, to restrain them from infringing certain letters patent now belonging to the plaintiff company. The first of these patents is that granted to Wm. Morgan-Brown as a communication from Alex. Graham Bell, dated the 9th December, 1876, No. 4765. This patent was dealt with by disclaimer on 13th February, 1878, and as so amended claims as follows:—

(1) The method herein described of producing or transmitting musical notes by means of undulatory currents of electricity, whereby two or more telegraphic signals or messages can be transmitted simultaneously over a single circuit in the same or opposite directions.

(2) In a system of multiple telegraphy wherein undulatory currents of electricity are employed, the employment of receiving instruments, the armatures of which are tuned to definite pitches so as to vibrate only when a sound of like pitch is transmitted, substantially as described.

(3) A system of telegraphy in which the receiver is set in vibration by the employment of undulatory currents of electricity, substantially as set forth.

(4) The combination, substantially as set forth, of a permanent magnet or other body capable of inductive action with a closed circuit, so that the vibration of the one shall occasion electrical undulations in the other or in itself, and this I claim whether the permanent magnet be set in vibration in the neighbourhood of the conducting wire forming the circuit, or whether the conducting wire be set in vibration in the neighbourhood of the permanent magnet, or whether the conducting wire and the permanent magnet, both simultaneously, be set in vibration in each other's neighbourhood.

(5) The method of producing undulations in a continuous voltaic current by the vibration or motion of bodies capable of inductive action, or by the vibration or motion of the conducting wire itself in the neighbourhood of such bodies, as set forth.

(6) The method of producing undulations in a continuous voltaic circuit by gradually increasing and diminishing the resistance of the circuit, or by gradually increasing and diminishing the power of the battery, as set forth.

(7) The method of transmitting vocal or other sounds electrically by causing the intensity of an electrical current to vary in a manner proportional to the variations of density produced in the air by the said sounds.

(8) The method of transmitting vocal or other sounds electrically by causing the intensity and polarity of an electrical current to vary in a manner proportional to the velocity and the direction of motion of the particles of air during the production of the sounds.

(9) The union upon and by means of an electric circuit of two or more telephones constructed for operation substantially as described, so that if the plate armature of any one of the said instruments be moved in any manner the armatures of all the other telephones upon the same circuit will be moved in like manner, and if the transmitting armature be moved or vibrated by sound, like sounds will be produced by the motion or vibration of the armature of the other telephones upon the circuit.

(10) In a system of electric telegraph or telephony, consisting of transmitting and receiving instruments united upon an electric circuit, I claim the production in the armature of each receiving instrument of any given motion by subjecting said armature to an attraction varying in intensity, however such variation may be produced in the magnet, and hence I claim the production of any given sound or sounds from the armature of the receiving instrument by subjecting said armature to an attraction varying in intensity in such manner as to throw the armature into that form of vibration that characterises the given sound or sounds.

(11) The combination with an electro-magnet of a plate of iron or steel or other material capable of inductive action which can be thrown into vibration by the movement of surrounding air, or by the attraction of a magnet.

(12) In combination with a plate and electro-magnet, as before claimed, the means herein described or their mechanical equivalents of adjusting the relative position of the two, so that without touching they may be set as closely together as possible.

(13) In an electric telephone the combination with the plate of a magnet having coils upon the end or ends of the magnet nearest the plate, substantially as described.

(14) The combination with an electric telephone, such as described, of a sounding box, substantially as herein shown and set forth.

(15) In combination with an electric telephone, as herein described, the employment of a speaking or hearing tube for conveying sounds to or from the telephone, substantially as set forth.

(16) In an electric telephone the combination with a permanent magnet and plate armature of a soft iron pole-piece forming the core for the coil, substantially as described.

(17) In a system of telegraphy in which the vibrating receiver operates the circuit breaker of a local circuit independent of said receiver, as described, a vibratory circuit breaker for said local circuit, consisting of a light spring arm, whose free end overlaps the reed or vibrating portion of the receiver in combination with a portion of the receiver in combination with a contact tip or point in said circuit with which the spring arm makes and breaks contact, substantially as set forth.

(18) The autograph telegraph comprising the combination of a series of transmitters and transmitting bristles or wires, a single main wire receivers corresponding in number to the transmitters, tuned to a pitch to vibrate in unison with the succession of electric impulses transmitted from their respective transmitters, vibratory circuit-breakers, one for each receiver, and a local circuit and receiving bristle for each vibratory circuit-breaker, the series of bristles resting upon prepared paper, the whole for operation substantially as shown and described.

This patent was in 24th September, 1878, assigned to the Telephone Company, Limited, and the company in its turn on 11th August, 1880, assigned the patent to the United Company, the present plaintiff. The next patent sued upon is one dated the 30th July, 1877, No. 2909, granted to Thos. Alva Edison. This was also amended by disclaimer on the 9th February, 1880, and again on 23rd March, 1881. The patent was assigned to the Edison Telephone Company, Limited, on the 2nd August, 1879, and by that company to the plaintiff company on the 12th July, 1880. The claim of the inventor as set forth in the specification is "In an instrument for transmitting electric impulses by sound, the combination with a diaphragm or tympan of electric tension regulators, substantially as in the specification described; for varying the resistance in a closed circuit, substantially as set forth in the said specification."

The particular breaches complained of was the sale to the Lancashire and Yorkshire Railway Company of telephones, known as the Hunning's micro-telephone transmitters and magneto-electric receivers. The defendants by their defence dispute the validity of both patents, and in particular allege prior publication or anticipation, as to the former patent, by prior letters patent granted to C. F. Varley, 8th April, 1870, No. 1044; to E. Chabot, 4th May, 1876, No. 1874; to J. H. Johnson, 29th July, 1874, No. 2646, and 16th March, 1875, No. 974; to P. Jensen, 2nd September, 1874, No. 2999, and 29th February, 1876, No. 843; to A. G. Bell, in America, 7th March, 1876, No. 174,465, and published in this country before the date of Morgan-Brown's patent, by publication in the *English Mechanic,* of 11th August, 1876; *Nature,* of 14th September, 1876; in a paper on "Researches in Telephony," by A. G. Bell, published in the proceedings of the American Academy of Arts and Sciences, and circulated in London; in the *Telegraphic Journal* of 15th December, 1875, and 1st October, 1876; the *Scientific American,* of 9th September, 1876; in the *Zesitchift der Deutsch Telegraphen Vereins*; in the Report on the Philadelphia Exhibition for 1876, pages 130, 131; the *New York Tribune,* of 9th November, 1876; and by the use by Sir W. Thomson, at the meeting of the British Association in August, 1876; and as to Edison's patent by the above-mentioned instances, and also by the patent granted to Edison in America on 12th August, 1873, No. 141,777; in the *Philadelphia Press* of 9th July, 1877; in Moncel's "Exposé des Applications de l'Electricité," second edition, vol. i., p. 246; by the account of Reis's telephone, published in Ferguson's "Electricity," pp. 257, 258; by the patent No. 158,787, 19th January, 1875, granted in America to Edison; in Sprague's "Treatise on Electricity," at p. 104; and by the manufacture of Reis's telephone by Wm. Ladd in London.

The infringing telephones are alleged to infringe Bell's patent in respect of the receiver, and Edison's patent in respect of the transmitter.

Mr. Aston, Q.C., Mr. Webster, Q.C., Mr. Cozens Hardy, Q.C., and Mr. Moulton were for the plaintiff company, and Mr. J. Pearson, Q.C., Mr. Hemming, Q.C., and Mr. Goodeve, and Mr. Muirhead for the defendants.

The case was opened at considerable length by Mr. Aston, who gave an elaborate history of the invention, and is still proceeding, having reached the stage of the defendant's opening. We shall deal with the case more fully later on. For the present it will suffice to give a general outline of the evidence as given on behalf of the plaintiff company.

Sir FREDERICK BRAMWELL, the plaintiffs' first witness, stated that Bell's instrument works well in quiet places, with no great disturbing influence, at a distance of 300 or 400 yards. Edison's instrument supplements Bell's and adapts the principle of the microphone, and actually can make an instrument speak at a distance in a louder tone than it is spoken into. The electric phenomenon which Hughes in his microphone and Edison in his telephone have turned to account is that bodies which have feeble electric conducting power have sensibly increased or diminished conducting power according as they are more or less under pressure. The telephone which is for practical purposes found most efficient is one compounded of the Edison transmitter and the Bell receiver. The Edison transmitter has in the first place a "tympan," as he describes it, of mica, a non-conducting substance, which is mechanically connected with a stratum of lamp-black called a "tension regulator," which forms a portion of a closed galvanic current; thus, every vibration of the mica disc affects the pressure on the stratum of lamp-black and causes an undulatory alteration in the strength of the voltaic current, corresponding exactly to the air vibrations of speech in the same way as in Bell's instrument, only intensified. It will, no doubt, be contended by the defendants on the Edison part of the case that the Hunning transmitter, which they use, is not covered by Edison's specification in respect of the material used for the "tension regulator." In Hunning's transmitter the material used is fine coke in minute hard lumps; in Edison's instrument lamp-black is put in compressed into a lozenge. Upon the Bell part of the case, on the contrary, it would appear that the main defence relied upon is that by exhibiting an instrument given him by Bell—in its then state of development—at the meeting of the British Association at Glasgow in the autumn of 1876, and describing it in his inaugural address, Sir William Thompson published the invention so as to avoid a subsequent patent. In that instrument the receiver and transmitter differed from one another and from the interchangeable transmitter and receiver in their perfected form. The tympanum of the transmitter was a membrane of goldbeater's skin, with a piece of watch-spring attached to give magnetic action. In place of a tympanum at the receiving end was a metal disc, free except at one part; and the part of the invention now relied on as novel and useful is, in fact, the substitution for the membrane at one end and the free plate or "tongue" at the other. Sir F. Bramwell, Sir William Thomson, and Dr. Hopkinson, the plaintiff's witnesses, all say that the membranous tympanum was defective in being subject to the influence of moisture and temperature, and therefore requiring frequent adjustment, and that the free "tongue" was defective as having a period of vibration of its own which would give out a sound that would drown or interfere with the sound of the voice. The plaintiffs' witnesses point out that the systems alleged by the defendants to be anticipations all depend on what is called the "make" and "break" system, and are capable of transmitting pitch but not quality. A tune can be played on an instrument at the listener's end of the circuit by an operator at the other end; but they are incapable of transmitting articulate speech. Sir William Thomson, Dr. Hopkinson, F.R.S., Mr. Imray, Mr. Johnson (Mr. Edison's representative), and Mr. Holt (a formal witness) have also been examined.

SOCIETY OF ENGINEERS.

THE UTILISATION OF TIDAL ENERGY.

AT a meeting of the Society of Engineers, held on Monday evening last in the Society's hall, Victoria-street, Westminster, Mr. Jabez Church, president, in the chair, a paper was read on "The Utilisation of Tidal Energy," by Mr. Arthur Oates. The author commenced by stating that the recent great advance in the application of electricity to the storage and transmission of mechanical power has caused attention to be directed to economising our coal by the employment of some of the exhaustless sources of power with which nature has endowed us. The most important of these is the tide, especially to this country, with its extensive seaboard and comparatively trifling amount of inland water-power, and where the wind is proverbially variable, for on the tides we may rely for the supply of a vast and unfailing amount of energy through every season. After a few introductory remarks, the author stated that the power derivable from our tides is sufficient to render us independent of all other sources, but dismisses from consideration the great and extensive horizontal motions of tide water, as the vertical motions, or rise and fall, could be more economically utilised. He then proceeded to explain how the energy of the rise and fall over a given area is calculated, and gave a table which showed approximately the power and value of the tidal energy derivable from one square mile of sea at six different ranges, viz., every 5ft. from five to thirty, which will include most of those which occur on our coasts. The power given in the table is about 26 per cent. of the theoretical amount. The adoption of this proportion greatly simplifies the calculations, as it allows just a quarter of the theoretical energy of a lunar day to represent the amount obtainable in twenty-four hours. This percentage will probably be obtained in practice, as it will allow of nearly half the power being wasted by its storage and transmission, if the efficiency of the first motors be only 50 per cent. In the table the energy is expressed in horse-power and the figures represent that of a superficial mile; it increases as the square of the range, from 469 at 5ft., to 16,895 at a 30ft. range. The value of the power as given increases from £2345 to £84,475, reckoned at £5 per horse-power per annum, which sum the author believes could be realised by its sale, as it could be used continuously for that amount. The capital which could be profitably employed in utilising the power of a square mile, and the number of superficial yards of sea required to produce 1-horse power at the different ranges, are also given in the table. The means which could be employed in utilising the rise and fall of tides are almost innumerable. Of these the tidal dam seems the most likely to come into general practical use, therefore the rest of the paper was devoted to the consideration of it. It would consist of a dam or weir, constructed across the entrance of a tidal inlet, or in any position where it would enclose, or isolate, a portion of the sea, so as to exclude the tide water until near the time of high water, when its fall into the inclosure would be utilised by suitable machines, which, for a general term, are named the "motors." The water would then be retained by the dam in the enclosure until low water, when its fall out would be utilised in the same way. After a reference to the main features and requirements of tidal dams, the author said that the greatest difficulties connected with them would be the short time during which the motors could work if a large proportion of the energy had to be utilised, and their constantly decreasing power whilst doing so, owing to the decreasing head of water as the enclosure emptied or filled. The latter, however, is comparatively trifling, and could easily be met; but the former is more serious, as it would necessitate the employment of large accumulators to store the power required during the time the motors were at rest. Of course in practice it would not be necessary to limit the working of the motors to exactly the periods of high and low water, but if they were allowed to work an hour at these times, five-sixths of the energy would still have to be stored if required continuously. If at first only a small portion of the power derivable from an enclosure was required, the time of utilising could be greatly extended, so that little of the power would need storing; and as the demand for it increased, more capital could be sunk in the provision of motors and accumulators. Some sectional drawings were given to illustrate the nature of the proposed tidal dam, which could be constructed of iron, and consist of large vertical cylinders sunk into the sea bed, and reaching to low-water level; these would have openings at each side for the ingress and egress of the water, and contain the motors, on which it would act in its passage from one side of the dam to the other. Above the motor cylinders the dam would be hollow and watertight, and contain the dynamo or magneto-electric machines, and the accumulators to convert and store the power. Many varieties of motor could be employed. Two examples were given in illustration. Their shafts are vertical, and would work a horizontal shaft above, which would drive the generators; the decreasing power would be met by starting fresh motors or stopping some of the machines by an automatic contrivance for the purposes.

Only a brief reference was made to the arrangement of the electric machines and accumulators, as it was considered a distinct branch of the subject, which ought to be dealt with by those especially conversant with electrical science. A description was then given of how the tides could be utilised for other purposes than the generation of electricity, such as pumping a supply of sea-water to inland towns, and furnishing the power for draining or irrigating land. After describing the most important modifications of the tidal dam, and the probable effect it would have on the currents and sea bed in its neighbourhood, some of its structural details were considered, and the mode of constructing the class of dam illustrated described. The remainder of the paper dealt with the choice of a suitable location for a tidal dam, and described the qualifications which ought to be possessed by it, in order to render the works an engineering and a financial success. The range of the tide should be great, and the physical features at the site of the dam sufficiently favourable to render the works of small cost as compared with the value of the power obtainable. In order to ensure financial success, the dam should be made to yield a dividend in addition to that accruing from the sale or use of the power; for example, a road or railway could be carried across an inlet by it, or it could be made to serve as a pier or promenade. If across an estuary, it would improve the navigation of the river by maintaining it at high-water level a sufficient period to enable larger vessels to reach ports further inland than their draught would otherwise allow. By serving for some of these purposes in addition to its primary use—which would not be interfered with by them—the tidal dam could be made to prove a successful speculation, even if it failed to profitably utilise the tides; therefore it will be especially desirable to have the first dam favourably situated, so as to deservingly inspire the confidence of the capitalist. The author concluded by stating his belief that in future the design and construction of tide-utilising works will form an important branch of civil engineering, and that the utilisation of tidal energy will prove a remunerative field of investment to the capitalist, and a great economic gain to the countries employing it.

TENDERS.

SEWERAGE WORKS AT CHIPPING WYCOMBE, BUCKS.

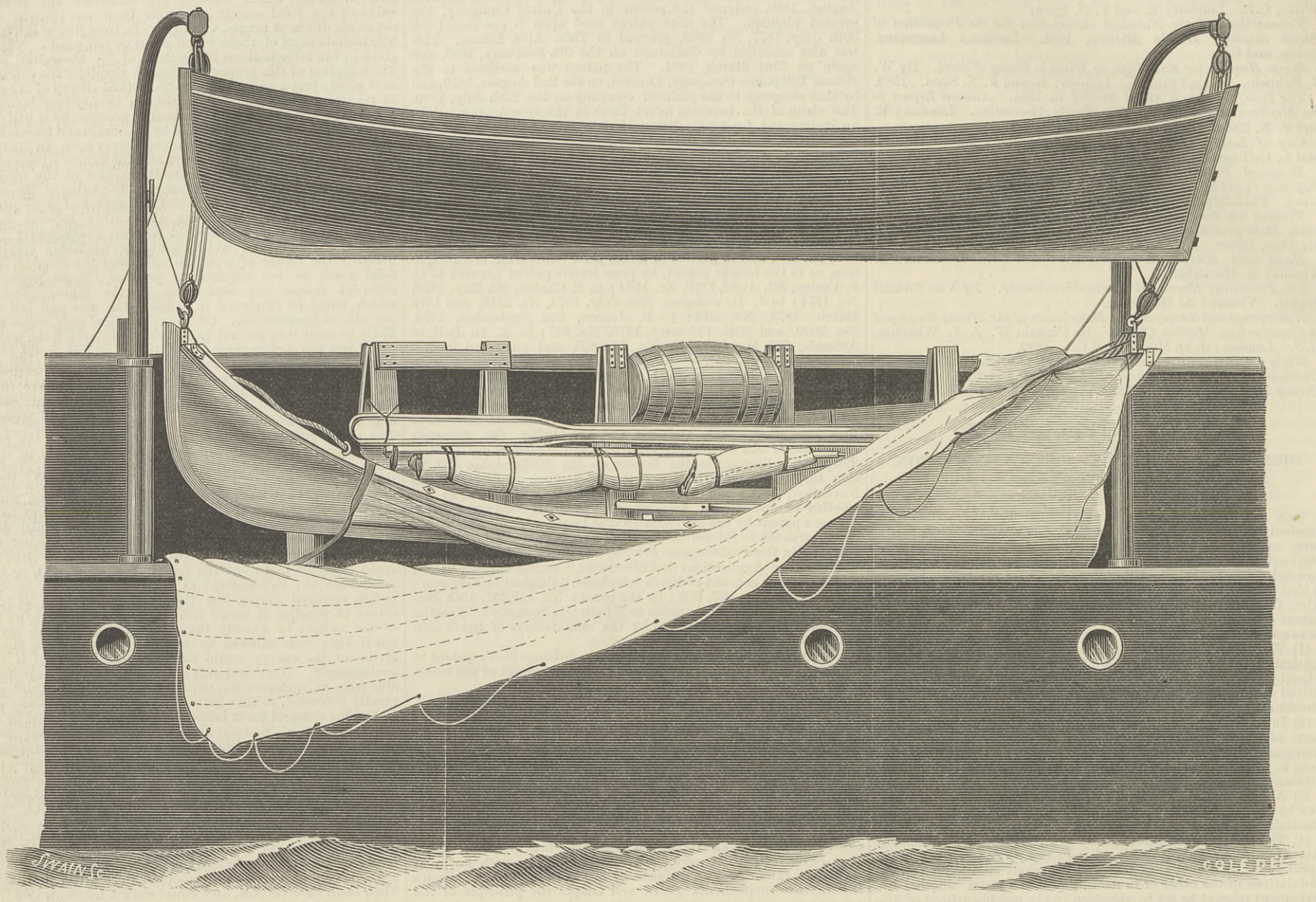
LIST of tenders for the construction of the works of sewerage and sewage disposal for the borough of Chipping Wycombe, Bucks. Mr. Baldwin Latham, C.E., F.G.S., engineer for the works.

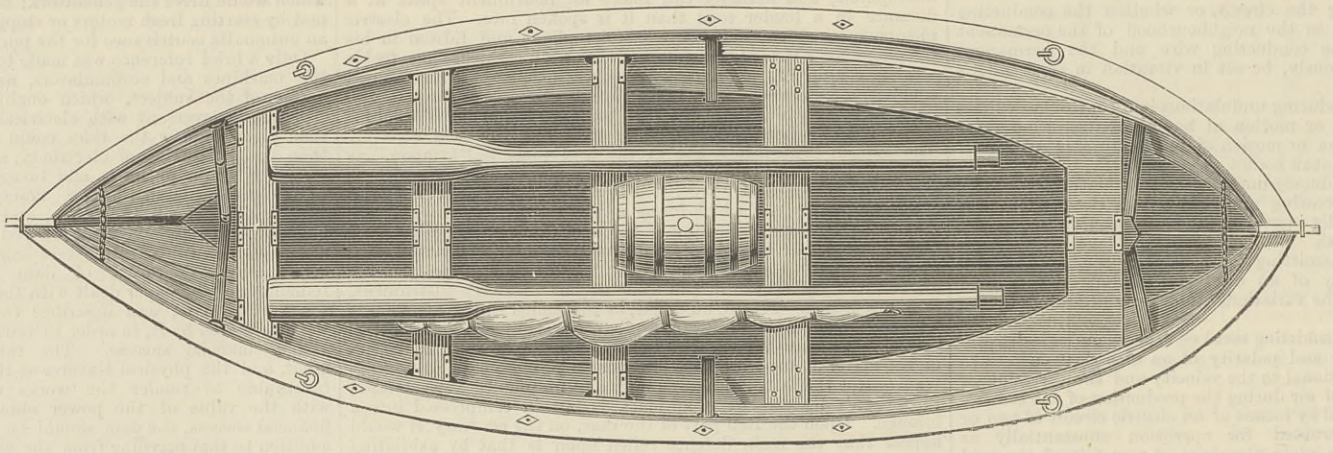
	£	s.	d.
1. North and Parry, Sleaford	34,749	0	0
2. J. Hoare and Sons, Blackfriars	29,959	2	3
3. George Law, Kidderminster	23,164	7	10
4. Lapish and Lutley, Gunnersbury	21,954	0	0
5. Kellett and Bentley, Queen Victoria-street, E.C.	21,454	13	0
6. J. Strachan and Co., Wood-green, N.	21,138	0	0
7. J. Simons, Sidcombe, Kent	20,265	10	6
8. Henry Sanders, Southampton	19,967	0	0
9. R. Hammond, Canonbury, N.	19,800	0	0
10. Ford and Everett, Westminster, S.W.	19,749	0	0
11. B. Cooke and Co., Battersea, S.W.	19,402	12	0
12. John Mackay, Hereford	18,633	3	1
13. J. Malland Smith, Westminster, S.W.	18,000	0	0
14. Carrall and Lewis, Birmingham	17,739	13	11
15. Hill Brothers, Beckenham	17,772	0	0
16. A. Palmer, Birmingham	17,281	4	4
17. Bottom Bros., Battersea, S.W.	17,257	0	0
18. Fotherby and Son, Burnley—accepted subject to inquiry	16,958	5	7

CORINTH CANAL.—The prospectus is issued of the Société Internationale du Canal Maritime de Corinthe, the capital being 30,000,000f. in shares of 500f. each. The company is formed for constructing a canal across the Isthmus of Corinth, thus effecting a very material shortening of the route from the Mediterranean and the Adriatic to Greece, Turkey, and the Black Sea ports.

COLLAPSIBLE BOAT FOR THE CAPE MAIL STEAMER SPARTAN.

CONSTRUCTED BY THE BERTHON BOAT COMPANY, ROMSEY, HAMPSHIRE.





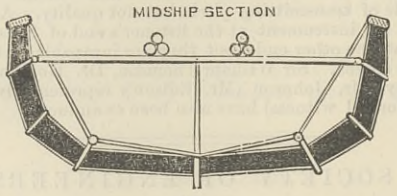
SHEER PLAN

NAVAL AND SUBMARINE EXHIBITION LECTURES.

THE BERTHON COLLAPSIBLE BOAT.

This boat was exhibited and described by its inventor, the Rev. E. L. Berthon, M.A., in a lecture delivered on Thursday evening, the 13th of April. The discourse was entitled "On the Supply of an Abundance of Lifeboats to the Royal Navy and Mercantile Marine." Mr. Berthon, in introducing the subject, remarked that his audience would agree that the subject which was intended to be illustrated most prominently at the present Naval Exhibition was the means of saving life at sea. He believed that every thinking person would be convinced that something more must be done than has at present been accomplished. In the last few years ocean navigation has gone on extending with rapid strides. Our ships are getting larger and larger, and the number of passengers which the ships carry is increasing in still greater proportion; but until recently it has been impossible to supply those ships with adequate life-saving apparatus in the shape of boats. Rafts, life-buoys, floating mattresses, and inflated necklaces, are very excellent articles, for they will sustain shipwrecked persons in the water, so that they may have a chance of being picked up; but they only serve as temporary refuges, and they may merely lead to a lingering death unless boats are at hand to take the people out of the water. What is needed is sufficient boat accommodation to save all hands on board. Two typical shipwrecks which occurred not many years ago, namely, those of the Northfleet and the Cospatrick, illustrate the great need which exists for more boat accommodation than is now provided. The Northfleet was an American ship of about 1000 tons, and her crew and passengers all told amounted to 496 persons; but she had boat accommodation for not much more than one quarter of that number. The Cospatrick was of about the same tonnage, and she also had about 500 persons on board. At the Board of Trade inquiries which followed the loss of these ships the owners were held perfectly harmless and exonerated from all blame, because it was discovered that the boat accommodation was up to the requirements of the Act of Parliament, that requirement being that a 1000 ton vessel should carry boats capable of holding 140 persons. On board the Northfleet the boats were so crowded when the order was given to lower them that the davits were actually bent down with the weight of the people. Nearly all the people on board the Northfleet perished through an insufficiency of boats. The Cospatrick took fire in smooth water and fine weather, about 180 miles from the coast of Africa. The crew—44 in number—did all they could to extinguish the flames. After the fire had burst through the deck, and had even caught the rigging, the chief officer said to the commander, Captain Elsey, "Shall I put out the boats?" "No," replied the captain, "put out the fire." Some very ill-natured comments were made by the press upon this utterance of the captain, but perhaps the captain did quite right. There were on board more than 440 men, women, and children, and if the crew had been taken from their fire duty to lower the boats those boats would have been swamped by the people jumping into them. Only one boat left the ship, and that contained thirty-one persons. This boat was picked up, after thirteen days, with only three survivors. If there had been boats enough to hold all the people on board the captain's order would have been very different. If it was known that the boat accommodation on board a vessel was sufficient, discipline could be maintained, and the passengers could be got into the boats without confusion. So long as the law remains

MIDSHIP SECTION



as it is with regard to the proportion of boat accommodation to be carried by passenger ships, so long will the present awful deficiency of boats and the terrible risk of life continue. Emigrants are leaving our shores at the rate of about 280,000 a year, and at one time the number reached 1000 persons every day. The ships of all our large steam companies carry admirable boats so far as the boats themselves are concerned, but they are not sufficient in number to save a quarter of the people on board. Even small boats will live in a rough sea if they are properly managed. In the wreck of the London, a dingy 14ft. long, under clever management, was the means of saving fourteen people. One of the Berthon boats being exhibited in the Hall had been carried by the Spartan, one of the Union Steamship Company's vessels, and had done admirable work in Algoa Bay. She had been used to keep up communication with the shore, and had stood up to her canvas and taken the sea in a most remarkable way, while other boats were almost swamped. The Berthon boat, when folded up, occupies about one-fifth or one-sixth of the space occupied by an ordinary wooden boat. The ribs are of wood, and run longitudinally instead of transversely, and are jointed at the stem and the stern, and the space between the ribs is filled up with canvas instead of planking. A second layer of canvas is placed inside, and thus there is formed a boat within a boat. This arrangement also divides the whole of the body of the boat into compartments, the number of which corresponds with the number of the spaces between the adjacent timbers. The timbers stand out in radiating planes when the boat is open, and lie down in vertical planes when the boat is shut. The shut boat occupies only one-sixth of the open width. As soon as the weight is brought on to the spans the boat opens of its own accord. A Berthon boat will stand an amount of knocking about which would be sufficient to destroy a boat of ordinary construction. The gunwales and all the timbers are formed of a highly elastic and very expensive kind of wood. This material is cut into strips and steamed, and then bent in moulds and rivetted with copper rivets; and thus a complete bow is formed. The boats are provided with good keels and good bilge keels, and if they strike the ground they escape without damage, for although they are made of canvas, they are not flimsy. A sharp stone may cut a hole in the canvas, but even in this case the boat does not go down, for the shell is divided into eight compartments, and the entry of water is restricted to the wounded compartment. A large boat, capable of holding forty men, had been cast off and lowered at sea by two men in 1 min. 20 sec. The lecturer had no doubt that with a proper crew the operation could be performed in half that time. One of the Berthon boats was put on board the Teuton on the very morning that she sailed on her last voyage. The Teuton was wrecked off the southern coast of Africa, about forty-five miles from the Cape, and a statement has gone abroad that the Berthon boat failed on that occasion; but this statement is altogether erroneous, for the fact is that no attempt was made to open the boat, and much less to lower it. It went down bodily with the ship. The lecturer was led to the invention of this boat many years ago by an accident which occurred in connection with the loss of the Orion in the year 1849. Within a fortnight after its construction he submitted a model to the Admiralty Superintendent at Portsmouth, and it was reported upon in the most favourable manner. One of those boats capable of holding 350 men was supplied to the unfortunate Great Eastern, but no ship in the world would require a boat of that size now. The shipowning interest had been opposed to the introduction of the folding boat, not because they were afraid of the expense which would be entailed by the adoption of it, but because in the present

state of the law shipowners were practically irresponsible for loss of life by shipwreck if they carried the number of boats at present prescribed by Act of Parliament. If it were demonstrated that by the adoption of the Berthon boat passenger ships would be able to carry a sufficient number of boats to hold all the people on board, the blame would be upon shipowners in the event of loss of life being occasioned through a deficiency of boats. Nothing will bring about a change in this respect but a change in the law. That noble pattern of humanity, Admiral Sir William Mends, had said that he never saw a troopship go to sea without a sigh and a pang, for, while there might be two thousand men, women, and children on board, the vessel could only carry fourteen boats, and these would carry only 550 people. During the last five years all the troopships have carried a sufficient number of Berthon boats for 600 men, besides the usual supply of boats of the ordinary character. He hopes the time is not far distant when all passenger ships will be required to carry adequate boat accommodation for all persons on board. The Berthon boats are made in all forms and in all sizes, and are constructed for pleasure purposes as well as for the saving of life. They have been adapted to the saving of the lives of crews engaged in the most dangerous of all possible expeditions—namely, torpedo craft service. At the instance of Admiral Ryder, Mr. Berthon has devised a form of boat suitable for this purpose, and in consequence of the limited space available for storage these boats are made in halves, the division being transverse. All the torpedo boats belonging to England are now furnished with this form of divided boat, and the French Government, the Italian Government, and two or three others have followed suit. Only on the day of the lecture he received an order from the Greek Government to supply twenty-one of the boats for the torpedo craft in the Piræus, and several have been ordered for the Chinese. A large boat 31ft. by 8ft. 3in., in three parts, so as to be stowed between decks out of the reach of an enemy's shot, is carried by H.M.S. Inflexible. This boat is remarkable for its carrying power, as well as its excellent sea-going qualities, and stands up well under an amount of sail that would be dangerous in common boats. Our engravings show the boat of the Spartan stowed against the ship's side with sails, oars, and water breakers. The boat is also shown opened at the ends of the davits and ready for launching. When stowed it is covered by a tarpaulin—shown partly cut off—and occupies a space only some inches thick. The remaining engravings are a sheer plan and cross section. Our engravings were sketched from the boat as exhibited, combined with a wooden structure representing a portion of the Spartan's side.

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

(*From our own Correspondent.*)

THE mills and forges are still insufficiently supplied with orders, yet merchants are offering some good parcels for export. The descriptions mostly needed are hoops, bars, and sheets, and the markets from which the demand is coming are Australia and New Zealand, South America, India, and some parts of the Continent, particularly Russia, Italy, and Spain. The work booked this week on the Wolverhampton and Birmingham Exchanges has included orders such as these, but the contracts accepted have not been so numerous as would have been the case if prices had been more favourable to makers. It is this matter of price which is the chief drawback in trade at the present time.

Medium and common bar makers are fairly actively employed, but the "list" houses complain; £7 to £6 15s. may be said to be the price for medium bars, and £6 7s. 6d. and slightly less for common sorts. The list prices for plating bars are :—Ordinary, £8: best, £9 10s.; and best turning bars, £11 per ton. In actual business, however, these prices are scarcely being realised.

Iron of engineers' sections, such as T and rivet iron, is in fair demand. Ordinary qualities of T iron are priced at £7 15s. to £8, while "marked" sorts are £8 10s. to £9 10s. per ton. Rivet iron of ordinary descriptions is quoted at £8 to £8 10s., "marked" at £9 to £9 10s., and best best at £9 15s. to £10.

The Buenos Ayres hoop makers reported this afternoou they are making some good shipments, as also to Australia and to certain parts of Europe Inquiries from the United States are not, however, coming forward with much vigour. Prices remain at £7 to £6 17s. 6d., with business occasionally done at less.

The arrangements in the steel trade for restricting production do not progress rapidly. In consequence of the large number of the makers a not inconsiderable difficulty is experienced in arriving at anything like a unanimous conclusion, and the scheme which was to come into force this week is still officially postponed. A further special meeting was, however, held this afternoon, at which action was taken which will bring the desired end more nearly to conclusion. Sheets of a maximum of 24 w.g. were £8 15s. and upwards, and of maximum 27 w.g. £9 15s. upwards.

Thin—stamping—sheet makers reported a steady business at satisfactory prices. "Severn" singles were quoted at £12 per ton, while the best singles of the same firm—E. P. and W. Baldwin—were quoted at £13, and their double best £14 per ton. Charcoal sheets rolled by the well-known firm of E. T. Wright and Sons, of the Monmoor Works, were quoted £16 10s. to £17, while best charcoal sheets—Wm. Barrows and Sons—were £19 5s.

Tin-plate makers reported that alike the Australian and the United States' demand was quieter, yet that for the present their mills were steadily occupied alike for the markets just named and for the Continent. Prices of East Worcestershire makes remained officially at 23s. per box for charcoals and 21s. and 22s. for coke sorts, but these rates were not obtainable, and in actual transactions prices had to be regulated by the nature of the specification, &c. Makers hereabout do not seem to expect that any very definite strengthening of prices will result from the restriction policy of the Welsh makers; still they are hopeful upon the matter.

Pigs showed a little revival in a few makes. Makers who were last week unable to effect sales reported transactions this week. The "Willingsworth" part-mine pigs changed hands at 47s. 6d.; cinder pigs were 37s. 6d. to 40s. The drop in one of the leading brands of all-mines, announced last week, has virtually brought down other best native makers to the same level, namely, 67s. 6d. and occasionally 65s. per ton. Hematites of Barrow and Welsh makes are priced at 67s. 6d. delivered here. Wellingborough (Northampton) pigs are quoted at 52s. 6d. delivered, but the figure is beyond the market by quite 2s. 6d. per ton.

In Wolverhampton and Birmingham ironmasters and consumers were hampered by the wages' complication in the North of England. Twice the Staffordshire ironworkers have broken the sliding scale agreement when it suited them. Under the circumstances the conviction throughout the trade is that it will be unsafe to conclude that any other decision than that which may follow upon the further revolt against the Conciliation Board in the North will have to regulate the wages arrangement throughout the Midland iron centres. Prices would have been weaker than they were both to-day and yesterday but for this uncertainty.

The recent revolt is for the present overlooked by the employers, and there is a disposition to give the men another opportunity of being faithful to their agreements. Under these circumstances Mr. R. Chamberlain's consent to act again as arbitrator to the board would be welcomed by masters as well as by men. The question to be submitted to the new arbitrator would relate to the application of the men, preferred at last Thursday's meeting, that there should be a new wages basis, starting with a rise of sixpence per ton to puddlers. This it was proposed to bring about by making the sum, plus the average price of bars, one shilling instead of, as at present, sixpence.

The difficulty in holding the men to their agreements is leaving matters hardly more settled than they were before the Wages Board was formed, and it is sadly hampering business. Customers are complaining of the strike conditions which it is again necessary to insert into contracts, and they talk of seeking to place with Belgian firms orders embracing considerable lots.

The wages troubles are giving zest to the experiments which are being made with the view of using Staffordshire common pigs in the making of steel by the basic Bessemer method. The statement of Messrs. Thomas and Gilchrist before the Society of Arts—that up to the stage of the puddled bar the metal can be produced at much under the cost of iron in that partially manufactured state, and that in the subsequent stages there would be a reduction of 7s. per ton; at the same time that the metal is equally malleable and equally weldable with the product of the old iron forge—has already checked enterprises aiming at an extension of forge power in this part of the kingdom.

Progress continues to be made in the effort which is being put forth in the north and south Staffordshire at the present time to nduce the ironworkers to join in the insurance scheme put forth by the Employers' Liability Assurance Corporation (Limited).

There is no falling off in the excellence of the prospects of full work at the heavy cable and anchor works in the Brierley Hill district.

At the South Staffordshire Mines Drainage Commissioners' meeting in Wolverhampton on Wednesday it was stated that the Bill for obtaining increased rating powers by the Commissioners would be considered by a Select Committee of the House of Lords on the 5th inst. The members of the Commission representing the Earl of Dudley and the Patent Shaft and Axletree Company expressed their unwillingness to carry their opposition into the House if an amicable settlement could be come to. A consultative meeting was therefore arranged, in the hope that a compromise may be effected.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—The iron trade of this district continues exceedingly dull. At Manchester on Tuesday there was an extremely quiet market, and 46s. per ton, less 2½, is now about the average price asked for both forge and foundry qualities delivered equal to Manchester; but even this low figure does not attract buyers. A few small sales were reported in Lincolnshire and Derbyshire irons at about 46s. 6d. to 47s. per ton, less 2½, delivered here, which, so far as Derbyshire iron is concerned, represents a drop of about 1s. per ton upon recent quotations. District brands are, however, competing with the local makes at lower figures than the above. Middlesbrough iron was nominally quoted at about 51s. per ton net cash delivered equal to Manchester.

In the finished iron trade makers are working for the most part on old contracts, and in some cases, where they have still fairly good deliveries to make, they are holding out for £6 15s. per ton for bars delivered into the Manchester district. Specifications, however, are not coming in very freely, and with an absence also of new orders prices are decidedly easier, and local bars can be bought as low as £6 10s., with hoops at £6 15s. to £6 17s. 6d., and good Staffordshire plates at £8 7s. 6d. to £8 10s. per ton delivered equal to Manchester.

I hear that engineers in this district have in some cases recently been securing tolerably good orders, and generally sufficient new work continues coming in to keep this branch of trade well employed.

Messrs. Richmond and Chandler, agricultural engineers of Manchester, are erecting large new works from the designs of Messrs. Corbett and Sons, which works will have a floor area of about 8000 square yards, and occupy a site covering about 3300 yards. The works do not include any foundry, and are simply for putting together and finishing the various implements manufactured by the firm, together with show rooms.

The London and North Western Railway Company has erected at its Crewe works a large new foundry, which is to be opened this month with a great demonstration. This foundry will be fitted up with two of the improved cranes manufactured by Messrs. Craven Bros., of Manchester, a description of which I gave in my notes on a visit to their works recently.

At the pit's mouth the average prices of coal are about 8s. to 8s. 6d. for best coals, 6s. 6d. to 7s. for seconds, 5s. 6d. to 5s. 9d. for common house coals, 4s. 9d. to 5s. 3d. for steam and forge coals, 4s. 6d. to 4s. 9d. for burgy, 3s. 9d. to 4s. 3d. for best slack, and 3s. to 3s. 6d. for ordinary qualities.

Barrow.—Pig iron, I notice, this week is in very quiet demand, and so far as new business is concerned I am informed that it is practically at a standstill. Makers, however, have sufficient work for some months to come, and consequently are not at present suffering from the above-named cause. Furnaces, as I am informed, maintain their yield, the output being large, and there are very heavy deliveries both by rail and sea. There has been a considerable increase in the amount of exports during the last few weeks, and from the information I have gained I have reason to know that large parcels for early shipment to America and other places are being prepared. The prices are not quite so good, No. 1 Bessemer being 54s. 6d.; No. 2, 53s. 6d.; and No. 3, 52s. 6d. per ton at works net or f.o.b. at the ports on the west coast, with a three months' delivery.

In the steel trade I have not heard of new orders being booked of any extent, but there is nevertheless a brisk employment. The prices show a depreciation this week of 2s. 6d. a ton, average samples being quoted at £5 17s. 6d. net. Several new orders have come to hand in the shipbuilding trade which have imparted a new life to this industry; and boiler-making, engineering, and foundry branches are also participating in the improvement. There is a quiet demand for iron ore at from 13s. 6d. to 15s. per ton, and there appears to be a good business being done in the export of foreign ore. A busy employment is noted amongst railway rolling stock makers, and the traffic is very brisk on the railways. There is a very good demand for coal and coke for manufacturing purposes.

The tin-plate works belonging to Messrs. W. Griffiths, of Workington, have again been stopped, and there is no prospect of their being started again for some time to come.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

THE battle between the ironmasters and the "bears" which still proceeds, and the strike of the ironworkers against the award of Sir J. W. Pease, were the two great topics of conversation at the Cleveland iron market held at Middlesbrough on Tuesday last. The market was remarkably well attended, and the tone thereof might be characterised as animated.

Notwithstanding the strike, which must have the effect of throwing a quantity of pig iron on to the market, and of relieving the pressure of consumers for immediate delivery, the "bears" seem to be getting more and more pushed into a corner. Their great resource, namely, frightening warrant holders, seems to be altogether failing them. The latter now believe in the ultimate victory of the ironmasters, and are refusing to sell at low prices; consequently the "bears" have been forced to come to the ironmasters terms in many instances, in order to keep their customers going. The ice once broken, they are getting used to adopt the course which previously they strenuously resisted. Consumers are complaining loudly of the difficulty they have in obtaining deliveries from merchants; at least they did so up to the end of last week. Now they have ceased to press until the termination of the strike enables them to set their works going once more. The offers made by "bears," of which so much was heard a few weeks since, for delivery over the third and fourth quarters at low prices, seem now to have ceased. Makers adhere to their previous price of 43s. 6d. for prompt delivery for No. 3 g.m.b. Those within and those without the combination are equally firm. Merchants' prices may be considered to be 43s., and warrant holders are asking the same as merchants. There are, however, very few of the latter who do not wish to keep what they hold for the present, and until they can realise higher prices.

The stock of iron in Connal's warrant store is now 147,249 tons, which is 1693 tons less than a week ago.

The shipments for April have been published. As to pig iron, 38,734 tons were sent away to foreign countries, and 30,175 tons to ports within this country, making a total of 68,909 tons shipped altogether. Of manufactured iron and steel, 14,358 tons went abroad, and 11,171 tons to home ports, making a total of 25,529 tons. These figures show a decrease of 20,928 tons of pig iron, and 4517 tons of manufactured iron and steel on the previous month part of which is accounted for by there being one day less, and part is due to the Easter holidays.

The manufactured iron trade is at a complete standstill owing to the strike, which has before been alluded to. On Friday last the Board of Arbitration sat at Darlington, and received and adopted by a large majority, including both employers and operatives, the recommendations of the joint committee which had been appointed some days before to consider the question of puddlers' extras. The report referred to made some very distinct concessions to the workmen. It had been ascertained that the extras paid throughout the district amounted on an average to about 1s. 5d. per ton on puddled bar made, and it was now recommended that allowances, though in a somewhat new form, should be made which would amount to about 2s. per ton. The realisation of this amount was, however, made to depend partly on the steady working of puddlers and underhands every day during the week. Notwithstanding the adoption of this scale of extras by the Board of Arbitration, the ironworkers all over the North of England seem to have rejected it at once and to have determined to resist it to the utmost. As far as their views can be learnt, this extraordinary and apparently unreasonable action is to be explained as follows :—The employers and also the workmen's union officials, and the more reasonable delegates desire to make extras proportional to steadiness, and so encourage industry and large production. The ironworkers, however, desire to give equal benefits to unsteady workmen, and say that the tendency of any scale should be to facilitate restriction of make and small productions. They declare they would rather be idle on Monday than work at any price, in order that less puddled bars may be made, and that the demand for their labour may consequently increase. Their motto is, "less work and more pay." Under these circumstances, and whilst Sir J. W. Pease's award was still not forthcoming, the ironworkers held meetings, and pretty generally decided to strike. On Monday, May 1st, the award was published, and added fuel to the flames. It commenced by a long review of the facts submitted for the consideration of the arbitrator, and then proceeded to award :—(1) That no advance be given on the past quarter; (2) that no advance be given upon the current quarter; (3) that an advance of 2½ per cent. be given on the first half of the following quarter, and 5 per cent. on the second half thereof; and (4) that the special claim of the higher paid workmen for a 7½ per cent. advance be not entertained. The operatives professed to be bitterly disappointed with this award. They struck work immediately throughout the whole of the North of England, and began to relieve their feelings by holding meetings. At these they denounced the award, the arbitrator, and some of their own officials, and called for a new arbitrator and a new award; and determined not to go to work until this new award was known and found to be palatable to them. On Monday night work was, however, resumed at the Skerne Ironworks and Messrs. Fry, Janson, and Co.'s, Darlington, where it has not been the custom for a long time to work on Mondays, and therefore the Monday, working question was not to the front. On Wednesday morning the workmen at Consett resumed work on the terms of the award, and of puddlers the new scale of extras, but they demand a reconsideration of the whole question by the Board, and threaten to withdraw from the latter if this request was not entertained. The remaining works were still on strike on Wednesday morning without any prospect of recommencing. Meanwhile the iron manufacturers seem to have come to the conclusion that the Board of Arbitration is a farce, and the time and labour they are continually expending over it is entirely thrown away. They are therefore reorganising and strengthening their association or union. It is understood that as reconstituted it will include almost every manufacturer in the North of England, and that a large sum will be at once subscribed to be utilised in resisting unreasonable claims, or in compensating any of the members who may be victimised or otherwise unfairly dealt with by their workmen. It seems to be quite clear that the Board of Arbitration is powerless to enforce its own decisions, and has fallen into contempt on both sides. The next thing will therefore be to see what can be done by a powerful and wealthy combination.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

MR. W. S. DAVY, chairman—and joint-managing director with Mr. David Davy—of Messrs. Davy Bros., Limited, engineers, Park Ironworks, Sheffield, has resigned his position to become the general manager of the Barrow Hematite Iron and Steel Company, Limited. The post was vacant by a readjustment of offices, which enables Mr. Josiah Smith, the late general manager, to devote his attention to other important duties. The salary is to be £3500 a year. At Messrs. Davy Brothers, Mr. David Davy, I understand, will succeed to the vacant chairmanship.

Messrs. John Brown and Co., of the Atlas Works, and Messrs. Charles Cammell and Co., of the Cyclops Works, have received, in addition to the order from the Dutch Government noticed last week, an extensive order from the Italian Government for their new war-ship the Italia, which is to be armoured with 19in. of steel-faced plates on the "Ellis" and "Wilson" systems. Test plates for the Italia were being made at both establishments, and it was anticipated that the plates would be tried against the 100-ton gun at Spezzia. The Italian Government, however, have resolved to proceed with the completion of the Italia without further delay. The order is for about 1800 tons, divided between the two companies.

Messrs. Joseph Rogers and Son, Limited, the well-known cutlery manufacturers, have established a manufactory in Pond-street on a most extensive scale, for the production of machine-made table knives, to compete with the American machine-made goods.

In the market the rapid advances in the value of ivory are causing some uneasiness. At the last quarterly sale, which closed on the 28th ult., there were only 81 tons offered—including 10 tons withdrawn from previous auctions—as against 122 tons offered in April, 1881. The falling-off was mainly owing to the continued scarcity of Cape—only 1½ tons—and the limited supply of West Coast African—11 tons. From Zanzibar and Bombay there were 33 tons, 24 tons from Alexandria, and 9 tons from Malta. All descriptions, except for billiard ball purposes, have gone up from £3 to £4 per cwt., and the ivory cutters have resolved for the second time this year to raise their prices. The stores in the docks this year amount to 133 tons, compared with 213 tons for the corresponding period of last year. Mr. W. Wostenholm, Holly-street, Sheffield, has just had invoiced to him no fewer than 522 tusks, which he says will all be cleared out in a fortnight. These tusks represent 276 elephants, and if one ivory cutter alone can get through so many in so short a time, there is some fear of the elephant being relegated to the lost species of animals.

I notice from a South American paper that Messrs. Ward and Payne's exhibit of edge tools, sheep shears, &c., at the Buenos Ayres Exhibition is spoken of as one of the finest displays in the whole building.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

The Glasgow iron market became steady towards the close of the past week, and as No. 3 special brands had become somewhat scarce, the prices of that class of iron began to strengthen. In the beginning of the present week the feeling in the market was also strong, in consequence chiefly of the very heavy shipments then reported, these having exceeded 18,000 tons for the week, as compared with 14,000 in the preceding week, and 13,000 in the corresponding week of last year. To date the shipments since Christmas are fully 30,000 tons more than they were at the same time last year. Business with Canada has within the past week or two very materially improved, and while America is dull, the orders from the Continent are of greater importance. At the moment it is somewhat difficult to forecast the course of the market, seeing that while the facts mentioned, as well as others that might be referred to, are favourable to an upward turn in the quotations, the stocks of Scotch pig iron are still increasing at the rate of upwards of 2000 tons per week. If the wages dispute in Cleveland were likely to be of any duration, there is no doubt that it would indirectly affect our market and improve the value of iron; but it is not likely that this quarrel will be prolonged.

Business was done in the warrant market on Friday morning at from 47s. 2d. to 47s. 4d. cash, and 47s. 4½d. to 47s. 6d. one month; the afternoon quotations being 47s. 3½d. cash, and 47s. 8d. eight days. Monday being a bank holiday, no market was held. On Tuesday the tone of business was strong, with transactions in the morning at 47s. 6d. to 47s. 7½d. cash, and 47s. 9d. to 47s. 10d. one month; the market being rather quieter in the afternoon at 47s. 6½d. to 47s. 3d. cash. Yesterday business was done at 47s. 2d. to 47s. 5½d., and 47s. 8d. one month. To-day—Thursday—business done at 47s. 3½d. cash to 47s. 7½d. one month.

Certain qualities of makers' iron being scarce, as above stated, and the shipping trade being very heavy, the quotations are to some extent improved, and are now as follow:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 58s. 6d.; No. 3, 53s. 6d.; Coltness, 59s. and 54s. 6d.; Langloan, 59s. and 54s.; Summerlee, 57s. and 49s. 6d.; Calder, 57s. and 50s.; Carnbroe, 51s. 6d. and 48s.; Clyde, 51s. 6d. and 49s.; Monkland and Quarter, each 48s. 6d. and 46s. 6d.; Govan at Broomielaw, 49s. and 47s.; Shotts at Leith, 58s. 6d. and 54s. 6d.; Carron at Grangemouth, 49s. 6d., specially selected, 52s., and 48s. 6d.; Kinneil at Bo'ness, 48s. 6d. and 46s. 6d.; Glengarnock at Ardrossan, 51s. 6d. and 48s. 6d.; Eglinton, 48s. 6d. and 46s. 6d.; Dalmellington, 48s. 6d. and 47s.

There is no improvement so far as can be ascertained in the condition of the malleable iron trade.

The coal trade continues very active, a large amount of business being done.

The Fife and Clackmannan Miners' Association has resolved that from this week the men will begin to restrict their work to five days per week of eight hours each.

The West of Scotland Gas Managers' Association has held its tenth annual meeting at Dumbarton under the presidency of Mr. Samuel Dalzell. A number of interesting papers was read, and discussions took place on the illuminating power of gas, the general opinion seeming to be that in Scotland the standard of illumination should not be less than twenty-five candles.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

The prominent feature of the past week has been the sliding scale discussion. Messrs. Burnyeat Brown and Co., of the Aberghorki Collieries, are expected to follow in the track of the Ocean Collieries. There was an important meeting held on Saturday last at Cardiff, in order to revise the scale of the Associated Masters, Mr. W. T. Lewis in the chair. It appeared, however, that the house-coal men dissent from being bound by a scale which affects also the steam-coal men, and for the present the movement is in abeyance.

There is a partial strike at Dowlais amongst the men of the Goal Mill, and it is stated that the rail straighteners of these works and the neighbouring works are acting together to get an advance of wages.

There is not so good a demand for steel rails. Business in fact in most branches of iron and steel has fallen away a little, and in consequence several planned re-starts are again hanging fire. With respect to the management of Dowlais, Mr. Martin will shortly take up his post, and his entry is looked forward to with pleasant anticipation.

I have not much improvement to record in connection with tin-plate. The demand is feeble, and prices offered low.

The new Bute Dock Bill is to be the next subject of interest. A hard fought contest is expected.

I am glad to note that Treherbert Foundry is in good condition. Orders are coming in from all parts of the country for the hauling engines.

A good find of the best Mynyddyslwyn has taken place at Llancaiach, and a good round sum of money has been offered for the taking. The house coal pits of the Cwmfelin Valley are turning out well. This is being watched with interest, as the district—the Taff Bargoed—is to be the successor of the Rhondda. The exports from Cardiff, Swansea, and Newport have been fully sustained. Cardiff and Newport have been exceptionally active. Prices, too, are well maintained.

Charing-cross and Cannon-street Railway Bridges.—On Wednesday, a Select Committee of the House of Commons sanctioned the preamble of the South-Eastern Railway Bill, which proposes to widen the present line from Cannon-street Railway to Charing-cross, and also to widen the Charing-cross and the Cannon-street railway bridges. The Committee decided that the Charing-cross bridge should not be widened by more than 48ft.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

25th April, 1882.

1945. Telephone Alarms, W. Morgan-Brown.—*(J. F. Kettell, U.S.)*
1946. Secondary Batteries, C. V. Boys, Wing.
1947. Coke, J. Jameson, Newcastle-on-Tyne.
1948. Producing Spray, L. H. Armour, Gateshead.
1949. Bessemer Converters, S. G. Thomas, London.
1950. Coke Ovens, R. de Soldenhoff, Merthyr Tydfil.
1951. Hooping Casks, A. J. Boult.—*(M. Beasley, U.S.)*
1952. Nut Lock, H. Haddan.—*(W. Courtenay, U.S.)*
1953. Memorial Plates, H. Haddan.—*(E. Olive, Paris.)*
1954. Heating Metal Plates, H. F. Taylor, Neath.
1955. Umbrellas, F. Wolff.—*(A. Malmros, Sweden.)*
1956. Electric Batteries, T. J. Handford.—*(B. Jarriant, Paris.)*
1957. Steering Vessels, A. Redie.—*(J. Ericson, U.S.)*
1958. Steam Boilers, G. Hawksley & M. Wild, Sheffield.
1959. Ornamental Surfaces, J. Noad, East Ham, and H. Salomon, London.
1960. Clock Movements, H. H. Lake.—*(F. Lane, U.S.)*
1961. Preventing the Run Away of Horses, H. Lake.—*(R. J. la Grange, U.S.)*
1962. Copying Presses, E. Behrens, East Greenwich.
1963. Surgical Splints, H. Hides.—*(E. Porteous, Antwerp.)*

26th April, 1882.

1964. Brakes for Carriages, A. Archer, Liverpool.
1965. Head Covering, C. Naish.—*(W. Gotaas, Norway.)*
1966. Preventing Smoke, W. Begg, Sale.
1967. Maximum Thermometers, H. J. Haddan.—*(H. Kappeller, jun., Vienna.)*
1968. Combined Steam Engine and Boiler, E. Edwards.—*(H. Hoffmeister, Austria.)*
1969. Explosive Compound, C. W. Siemens.—*(C. Himley and L. von Frützschler-Falkenstein, Germany.)*
1970. Nut Locks, J. T. King.—*(S. Gissinger, U.S.)*
1971. Umbrella Racks, C. J. Appleton and S. Ogden, Manchester.
1972. Railway Carriage Lamps, H. Defries, London.
1973. Moulding Seggars, W. E. Gedge.—*(A. Pothier, Paris.)*
1974. Barns, I. Henson, Derby.
1975. Ventilators, T. E. Bladon, Birmingham.
1976. Opening Meat Tins, T. George, Attleborough.
1977. Valves, J. Baldwin, Keighley.
1978. Decorticating Chinese Nettle Stalks, W. R. Lake.—*(P. A. Favier, France.)*
1979. Urinals, J. Berresford, Birmingham.
1980. Thermometers, C. Townsend, Bristol.
1981. Charging Printing Blocks with Colour, A. M. Clark.—*(J. Hutchison, U.S.)*

27th April, 1882.

1982. Removable Cartridge Magazines, G. Vaughan.—*(J. Werndl, Austria.)*
1983. Slide-valve Pumps, A. W. Cooper, Dundee.
1984. Refrigerating, J. Chambers, Manchester.
1985. Low-water Alarm, J. W. Kenyon, Manchester.
1986. Safety Matches, J. L. Field, Parkstone.
1987. Naphtha Lamp Burners, B. Sawdon, Hull.
1988. Pulsometer Engines, E. H. Greeven.—*(G. A. Greeven, Germany.)*
1989. Barrels, H. J. Haddan.—*(W. Stewart, Canada.)*
1990. Water-wheels, H. J. Haddan.—*(E. C. Masson, France.)*
1991. Tools for Cutting Pipes, C. D. Abel.—*(T. J. W. Geerkens, Germany.)*
1992. Stoppers for Bottles, I. Burdin, Knottingley.
1993. Umbrellas, J. and F. S. Liley, London.
1994. Mechanical Telegraphs, W. Chadburn, Liverpool.
1995. Heating Metal, H. H. Andrew, Sheffield.
1996. Moleskin Cloth, H. & H. King, Hebden Bridge.
1997. Horological Candlesticks, R. R. Gubbins, New Cross, and A. Thümling, London.
1998. Oil Vessels, J. Robinson, Bradford.
1999. Storing Electric Currents, J. Rogers, London.
2000. Life Saving, P. de la Sala, Hackney.
2001. Manhole Covers, F. Dyer, London.
2002. Excavating Machine, T. Crampton, London.
2003. Preventing Fouling of Ale Casks, E. Caddick, Burton-on-Trent.
2004. Brooches, J. G. Rollason, Birmingham.
2005. Metallic Handles, C. J. Gibbs, Smethwick, and A. Spooner, West Bromwich.

28th April, 1882.

2006. Ventilating Greenhouses, M. Willshaw, Lenton.
2007. Sorting Potatoes, C. Abel.—*(G. Gramhe, Stettin.)*
2008. Caloric Engines, F. C. Glaser.—*(K. Teichmen, Germany.)*
2009. Railway Signalling, E. J. Chabrel, London.
2010. Shoes, D., P., and N. Fraser, Arbroath.
2011. Corrosion of Screw Propeller Blades, D. Johnston, Govan.
2012. Raising Beer, J. Forbes, Coventry, and J. Hamilton, Smethwick.
2013. Washing, J. Mitchell, Newcastle-on-Tyne.
2014. Treating Rice, J. T. Armstrong, Newcastle-under-Lyme.
2015. Opening Window-sashes, G. Hurdle and W. Davie, Southampton.
2016. Glove Fasteners, W. J. Walden, Kingsland.
2017. Mosaics, H. J. Haddan.—*(G. Stanley, U.S.)*
2018. Gear Cutting, H. Haddan.—*(A. Brainard, U.S.)*
2019. Gas Burners, T. Fletcher, Warrington.
2020. Electric Light, J. C. Asten, Lower Norwood.
2021. Cleaning Wool, E. Mansfield, London.
2022. Door Knobs, J. H. Welch, Birmingham, and B. W. Spittle, Wednesbury.
2023. Regulating Gas, J. C. Stevenson, Liverpool.
2024. Drawing Gas from Mains, T. Thorp, Whitefield, and T. G. Marsh, Oldham.
2025. Ornamenting Glass, C. J. Bishop, St. Helens.
2026. Refrigerator, W. R. Lake.—*(D. W. Davis and E. W. Voigt, U.S.)*
2027. Fog Signal, T. Whittingham, Rugeley.
2028. Sugar, W. R. Lake.—*(L. May, Austria.)*
2029. Treating Skins, D. T. Gardner.—*(N. Hardin, Russia.)*
2030. Electrical Switches, R. Brougham, London.

29th April, 1882.

2031. Spindles, G. Golland, Nottingham.
2032. Locks, A. M. Clark.—*(A. Parise, Paris, and C. Flandin, Italy.)*
2033. Securing Knife Blades, M. Merichenski, Poplar.
2034. Raising Beer, J. J. Harrop, Manchester.
2035. White Light, J. Imray.—*(C. Clamond, Paris.)*
2036. Washing Clothes, T. Body, St. Austell.
2037. Electric Incandescent Lights, A. L. Jousselin, Paris.
2038. Weaving Fabrics, J. Hamilton, Strathaven.
2039. Pen-holders, M. Fischer, Prussia.
2040. Combing Wool, J. Harding.—*(S. Pegler, France.)*
2041. Boots, T. J. Handford.—*(H. C. Gros, Germany.)*
2042. Temples for Looms, W. R. Lake.—*(La Société de Tassigny Frères et Cie., France.)*
2043. Horses' Bits, I. Henson and E. Hall, Derby.
2044. Dynamo-electric Machine, R. Brougham, London.
2045. Sifting Substances, C. Wellin, London.

1st May, 1882.

2046. Windlasses, A. B. Brown, Edinburgh.
2047. Bridges, W. W. Wynne, London.
2048. Vaginal Syringes, E. de Pass.—*(P. Lawrence, U.S.)*
2049. Fire Extinguishers, J. R. Brown, U.S.
2050. Rotary Motors, E. A. Brydges.—*(A. Sieckenius, Germany.)*
2051. Washing Wool, T. J. Mullings, London, and W. Whiteley, Lockwood.
2052. Electrical Generators, T. J. Handford.—*(T. A. Edison, U.S.)*
2053. Railway Door Fastenings, P. M. Justice.—*(J. W. Krepps, U.S.)*
2054. Rotary Mills, J. A. A. Buchholz, London.
2055. Boots, J. Keats, Bagnal.
2056. Distributing Sewage, J. Shipway, Birmingham.
2057. Gas Engines, C. M. Sombart, Germany.
2058. Gas Engines, A. N. Porteous, Edinburgh.
2059. Cutting Paper, H. J. Haddan.—*(G. Broussier, Belgium.)*
2060. Fog Horns, A. L. Wharton, East Grimsby.

Inventions Protected for Six Months on Deposit of Complete Specifications.

1932. Self-levelling Ships' Berths, A. A. Young, Boston, U.S.—*22nd April*, 1882.
1933. Life-preserving Mattresses, A. A. Young, Boston, U.S.—*22nd April*, 1882.
1970. Nut Locks, J. T. King, Liverpool.—A communication from S. Gissinger, Pittsburgh, U.S.—*26th April*, 1882.
2029. Refrigerator, W. R. Lake, Southampton-buildings, London.—A communication from D. W. Davis and E. W. Voigt, Detroit, U.S.—*28th April*, 1882.

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

1670. Screw Propellers, N. D. Spartali, Liverpool.—*29th April*, 1879.
1769. Filter Plates, H. E. Newton, London.—*5th May*, 1879.
1635. Electric Light, J. MacKenzie, London.—*25th April*, 1879.
1682. Iron, G. E. Dering, Lockleys.—*29th April*, 1879.
1737. Belting, F. Walton, Twickenham.—*2nd May*, 1879.
1640. Composing Type, F. Wicks, Glasgow.—*26th April*, 1879.
1683. Phosphoric Iron, E. Riley, London.—*29th April*, 1879.
1722. Pumps, C. Pieper, Berlin.—*1st May*, 1879.
1759. Rolling Tea Leaf, W. Jackson, Gainsborough.—*3rd May*, 1879.
1662. Steering Ships, G. D. Davis, Stepney.—*28th April*, 1879.
1709. Carding Wool, I. Holden, Bradford.—*30th April*, 1879.
1715. Melting Iron, W. H. Fryer, Coleford.—*30th April*, 1879.
1770. Hay-cock Moulding, H. A. Bonneville, London.—*5th May*, 1879.
2051. Propelling Ships, P. M. Justice, London.—*22nd May*, 1879.
1664. Parallel Staple, J. Pattison, Sheffield.—*28th April*, 1879.
1666. Boots, J. H. Johnson, London.—*28th April*, 1879.
1703. Obtaining Soda, J. Townsend, Glasgow.—*30th April*, 1879.
1704. Boilers for Paper-making, G. Sinclair, Leith.—*30th April*, 1879.
1711. Steel, S. G. Thomas, London.—*30th April*, 1879.
1733. Illuminating Gas, R. S. Ripley, London.—*1st May*, 1879.
1743. Brakes for Winding Engines, T. Burns, West Leigh.—*2nd May*, 1879.
1749. Machinery for Engines, T. Coltman, Leicester.—*3rd May*, 1879.
1692. Regulating Electric Currents, J. S. Sellon and H. Edmonds, London.—*30th April*, 1879.
1701. Condensing Air, T. Cartledge, Manchester.—*30th April*, 1879.

Patents on which the Stamp Duty of £100 has been paid.

1523. Winding Sewing Threads, J. P. Kerr, Paisley.—*26th April*, 1875.
1529. Furnace Grates, T. Henderson, Birkenhead.—*26th April*, 1875.
1551. Glass-melting Furnaces, C. W. Siemens, London.—*28th April*, 1875.
1756. Breech-loading Small-arms, W. Anson and J. Deeley, Birmingham.—*11th May*, 1875.
1695. Excavator, J. Deas, Glasgow, and A. Nairn, Crosshill.—*7th May*, 1875.
1618. Warping, J. J. and G. Ashworth, Pendleton.—*1st May*, 1875.
1726. Ice, J. Siddeley and F. N. Mackay, Liverpool.—*10th May*, 1875.

Notices of Intention to Proceed with Applications.

Last day for filing opposition 19th May, 1882.

5611. Rolling Mills, E. Edwards, London.—A com. from G. Erkenzweig.—*22nd December*, 1881.
5623. Measuring Electric Currents, C. A. Carus-Wilson, London.—*23rd December*, 1881.
5628. Knitting Machines, L. A. Groth, London.—A com. from G. T. Grosser.—*23rd December*, 1881.
5636. Keyless Watches, C. H. Errington, Coventry.—*23rd December*, 1881.
5640. Printing Machines, A. Godfrey, Clapton.—*23rd December*, 1881.
5676. Dressing Hides, &c., W. Morgan-Brown, London.—Com. from F. Batchelder.—*27th December*, 1881.
5677. Opening Doors, &c., J. Barrett, Eastburn.—*27th December*, 1881.
5678. Spinning Machinery, M. Wright, Wibsey.—*27th December*, 1881.
5680. Middlings Purifiers, C. D. Abel, London.—A com. from C. Oberdorfer and C. Hönig.—*27th December*, 1881.
5687. Controlling Electricity, C. A. Carus-Wilson, London.—*27th December*, 1881.
5688. Cymaphens, C. F. Varley, Bexley Heath, and F. H. Varley, London.—*27th December*, 1881.
5708. Stoves, F. Brown, Farley Hill, Luton.—*28th December*, 1881.
13. Coating Ships' Bottoms, W. G. Little, Doncaster, and B. Nickels, London.—*2nd January*, 1882.
17. Increasing the Heat of Fuel, G. D. Peters, London.—*2nd January*, 1882.
363. Rotary Motion, A. M. Clark, London.—A communication from F. Elbing.—*24th January*, 1882.
484. Finger Rings, W. R. Lake, London.—A communication from R. J. La Grange.—*31st January*, 1882.
504. Railway Brake, H. H. Lake, London.—A com. from A. Rudolff and M. von Pichler.—*1st February*, 1882.
573. Swells for Shuttle-boxes, W. Haythornthwaite, Blackburn.—*6th February*, 1882.
776. Marine Engines, G. A. P. H. Duncan, London.—*17th February*, 1882.
808. Animal Charcoal, J. G. Macfarlan, Richmond.—*20th February*, 1882.
853. Safety Lifts, A. M. Clark, London.—A communication from J. McCarroll.—*21st February*, 1882.
1009. Ships, H. H. Lake, London.—A communication from A. P. Bliven.—*2nd March*, 1882.
1088. Brewery Coppers, G. Inskipp and J. Mackenzie, London.—*7th March*, 1882.
1393. Sulphur, F. B. Rawes, Stratford.—*22nd March*, 1882.
1486. Bottles, D. Rylands, Stairfoot, near Barnsley.—*28th March*, 1882.
1591. Starch, &c., H. H. Lake, London.—A com. from E. Wilhelm.—*1st April*, 1882.
1615. Utilising Water-power, E. Davies, London.—*3rd April*, 1882.
1635. Mechanical Toys, W. R. Lake, London.—A communication from W. A. Webber, G. B. Kelly, E. L. Rand, and J. L. Givan.—*4th April*, 1882.
1637. Upright Bearings, J. H. Johnson, London.—A communication from A. Fesca.—*4th April*, 1882.
1657. Automatically Playing Pianofortes, W. R. Lake, London.—A communication from F. E. Moore.—*5th April*, 1882.
1932. Self-levelling Ships' Berths, A. A. Young, Boston.—*22nd April*, 1882.
1933. Life-preserving Mattresses, A. A. Young, Boston.—*22nd April*, 1882.

Last day for filing opposition, 23rd May, 1882.

5681. Dynamo Machines, J. Richardson, Lincoln.—*27th December*, 1881.
5686. Cut-off Valves, H. H. Lake, London.—A com. from S. A. Goodwin.—*27th December*, 1881.
5692. Applications of Designs to Surfaces, T. Jones, London.—*28th December*, 1881.
5696. Recording Musical Notes, J. Wallis, London.—A com. from J. Föhr.—*28th December*, 1881.
5714. Portable Ovens, J. H. Johnson, London.—A communication from Messieurs Geneste, Herscher, and Co.—*29th December*, 1881.
5720. Fire-lighters, F. Holmes, New Cross, London.—*30th December*, 1881.
5726. Winding Machines, R. Speight and T. Speight, Bradford.—*30th December*, 1881.
5735. Heating Water, T. Drake, Huddersfield.—*31st December*, 1881.
5739. Treating Maize, T. B. Kinder, Anerley.—*31st December*, 1881.
9. Tube Expanders, G. Allix, Poplar, London.—*2nd January*, 1882.
25. Soap, G. Payne, Millwall, London.—*3rd January*, 1882.
37. Packing for Stuffing Boxes, P. Blair, Birkenhead.—*4th January*, 1882.
38. Stripping Cylinders, &c., G. H. Kenworthy and J. Beard, Ashton-under-Lyne, and J. G. Whitehead, Newton Moor.—*4th January*, 1882.
43. Barges, &c., E. Moxon, Tunbridge Wells.—*4th January*, 1882.
46. Open Fireplaces, W. Haughton, Middle Temple, London.—*4th January*, 1882.
73. Horseshoes, J. Vernon, Newton Stewart.—*6th January*, 1882.
103. Bottles, A. Jacobs and I. Jacobs, London.—*7th January*, 1882.
151. Cork-branding Machines, C. J. Leclere, London.—*11th January*, 1882.
203. Distillation of Glycerine, G. Payne, London.—*14th January*, 1882.
271. Purifying Grain, H. J. Haddan, London.—Com. from P. Lefebvre and J. Nagel.—*19th January*, 1882.
273. Umbrellas, &c., H. J. Haddan, London.—A com. from C. Neumeister.—*19th January*, 1882.
320. Recording the Game of Chess, A. M. Clark, London.—A communication from L. Hours-Humbert.—*21st January*, 1882.
382. Drying Tea, J. H. Johnson, London.—A communication from J. C. Allen.—*25th January*, 1882.
411. Sewerage Gullies, C. Pieper, Berlin.—*27th January*, 1882.
556. Securing Windows, E. Verity, J. M. Verity, and B. Banks, Leeds.—*4th February*, 1882.
643. Gas Burners, J. W. Plunkett, London.—*10th February*, 1882.
955. Reducing Metals, F. Wirth, Frankfort-on-the-Main.—Com. from H. Rössler.—*27th February*, 1882.
1101. Metallic Packing, G. Holcroft, Manchester, & J. Grundy, Ashton-under-Lyne.—*7th March*, 1882.
1127. Preservation of Animal Matter, J. Imray, London.—Com. from F. Artimini.—*8th March*, 1882.
1158. Reservoir Penholders, G. R. Hughes and T. Carwardine, London.—*10th March*, 1882.
1249. Magneto-electric Machines, C. L. Levey and E. Lumley, London.—*15th March*, 1882.
1346. Bottles, C. M. Taylor, Snaresbrook.—*20th March*, 1882.
1374. Looms for Weaving, J. Stansfield, Colne.—*21st March*, 1882.
1390. Driving Dynamo Machines, J. B. Rogers, London.—*22nd March*, 1882.
1418. Weaving Looms, A. Rollason, Manchester.—*24th March*, 1882.
1526. Printing Telegraphic Messages, W. R. Lake, London.—A communication from A. F. Johnson and F. B. Johnson.—*29th March*, 1882.
1536. Bedsteads, J. Reynolds, Birmingham.—*30th March*, 1882.
1558. Governors, E. Truman, Grantham.—*31st March*, 1882.
1561. Purifying Coal Gas, J. Walker, Leeds.—*31st March*, 1882.
1582. Producing Copies of Writings, M. Farmer, Middlesex.—*31st March*, 1882.
1593. Gloves, H. Urwick, St. John's Hill, Wandsworth.—*1st April*, 1882.
1625. Recovering Lead from Fumes, E. A. Cowper and T. Sopwith, London.—*4th April*, 1882.
1675. Slide Valves, D. Halpin, London.—*6th April*, 1882.
1791. Wire for Lockets, &c., E. Richardson, Birmingham.—*14th April*, 1882.
1970. Nut-locks, J. T. King, Liverpool.—A communication from S. Gissinger.—*26th April*, 1882.

Patents Sealed.

(List of Letters Patent which passed the Great Seal on the 28th April, 1882.)

4744. Extracting Fat from Bones, E. Edwards, London.—*29th October*, 1881.
4765. Mattresses, J. T. Lockey, Northwich.—*1st November*, 1881.
4782. Sewing Materials, E. H. Smith, New York, U.S.—*1st November*, 1881.
4785. Preventing Incrustation in Boilers, E. Edwards, London.—*2nd November*, 1881.
4802. Whiting, William Brothers, Livesey Chemical Works, near Blackburn.—*2nd November*, 1881.
4815. Carriages for Lace Machines, W. Spowage, Nottingham.—*3rd November*, 1881.
4816. Candles, L. A. Groth, London.—*3rd November*, 1881.
4824. Electric Current Meters, C. A. Carus-Wilson, London.—*3rd November*, 1881.
4825. Dynamo Machines, C. A. Carus-Wilson, London.—*3rd November*, 1881.
4830. Boats, W. R. Lake, London.—*3rd November*, 1881.
4836. Extinguishing Fire, W. E. Fitzmaurice, Brussels.—*4th November*, 1881.
4850. Carbons, C. J. Allport, London, and R. Punshon, Brighton.—*5th November*, 1881.
4856. Ships' Sleeping Berths, W. R. Lake, London.—*5th November*, 1881.
4873. Small Fire-arms, E. James, Birmingham.—*7th November*, 1881.
4876. Ventilating, W. Teague, Illogan.—*8th November*, 1881.
4904. Consuming Smoke, E. P. Alexander, London.—*9th November*, 1881.
4971. Gas Stoves, C. W. Torr, Birmingham.—*12th November*, 1881.
5049. Bearings for Axles, W. R. Lake, London.—*17th November*, 1881.
5296. Sulpho-acids, F. Wirth, Frankfort-on-the-Main.—*3rd December*, 1881.
5317. Tunnelling Machinery, T. English, Hawley.—*5th December*, 1881.
5439. Boilers, W. C. Burder, Loughborough.—*13th December*, 1881.
5494. Secondary Voltaic Cells, J. W. Swan, Newcastle-on-Tyne.—*15th December*, 1881.
5586. Colouring Matters, F. Wirth, Frankfort-on-the-Main.—*21st December*, 1881.
5621. Treating Gases, F. Wirth, Frankforth-on-the Main.—*23rd December*, 1881.
121. Stoves, A. C. Engert, Bromley-by-Bow, London.—*9th January*, 1882.

592. TREATING WHEAT, J. A. A. Buchholz, Vauxhall, London.—*7th February*, 1882.
795. FIXED WHITE PIGMENT, H. Knight, Liverpool.—*18th February*, 1882.
873. SELF-COCKING FIRE-ARMS, J. Dickson, jun., and A. G. Murray, Edinburgh.—*23rd February*, 1882.
917. REFLECTORS, H J. Haddan, Kensington.—*25th February*, 1882.
945. SADDLE-BARS, J C. Reed, Watford.—*27th February*, 1882

(*List of Letters Patent which passed the Great Seal on the 2nd May*, 1882.)

4584. PACKING CASES, W. H. Bennett, London.—*20th October*, 1881.
4821. MEASURING WATER, W. Jones, Manchester.—*3rd November*, 1881.
4826. SPRING MATTRESSES, G. Lowry, Salford.—*3rd November*, 1881.
4834. ATTACHING HORSES to SHAFTS, H. Dickinson, Huddersfield.—*4th November*, 1881.
4835. SPRING SAFETY HOOKS, J. Carter, Salford.—*4th November*, 1881.
4839. NUT-LOCKING DEVICE, S. Danischewsky, Paris.—*4th November*, 1881.
4841. PIANOFORTE ACTIONS, G. H. Brockbank, London.—*4th November*, 1881.
4844. CLEANSING FIBROUS SUBSTANCES, T. H. Cobley, Dunstable, and G. Tidcombe, jun., Watford.—*4th November*, 1881.
4847. PREPARING WOOL, &c., G. Little, Oldham.—*5th November*, 1881.
4848. LOCKS, &c., H. Gibbons and A. Anthony, Hungerford.—*5th November*, 1881.
4849. REDUCING FRICTION, W. J. Brewer, London.—*5th November*, 1881.
4851. ELECTRO-MOTIVE ENGINE, D. T. Piot, London.—*5th November*, 1881.
4855. ELECTRIC LAMPS, J. B. Rogers, London.—*5th November*, 1881.
4863. BRACELETS, &c., H. Allsop, Birmingham.—*7th November*, 1881.
4870. FOLDING BEDS, &c., H. Gardner, London.—*7th November*, 1881.
4877. PICKLING STEEL, T. H. Cobley, Dunstable, and C. Monckton, Harefield.—*8th November*, 1881.
4884. TRANSMITTING MOTION, D. Young, London.—*8th November*, 1881.
4896. PHOTOGRAPHIC EMULSIONS, J. Plener, London.—*8th November*, 1881.
4919. NECKTIES, &c., C. Ketley, London.—*8th November*, 1881.
4931. FLANGING, &c., BOILER PLATES, J. Lyall, Govan.—*10th November*, 1881.
5000. MERCURIAL AIR PUMPS, C. H. Stearn, Newcastle-upon-Tyne.—*15th November*, 1881.
5003. WATER-CLOSETS, H. Barron and H. Raimes, London.—*15th November*, 1881.
5038. CLIPS for SHEARING, F. Guillaume, Paris.—*17th November*, 1881.
5067. FURNACES, W. S. Welton, London.—*19th November*, 1881.
5081. STEREOTYPING APPARATUS, F. Harrild, London.—*21st November*, 1881.
5112. FILTER BLOCKS, C. D. Abel, London.—*23rd November*, 1881.
5131. SEWING MACHINES, J. Imray, London.—*24th November*, 1881.
5203. PRINTING FABRICS, J. Kerr and J. Haworth, Church.—*29th November*, 1881.
5251. WASHING MACHINES, W. B. Brooker, Bootle.—*30th November*, 1881.
5283. WASHING, G. F. Redfern, London.—*2nd December*, 1881.
5497. CARRYING BOXES, C. A. Carus-Wilson, London.—*15th December*, 1881.
5566. ELECTRIC CURRENTS, A. Millar, Glasgow.—*20th December*, 1881.
48. FOLDING NECKTIES, M. Steinbock, New York, U.S.—*4th January*, 1882.
172. CONCRETE, J. Jackson, London.—*12th January*, 1882.
284. VESSELS, T. Teodorescq, Galatz, Roumania.—*19th January*, 1882.
436. ELECTRIC TELEGRAPH PRINTING, J. Imray, London.—*28th January*, 1882.
439. SEATS of TRICYCLES, A. Burdess, Coventry.—*28th January*, 1881.
440. ABSTRACTING AMMONIA, G. Neilson, Summerlee, N.B.—*28th January*, 1882.
657. ANVILS, F. Wright and O. Wright, Dudley.—*10th February*, 1882.
676. SUGAR, C. Scheibler, Berlin, Germany.—*11th February*, 1882.
683. BALL BEARINGS, A. Burdess, Coventry.—*11th February*, 1882.
730. MEASURING ELECTRIC CURRENTS, C. A. Faure, London.—*15th February*, 1882.
760. DYNAMO-ELECTRIC MACHINES, C. W. Siemens, London.—*16th February*, 1882.
818. REAPING MACHINES, W. P. Thompson, London.—*20th February*, 1882.
833. PERPETUAL CALENDARS, P. M. Justice, London.—*21st February*, 1882.
843. DETACHING SHIPS' BOATS, J. A. Wilkinson and N. McGounell, Folkestone.—*21st February*, 1882.
867. CARRIAGES of LACE MACHINES, H. B. Payne, Nottingham.—*22nd February*, 1882.
876. SPINNING MACHINERY, G. Perkins, G. Wimpenny and J. H. Evans, Manchester.—*23rd February*, 1881.
899. COTTON LAPPING MACHINES, W. R. Lake, London.—*24th February*, 1882.
968. CUTTING HOLES, C. Scriven, Leeds.—*28th February*, 1882.
970. LANTERNS, G. Bray, Blackman-lane, Leeds.—*28th February*, 1882.
978. GAS, W. R. Lake, Southampton-buildings, London.—*28th February*, 1882.
992. PROPELLING SHIPS, J. Cooke, Richmond.—*1st March*, 1882.
1063. EXTRACTING METALS from ORES, H. H. Lake, London.—*4th March*, 1882.

List of Specifications published during the week ending April 29th, 1882.

3179, 2d.; 3691, 10d.; 3870, 6d.; 3887, 6d.; 3925, 6d.; 3939, 4d.; 3952, 6d.; 3961, 6d.; 3970, 6d.; 3976, 6d.; 3978, 6d.; 3998, 4d.; 4001, 6d.; 4008, 6d.; 4014, 4d.; 4029, 6d.; 4031, 6d.; 4036, 6d.; 4038, 10d.; 4042, 6d.; 4045, 6d.; 4042, 6d.; 4055, 6d.; 4058, 6d.; 4067, 8d.; 4075, 6d.; 4081, 6d.; 4083, 8d.; 4084, 6d.; 4085, 6d.; 4087, 6d.; 4094, 1s. 8d.; 4098, 6d.; 4099, 6d.; 4100, 2d.; 4101, 6d.; 4105, 8d.; 4106, 8d.; 4107, 6d.; 4111, 6d.; 4112, 6d.; 4113, 8d.; 4114, 6d.; 4115, 6d.; 4116, 2d.; 4118, 6d.; 4120, 6d.; 4121, 6d.; 4128, 6d.; 4129, 6d.; 4132, 6d.; 4133, 2d.; 4134, 6d.; 4136, 6d.; 4139, 4d.; 4140, 8d.; 4143, 6d.; 4144, 6d.; 4147, 8d.; 4150, 2d.; 4151, 6d.; 4152, 2d.; 4153, 4d.; 4155, 2d.; 4160, 6d.; 4161, 6d.; 4163, 2d.; 4164, 6d.; 4165, 4d.; 4166, 4d.; 4167, 2d.; 4169, 2d.; 4171, 6d.; 4172, 2d.; 4173, 2d.; 4174, 8d.; 4175, 2d.; 4176, 8d.; 4177, 2d.; 4179, 2d.; 4181, 2d.; 4182, 6d.; 4183, 4d.; 4185, 4d.; 4186, 4d.; 4187, 6d.; 4190, 2d.; 4192, 2d.; 4194, 6d.; 4195, 4d.; 4197, 6d.; 4198, 2d.; 4200, 4d.; 4206, 2d.; 4202, 4d.; 4203, 6d.; 4204, 2d.; 4205, 2d.; 4206, 2d.; 4210, 6d.; 4212, 4d.; 4214, 4d.; 4216, 6d.; 4217, 2d.; 4220, 6d.; 4221, 2d.; 4222, 2d.; 4223, 6d.; 4224, 2d.; 4226, 2d.; 4228, 2d.; 4231, 4d.; 4232, 6d.; 4234, 4d.; 4235, 2d.; 4236, 2d.; 4238, 6d.; 4239, 2d.; 4240, 8d.; 4242, 2d.; 4243, 6d.; 4245, 2d.; 4246, 6d.; 4247, 2d.; 4251, 2d.; 4252, 4d.; 4254, 2d.; 4255, 4d.; 4256, 2d.; 4257, 2d.; 4258, 2d.; 4259, 2d.; 4260, 2d.; 4262, 6d.; 4263, 2d.; 4264, 2d.; 4265, 6d.; 4266, 6d.; 4267, 6d.; 4270, 4d.; 4271, 6d.; 4274, 6d.; 4810, 4d.; 4319, 6d.; 4329, 6d.; 4351, 6d.; 4366, 6d.; 4424, 6d.; 4514, 6d.; 448, 4d.

*** Specifications will be forwarded by post from the Patent-office on receipt of the amount of price and postage. Sums exceeding 1s. must be remitted by Post-office order, made payable at the Post-office, 5, High Holborn, to Mr. H. Reader Lack, her Majesty's Patent-office, Southampton-buildings, Chancery-lane, London.

ABSTRACTS OF SPECIFICATIONS.

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

3179. PREPARATION FOR HEALING WOUNDS AND SORES, *G. Lowe, Barnet.*—*21st July*, 1881. 2*d.*

This consists in the combination with unctuous materials of the medicinal properties obtained from the plant trigonnella coerulea.

3691. VESSELS AND MACHINERY FOR AERIAL NAVIGATION, *A. L. Blackman, Nashville, U.S.*—*24th August*, 1881. 10*d.*

This relates to a vessel for aerial navigation in the form of a cylinder with conical ends or in the form of a shuttle, constructed upon one general framework of metal rods, tubes, or the like, and covered with or enclosed in an envelope of thin metal, silk, canvas or other suitable material. The vessel is divided into a gas field, and hull, with cabins and machinery compartments.

3808. IMPROVEMENTS IN THE MEANS AND APPARATUS FOR CONVEYING SOUND TO A DISTANCE FROM THEATRES, &c., BY TELEPHONIC TRANSMISSION, *C. D. Abel, London.*—(*A communication from C. Ader, Paris.*)—*1st September*, 1881. 6*d.*

The inventor uses two sets of transmitters, one on each side of the stage, one of the receivers being connected with a transmitter on the one side, and the other with a transmitter on the other side. In this way the listener can detect by the variations in the sounds transmitted to either ear on which side of the stage the speaker is. To avoid the shocks occasioned by walking on the stage, the transmitters are placed in boxes, the bottoms of which are filled with lead, and which rest in caoutchouc blocks. As batteries will not last during a long performance without polarisation, the inventor employs a distributing apparatus by means of which a fresh battery for each transmitter can be switched on after a stated time, interrupters being placed in circuit to prevent any noise in the receivers being occasioned by the change of batteries.

3812. AN IMPROVED METHOD OF AND APPARATUS FOR TRANSMITTING SECRET MESSAGES BY ELECTRO-MAGNETIC TELEGRAPH, *W. R. Lake, London.*—(*A communication from A. F. and F. B. Johnson Brooklyn, New York.*)—*2nd September*, 1881. 10*d.*

This invention relates to a method of transmitting secret messages by electro-magnetic telegraph instruments over ordinary telegraph wires. The inventors use three instruments: one by which the sender of the message himself prepares it for transmission by means of indentations made by the machine on a strip of paper; a second, which the indented paper passes through, and thereby causes the third or receiving instrument, with which it is connected by ordinary telegraph wires, to operate automatically and receive and print the message. The receiver prints the message in ordinary alphabetical letters whilst it is concealed from view and enclosing and addressing it for delivery. The invention is described at great length, and with detail drawings.

3870. WASHING AND TOILET CABINET, *E. R. Johnson, London.*—*6th September*, 1881. 6*d.*

This consists essentially in the combination of a fall down flap or front, the basin fixed upon said flap or front and tilting therewith into a vertical position, and the waste water tank for the basin to discharge into.

3887. FOUNTAIN PEN-HOLDERS, *D. H. Sparling, Oldham.*—*8th September*, 1881. 6*d.*

This consists of a fountain penholder with a tubular ink reservoir in which slides a piston, or packed plunger, or rod, so that the reservoir can be charged by drawing the piston rod outwards and the ink be supplied to the pen by pressing on the piston or by admitting air.

3898. IMPROVEMENTS IN APPARATUS FOR IGNITING GAS FOR ILLUMINATING BY MEANS OF ELECTRICITY, AND IN BATTERIES CONNECTED THEREWITH, *A. J. Hallam, Salford, and J. Walsh, Over Darwen, Lancashire.*—*8th September*, 1881.—(*Not proceeded with.*) 4*d.*

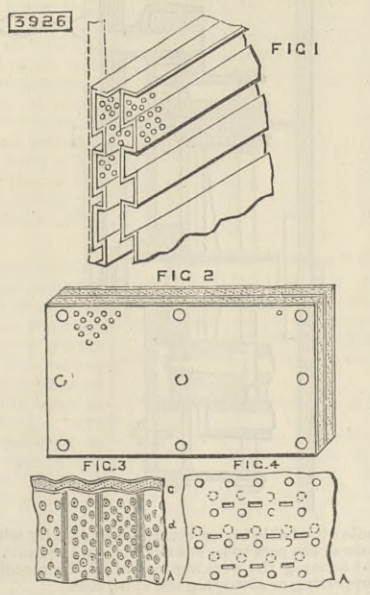
The inventors use two metal pillars with screw pins above each gas jet, the current leaping across from pin to pin and igniting the gas. The invention also relates to a means for lighting large districts at once by means of sliding contacts at a central point, and to an improved battery for this purpose.

3925. LOCKING DEVICES FOR THE ROOFS OF CARRIAGES AND PERAMBULATORS, *G. W. von Nawrocki, Berlin.*—*10th September*, 1881.—(*A communication from L. Schmetzer, Rothenburg, Bavaria.*) 6*d.*

According to one arrangement the ribs of the hood are pivotted to plates fixed to the sides of the vehicle, and the front rib has a spring extension beyond its pivot provided with a stud, which as the rib is raised moves over the plate and springs into one or other of a series of holes or recesses formed in the plate, whereby the rib is held in the position into which it is moved, the spring extension being sufficiently strong to hold the rib firmly but not to prevent its being shifted up or down when force is applied thereto by hand.

3926. SECONDARY BATTERIES OR MAGAZINES OF ELECTRICITY, *J. S. Sellon.*—*10th September*, 1881. 6*d.*

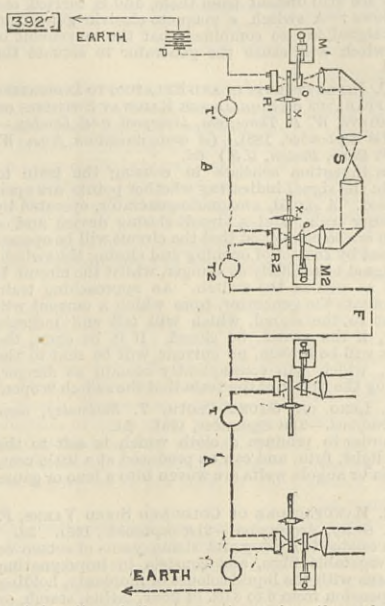
The electrodes are of lead or other suitable material, which are, or may be, coated with, or have attached to, or packed therein, spongy, precipitated, or reduced lead, &c. The lead electrodes are perforated, serrated, grooved, or corrugated, and the claim is the construction of secondary batteries of perforated plates or



sheets, roughened, serrated, or indented, composed of lead, platinum, or carbon, upon, in, or against which plates spongy or finely divided lead or oxides, or other salts or compounds of lead, or other suitable substances or compounds, are, or may be, held. The figures show some forms adopted.

3929. AN IMPROVED SYSTEM OF MULTIPLEX AND SELF-REVERTABLE "TELERADIOPHONE," *E. J. P. Mercadier, Paris.*—*10th September*, 1881. 10*d.*

This invention refers to a system of telegraphing, in which the signals are produced by radiophonic effects. The figure shows two stations A and A^1 separated by a long line F, in which two sets of transmitting and securing apparatus are arranged. A continuous current from battery P passes successively from station A, through radiophonic receiver and telephone R^1 T^1, to R^2 and T^2, &c., by line F. In front of each receiver, made of albanum, lamp-black, &c., are situated the openings of a wheel, rotating rapidly and continuously round an axis X. A diaphragm O of the same size as opening in wheel is fixed to a rigid shaft forming a prolongation of key lever M^1, and when at rest closes the openings, thereby checking the radiations from source S. The movement of M^1 consequently alternately allows and prevents the passage of radiations to selenium receiver R^1, and produces variations in its resistance, and therefore in



the intensity of the current passing through said receiver. There is therefore produced in all the telephones T^1, &c., a musical sound, the pitch of which is determined by the rate of turning of the wheel opposite the respective receivers. It is thus possible to transmit Morse signals acoustically. The figure shows the various arrangements of lenses and specula for conveying the light from source S to the receivers. Various modifications of the above with details of the apparatus are described and illustrated in the specification.

3939. WORM GEARING FOR DRIVING WASHING AND WRINGING MACHINES, CRANES, WINDLASSES, &c., *A. Shaw, near Huddersfield.*—*12th September*, 1881. 4*d.*

This consists in the combination of two worm wheels in gear with each other and in gear with two worms.

3952. LIFEBOATS, *J. Wetter, New Wandsworth.*—*13th September*, 1881.—(*A communication from G. B. Berrell, Pennsylvania, U.S.*) 6*d.*

This consists of a spherical lifeboat composed of two hemispherical parts connected by exterior flanges, and secured together by bolts, and constructed with a ballast plate and keel, forming integral parts thereof, the said boat being provided with suitable propelling, steering, and ventilating mechanism.

3961. CONSTRUCTION OF DRAINAGE FOR THE PURPOSE OF DESTROYING NOXIOUS GASES, &c., *R. H. Reeves, Isle of Wight.*—*14th September*, 1881. 6*d.*

The trapping may be done by means of a tongue or shutter descending into the drain below the surface of the sewage, the portion of the drain beneath the tongue or shutter being dished or hollowed out so as to ensure the gas being trapped off whenever there is sewage in the drain.

3970. PERAMBULATORS, &c., *G. Asher, Birmingham.*—*14th September*, 1881. 6*d.*

This consists in the combination with the body and framework of perambulators and other similar vehicles of annular flanged guiding plates, which are provided, the one with a series of circumferential locking recesses, and the other with a locking spring bolt, and which are so secured to the parts as to keep them in connection, and as to allow of them being freely turned into any required relative positions and automatically locked therein, with a facility of being freely turned into any other required position and automatically locked therein.

3978. CHURN, &c., *W. Rainbow, Luton.*—*15th September*, 1881. 6*d.*

This consists mainly in the combination of a rotary agitator or beater revolving in a vessel of square or other rectangular form, the form of the vessel being such as to prevent the liquid acquiring a rotary motion by being carried round with the agitator, and rendering unnecessary the employment of fixed blades to check the rotation of the liquid.

3998. HANDLES FOR KNIVES, FORKS, &c., *G. Renton, Sheffield.*—*16th September*, 1881.—(*Complete.*)—(*Void.*) 4*d.*

A hollow metal case is filled with hard wood, bone, horn, or tip, the former being stamped in two halves, which are soldered together after the insertion of the wood, bone, horn, or tip.

4001. BATHS, SINKS, &c., *J. Shanks, Barrhead, N.B.*—*16th September*, 1881. 6*d.*

This relates to the arranging or combining together of the water supply, discharge, and other apparatus of or connected with baths, sinks, or other vessels for washing purposes.

4008. ROCK-BORING APPARATUS, *M. Macdermott and W. Glover, London.*—*17th September*, 1881. 6*d.*

This relates to improvements on patents No. 2542, dated 2nd July, 1877, and No. 2598, dated 28th June, 1878. Instead of suspending and attaching a box to the standard of the apparatus, consisting of about ten different pieces, a cast iron or other metal plate is suspended and attached in the same way as therein described, having on the upper part thereof, a tube which forms part of the same casting as the plate, and through which tube the main screw of the machine is passed. A Second part relates especially to the form and disposition of the cams by means of which the blow is delivered by the machine.

4014. MOUNTING CROCHET COTTON AND OTHER BALLS, *H. Greg, Bolton.*—*17th September*, 1881. 4*d.*

This consists in turning the ball in two or more directions, with, by preference, carboard bands, and to which bands a hook or other convenient fastener is affixed for the purpose of attachment to a lady's dress.

4025. VELVET, *R. S. and E. Collinge, Oldham.*—*19th September*, 1881.—(*Not proceeded with.*) 2*d.*

This consists principally in the interweaving of fourteen ends or warp threads with nine or more picks or weft threads, each face pick floating over eleven ends and then interlocking with the other three, so as to make a fast pile.

4026. IMPROVEMENTS IN DYNAMO-ELECTRIC AND MAGNETO-ELECTRIC MACHINES, *E. de Pass, London.*—*19th September*, 1881.—(*A communication from La Société Anonyme des Cables Electriques, Paris.*)—(*Not proceeded with.*) 2*d.*

The principle of the invention is that of a fixed circuit, within which a Siemens coil or an electro-magnet is arranged, the wires of which always receive a current in the same direction, whilst the surrounding coil is traversed at each half revolution by reverse currents.

4027. MANUFACTURE OF CIGARETTES WITHOUT PAPER, *M. Appelbaum, London.*—*19th September*, 1881.—(*Not proceeded with.*) 2*d.*

A leaf of tobacco is used instead of paper.

4028. CASES OR PROTECTORS FOR WATCHES, &c., *F. Wirth, Frankfort-on-the-Main.*—*19th September*, 1881.—(*A communication from G. Speckhart, Nürnberg.*) 6*d.*

This relates to a case or covering of india-rubber or similar elastic material.

4030. LIFTING JACKS, *F. H. F. Engel, Hamburg.*—*19th September*, 1881.—(*A communication from J. F. W. Schultze, Hamburg.*)—(*Not proceeded with.*) 2*d.*

This relates to rack and pinion jacks, and has for its object to reduce the friction of the rack in its guides by using two pinions instead of one.

4031. SKEIN OR HANK HOLDER FOR BALLING OR REELING SKEINS OR HANKS OF COTTON, &c., *F. Mautsch, née Lecocq, Termonde, Belgium.*—*19th September*, 1881. 6*d.*

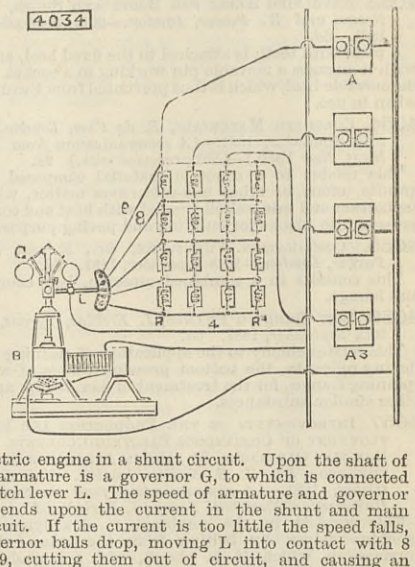
This relates to the employment of a series of adjustable arms, upon which to hold skeins of various lengths, which arms are mounted upon a swivelling device, which will conveniently support and contain the adjusting mechanism, and provide for clamping the apparatus to a table, board, or the like.

4033. FLUSH CISTERNS FOR WATER-CLOSETS, &c., *W. Wright, Plymouth.*—*19th September*. 1881.—(*Not proceeded with.*) 2*d.*

This relates to the employment of a weighted lift valve, which covers the flush pipe at the bottom of the cistern.

4034. IMPROVEMENTS IN AND CONNECTED WITH DYNAMO OR MAGNETO-ELECTRIC MACHINES AND ELECTRO MOTORS, *P. Jensen, London.*—*19th September*, 1881.—(*A communication from T. A. Edison, Menlo Park, New Jersey, U.S.*) 6*d.*

The object of this invention is to regulate the generating capacity of dynamo machines. One method of doing this is shown in the figure. A to A^3 are Edison machines connected in multiple arc; B is an



electric engine in a shunt circuit. Upon the shaft of its armature is a governor G, to which is connected switch lever L. The speed of armature and governor depends upon the current in the shunt and main circuit. If the current is too little the speed falls, governor balls drop, moving L into contact with 8 or 9, cutting them out of circuit, and causing an increased current through the field coils, and consequent increase of generative capacity. R to R^3 are resistance boxes.

4035. TREATMENT OF SUBSTANCES FOR THE MANUFACTURE OF AN ADHESIVE OR GLUE, *G. W. Bremner, London.*—*19th September*, 1881. 4*d.*

This relates to improvements in the manufacture of a glutinous substance or substances known as syrup of biphosphate of alumina, crystalline, or mineral gum, or syrup obtained from a mineral known as bauxite, to render those substances into a substance of a more fibrous nature similar to glue.

4036. CIGAR LIGHTERS, *W. Clark, London.*—*19th September*, 1881.—(*A communication from C. H. Vibbard, Aurora, and J. D. Brooks, Albany, U.S.*) 6*d.*

This consists in a cigar lighter constructed with a case provided with a hinged cover, and a spring eatch for holding the same closed, a tube provided with a spiral spring and a tubular cap for holding a candle, a slotted and curved partition, having a correspondingly curved spring attached to it for holding a fuse, a four-armed wheel pivotted to the case for raising the fuse, a curved arm attached to the cover for igniting the fuse, and a curved spring for raising the cover quickly, whereby a fuse will be ignited and a candle lighted by the act of opening the cover, and the fuse raised ready to be again ignited by the closing of the cover.

4037. SECONDARY BATTERIES, *W. Clark, London.*—*19th September*, 1881.—(*A communication from N. de Kabath, Paris.*) 6*d.*

This inventor claims the use of laminated and corrugated sheets of lead.

4038. EXPRESSION OF JUICE FROM SUGAR CANE, *W. Thomson, J. Mylne, London, and J. B. Alliott, Nottingham.*—*19th September*, 1881. 10*d.*

This relates to an apparatus for the expression of juice from the sugar cane, and consists partly in the combination of two vertical rolls, either plain or striated, and a flange to prevent the escape of cane downwards, but which will allow the expressed juice to drop. Modifications are described.

4039. CORSETS, *H. E. Newton, London.*—*19th September*, 1881.—(*A communication from M. Cohn, New York.*) 6*d.*

This relates to a corset in which a pocket is formed in either or each of the bosom-swells for the reception of a pocket-book, port-monnaie, or other article.

4040. BOOTS AND SHOES, *H. Loads and F. Afford, Norwich.*—*19th September*, 1881.—(*Not proceeded with.*) 2*d.*

The heel is constructed in two parts, consisting of the heel proper and a detachable heel plate, which constitutes the wearing surface.

4041. GLASS BOTTLES, &c., *H. Codd, London.*—*19th September*, 1881. 6*d.*

This relates to bottles fitted with screwed plugs to fit into threads formed in the mouth of the bottle, and it consists in forming a threaded recess in the side of the bottle, so that when the plug is removed it may be screwed into the recess, and will not get lost.

4042. GAS AND OIL STOVES, *S. Clark, Islington.*—*19th September*, 1881. 6*d.*

This relates to means whereby a more perfect combustion is obtained, and the products of combustion are more completely rendered innocuous by condensation, and by re-contact with the flames of the burner or lamp than with stoves of the construction heretofore adopted.

4043. CANS OR VESSELS FOR THE TRANSPORT OF MILK, *H. H. Lake, London.*—*19th September*, 1881.—(*A communication from F. Fleischmann, Austria.*) 6*d.*

This relates to a cylindrical can with stiffening hoops, and a disc of wood attached to the bottom. A handle serves also to force down the lid and secure it tightly, the lid being recessed to contain ice to keep the milk cool.

4044. CHURNS, *J. M. Hill, Devon.*—*20th September*, 1881.—(*Not proceeded with.*) 2*d.*

Within a vertical barrel revolves a spindle carrying

several beaters in the form of blades with passages through them, and placed alternately at right angles to each other.

4045. Light Rowing Boats for Racing and Pleasure Purposes, *J. H. Clasper, Oxford.*—20*th September*, 1881. 6*d*.

This consists in providing the boats with a kind of centre-board, something similar to the kind in use in sailing boats, and the manner of arranging it to prevent the water entering the boat, and in arranging it to have different degrees of depth.

4047. Treating a Certain Plant or Vegetable Material for Various Purposes, *M. Hilton, near Manchester.*—20*th September*, 1881.—(*Not proceeded with.*) 2*d*.

The inner bark of the plant known as broussonetia papyrifera, Vent, is boiled to remove the resinous matter, and then treated so as to separate the fibres therefrom, such fibres being then either made into yarn or thread or used to make felted fabrics.

4049. Securing Picks to their Shafts, *T. Trussell, Nottingham.*—20*th September*, 1881. 6*d*.

This consists partly in the construction of a complete pick for holing or under-cutting coal and other similar purposes, in which the pick blade is secured to a band on, or forming part of, the pick shaft by means of one, two, or more vertical or longitudinal wedges, secured in the said band by one or more horizontal or transverse cotters.

4050. Springs for Doors, &c., *A. Martin, Woolwich.*—20*th September*, 1881.—(*Not proceeded with.*) 2*d*.

The spring is fastened to the door, and its other end is jointed to a link, which is jointed to act as a hinge and fastened to the frame of the door.

4051. Driving Mechanism for Velocipedes, *E. R. Settle, Coventry.*—20*th September*, 1881. 4*d*.

This relates to a simple and compact form of double driving mechanism for velocipedes, and it consists in fitting in a chain wheel a differential barrel of one, two, or more diameters, carrying a row of studs on its differential peripheries. Attached to a sleeve carrying one driving wheel is an internally recessed flange, and a corresponding flange is fitted on its opposite side, keyed on the driving shaft, passing through the sleeve, the barrel gearing into both flanges.

4053. Revolving Heels for Boots and Shoes, *W. Brown and W. Peover, London.*—20*th September*, 1881. 6*d*.

A plate with teeth is attached to the fixed heel, and with it engages a movable pin working in a socket in the movable heel, which is thus prevented from turning when in use.

4054. Concrete Materials, *E. de Pass, London.*—20*th September*, 1881.—(*A communication from W. Hunt, New York.*)—(*Not proceeded with.*) 2*d*.

This relates to a concrete material composed of granite, stone, or other non-calcareous matter, with asphaltum and mineral oil treated with heat and compressed into blocks for building and paving purposes.

4055. Combination Furniture, &c., *F. and W. Parker, London.*—20*th September*, 1881. 6*d*.

This consists in a combined ottoman, box, couch, and lounge.

4056. Wet Spinning Frames, *J. Erskine, Tyrone.*—20*th September*, 1881. 6*d*.

This relates chiefly to the application of cleaning or licking rollers to the bottom pressing rollers of wet spinning frames, for the treatment of flax, hemp, and other similar substances.

4057. Improvements in the Production and Employment of Continuous Electric Currents in Railway Carriages, &c., and in Apparatus Used therefor, &c., *H. E. Newton, London.*—20*th September*, 1881.—(*A communication from the Société Universelle d'Electricité Tommasi, Paris.*) 6*d*.

This consists in the combination of a dynamo-machine driven by belting from the axle of the carriage in which it is placed, with a secondary battery, an interrupter, and electric lamps, in such a way that a continuous current shall be supplied to the lamps, even though the train be at a standstill, and consequently the dynamo-machine also.

4059. Improvements in Electrical Bath Apparatus to be Used for the Application of Electricity to Horses and other Animals, *H. H. Lake, London.*—20*th September*, 1881.—(*A communication from Dr. B. Barda, Vienna.*)—(*Not proceeded with.*) 4*d*.

This is an improvement on the electro-magnetic bath apparatus described in patent No. 1107, dated 14th March, 1881, so as to render the same applicable for animals, and especially horses.

4060. Regulating the Discharge of Secondary Batteries, &c., *A. M. Clark, London.*—20*th September*, 1881.—(*A communication from N. de Habath, Paris.*) 6*d*.

The discharge is regulated by varying the resistances, such as varying the height of the liquid in the battery.

4061. Storage and Delivery or Drawing off of Volatile and Inflammable Liquids, *H. H. Lake, London.*—20*th September*, 1881.—(*A communication from E. Judytski, Moscow.*—(*Not proceeded with.*) 4*d*.

This relates to the storage and delivery of naphtha and other volatile and inflammable liquids, and it consists of a main reservoir enclosed in beton or stone, fitted with pipes and a force pump to deliver the liquid to a drawing-off vessel. Extinguishers are provided by means of which carbonic acid gas can be supplied to the reservoir when required.

4062. Shredding Sugar Cane, *W. P. Thompson, Liverpool.*—21*st September*, 1881.—(*A communication from G. A. Bazé, Havana.*) 6*d*.

A horizontal drum has a series of curved blunt-edged blades fixed radially upon it, and revolves within a semi-cylindrical shell within which are fixed series of converging blades, between which the drum blades pass, suitable opening being provided in the case for the introduction and discharge of the cane. A grating composed of parallel bars is fixed in the feed hopper, and the drum blades pass between the bars and break down through the grating the cane that is thrown upon it.

4063. Hair-pins, *A. M. Clark, London.*—21*st September*, 1881.—(*A communication from M. T. Foote, Boston, U.S.*) 4*d*.

This relates to a hair-pin, the ends of which are first bent outwards and then inwards, the object being to form a clasp which seize the lock of hair, and prevent the loosening and accidental slipping out of the pin.

4064. Lifting or Digging Potatoes, &c., *J. Anderson, Monifeth, N.B.*—21*st September*, 1881.—(*Not proceeded with.*) 2*d*.

The object is to remove the potatoes from the ground without damaging them, and it consists in forming the reel or part of the machine which throws out or breaks up the drill of india-rubber, so that on striking or digging the crops they are not injured. The "hake" guard attached to the machine to retain the crops within any limited space when thrown out by the reel is also formed of india-rubber.

4066. Fancy Boxes, *J. Carter, Belfast.*—21*st September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to fancy boxes for carrying collars, cuffs, &c., and consists in forming a compartment therein in which is fitted a sundial adapted for showing true solar time in any position in which it may be placed by being carried on a magnet needle.

4067. Receptacles for Coins of the Various Denominations, *C. Horner, Halifax.*—21*st September*, 1881. 6*d*.

This consists of a series of cylinders of varying sizes to receive the different coins, and mounted vertically in a case, on which is a scale denoting the value of the particular coin in each cylinder, and the number and total value of the coins in each compartment is seen at a glance. The coins can be removed through a slit in the bottom of the cylinders.

4068. Carding Machines, *H. J. Haddan, Kensington.*—21*st September*, 1881.—(*A communication from Gouchez et Cie., France.*)—(*Not proceeded with.*) 2*d*.

This consists in the application of a scraping or sweeping roller for removing the flocks or fibres from the fancy roller, and transmitting them to the cylinder, so as to be able to dispense with the top cards, which prevent a proper supervision of the machine.

4069. Improvements in and Relating to Indicating Apparatus or Signals for Railway Switches or Points, *W. P. Thompson, Liverpool and London.*—21*st September*, 1881.—(*A communication from W. W. Gary, Boston, U.S.*) 6*d*.

The object of this invention is to give advancing trains notice of the position of points whilst the trains are still distant from them, and is carried out as follows:—A switch, a magneto-electric generator, and a signal, are so combined that the movement of the switch will cause the generator to actuate the signal.

4070. Improvements in and Relating to Indicating Apparatus or Signals for Railway Switches or Points, *W. P. Thompson, Liverpool and London.*—21*st September*, 1881.—(*A communication from W. W. Gary, Boston, U.S.*) 6*d*.

This invention consists in causing the train to operate the signal indicating whether points are open or closed. A signal, a magneto-generator, operated by a passing train, and a circuit-closing device and a switch are so connected that the circuit will be opened or closed by the act of opening and closing the switch. The signal is normally at danger, whilst the circuit is closed as well as the switch. An approaching train will actuate the generator, from which a current will be sent to the signal, which will fall and indicate safety, if the switch be closed. If it be open, the circuit will be broken, no current will be sent to the signal, which will consequently remain at danger, warning the driver of the train that the switch is open.

4071. Leno or Gauze Cloth, *T. Bottomley, near Bradford.*—21*st September*, 1881. 2*d*.

In order to produce a cloth which is soft to the hand, light, firm, and can be produced at a little cost, woollen or angola wefts are woven into a leno or gauze warp.

4072. Manufacture of Coloured Sized Yarns, *F. A. Gatty, Accrington.*—21*st September*, 1881. 2*d*.

This relates to dyeing and sizing yarns of cotton or other vegetable fibre, and consists in impregnating the yarns with the liquid colours or mordants, holding in suspension from 6 to 8 oz. of flour, farina, starch, or other farinaceous substance for every gallon of liquid, and then exposing the impregnated yarns to the action of steam or other moist heat for about ten minutes, so as to burst the cells of the farinaceous substance and thicken the colour or mordant upon the yarns, which thus become sized and dyed at the same time.

4073. Show-cases for Needles, &c., *A. W. L. Reddie.*—21*st September*, 1881.—(*A communication from L. G. Blood, New York.*)—(*Not proceeded with.*) 2*d*.

This consists in the combination of a box or case formed with cells having their upper portions open at the front, spring pushers being arranged in each cell; retainers, each overlapping the sides, and preferably also the back of the cell, and having an open centre and front to permit of the top paper of needles being displayed, and to permit of the finger being placed upon the top paper to draw it outwards, securing devices being provided to hold the retainers down upon the tops of the cells.

4074. Ornamental Fabric Applicable to the Manufacture of Skirts, Mantles, &c., *J. F. Wanner, London.*—21*st September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to the production of a fabric having the like embroidery stitch pattern on its opposite sides, and capable of being made up with either side outwards or uppermost.

4075. Wooden Boxes, &c., *J. Womersley, Norwich.*—21*st September*, 1881. 6*d*.

This relates to improvements on patent No. 3141, A.D. 1872, and consists in forming the four sides of wooden boxes from one length of wood by cutting grooves at the parts to form the corners, such grooves being formed of a semicircular form at the bottom, and the sides being V-shaped. A machine is described for cutting the grooves.

4076. Cases for Holding Cigarette Papers, *E. B. Burr, Walthamstowe, and W. T. Scott, Stratford.*—21*st September*, 1881.—(*Not proceeded with.*) 2*d*.

A number of cigarette papers are placed in a case furnished with a hinged lid, on the inner face of which is a spring to press on the top paper. The end of the spring is coated with an adhesive substance so as to carry with it the top paper when the lid is opened.

4077. Holding and Controlling Blind and other Similar Cords, *Sir C. H. Pennell, Cornwall.*—21*st September*, 1881.—(*Not proceeded with.*) 2*d*.

The check string passes through two plates or pieces of wood, the compression of which acting upon the string regulates the action of the blind, one of the plates being fixed to the window frame and the other actuated by screw pressure.

4079. Motive Power Apparatus Actuated by Horses, &c., *E. Edwards, London.*—22*nd September*, 1881.—(*A communication from O. Leinbrock, near Dresden.*)—(*Not proceeded with.*) 2*d*.

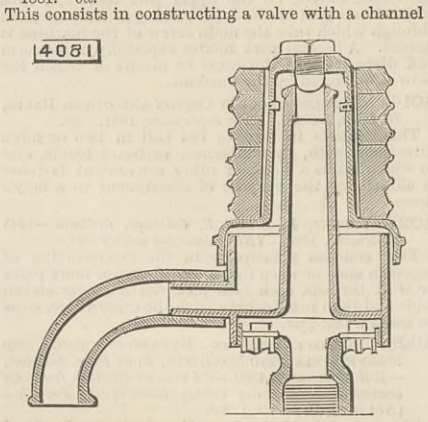
The horse is attached by harness to a post and stands on a movable floor composed of laths secured to an endless chain passing over wheels on transverse shafts. As the horse tries to move forwards he forces the floor backwards and so actuates the transverse shafts.

4080. Straightening, Punching, Barbing, Coiling, or Cutting into Lengths Metallic Wire, &c., *R. Pemberton, jun., Warrington.*—22*nd September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to means for making a kind of barbed wire fencing, and it consists in passing the wire from a coil mounted on a reel to two sets of straightening rolls, thence over a punch worked by a cam, then through mechanism which inserts a steel ribbon into the punched holes, then between dies which cut off the piece of ribbon and stamp it into the desired barb form, pressing the barbs alternately to opposite sides.

4081. Safety Valves for Water-heating Apparatus, *J. Challender, Manchester.*—22*nd September*, 1881. 6*d*.

This consists in constructing a valve with a channel



or cup around the central pillar of the said valve, and with a weighted shell or cap without upper openings, so that the escaping steam or water is directed downward into the said channel or cup. An opening in the side of the said channel or cup is provided with a spout which curves outward and downward, through which the steam or water is discharged in a downward direction on to the fire. The invention further consists in providing the valve with one or more lifting air-inlet valves, so as to prevent the formation of a vacuum within the boiler or hot-water apparatus.

4082. Steam Generator Furnaces, &c., *L. Shaw and P. T. Fletcher, Manchester.*—22*nd September*, 1881. 6*d*.

The object is to promote the combustion of the fuel, so as to avoid the emission of smoke to a great extent, and it consists in constructing a bed of tiles or fire-brick between the back end of the grate and the bridge, which is placed further back than usual, and an air inlet passage is formed between the end of the grate and the bed. The latter is covered with a layer of incandescent fuel, and the products of combustion flowing from the furnace meet the upward issuing current of heated air, and mixing with it becomes consumed as it passes over the bed of incandescent fuel.

4083. Measuring Water, *W. Richards, Norwood-road.*—22*nd September*, 1881. 8*d*.

This relates to water meters capable of bearing a high or low pressure and registering the actual quantity passed with accuracy, and it consists in providing piston meters with a metal cylinder closed at top and bottom and made in several parts. This cylinder is divided into three chambers by fixed partitions with central orifices, the lower chamber containing the piston sliding on a vertical tube, within which is a rod with a flange at its lower part and a knob at top, and which acts upon the covers of the valves. The middle chamber also contains a piston fixed to a vertical tube extending through the upper partition and sliding upon the rod mentioned. This tube is connected to the lower valve cover. In the upper chamber is the water inlet provided with a guard to reduce any suitable pressure, and also containing a valve-box with seats for two valves, each having three ports and fitted with a slide valve.

4084. Racquets, *A. Hodgkinson, Manchester.*—22*nd September*, 1881. 6*d*.

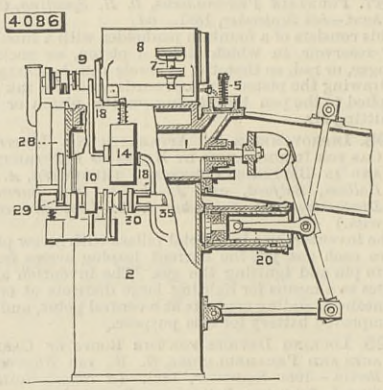
This consists in passing the cords or strings through the frame of the racquet, so that they are level with the top of the frame, either on one side only, or on both sides.

4085. Shaping and Moulding Clay for Making Bricks, &c., *C. H. Murray, Southwark.*—22*nd September*, 1881. 6*d*.

This relates to the dies for shaping clay, and consists in forming each side of such dies of a cheek or plate with grooves on its acting surface communicating with a pipe supplied with lubricating material, such side plates extending the whole length of the die, and having porous material arranged in front covering the whole surfaces thereof.

4086. Gas Engines, *J. Atkinson, Finsbury Park.*—22*nd September*, 1881. 8*d*.

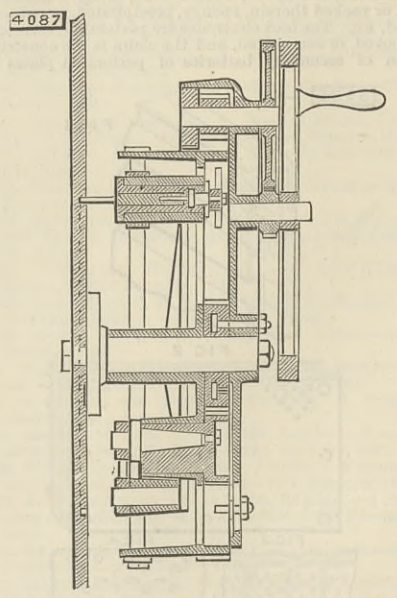
This relates to engines in which power is obtained by the ignition and subsequent expansion of a combustible mixture of gas and air. The cylinder 1 is fixed in a water tank 2 forming the base of the engine, and in it works a piston connected to the crank pin. Air is drawn in through valve 5 with a little water regulated by a cock, the compressed air being delivered through valve 7 to the compressed air chamber 8, from



which it passes by valve 9 to the power end of the cylinder, the valve being operated by a cam 10 and lever, such cam also operating the gas admission valve 14 which is actuated or disengaged by the governor. The gas passes by pipe 18, and mixing with the air is conveyed by another pipe to the cylinder; 20 is the gas pump driven from the piston crosshead. The ignition slide 28 is driven from crank 29, and the cam 30 regulates the exhaust, both being fixed on shaft 35 driven from the crank shaft.

4087. Cutting Holes in Metal Plates, *J. H. Smiles, Stockton-on-Tees.*—22*nd September*, 1881. 6*d*.

This consists essentially in apparatus for cutting circular or elliptical holes, or both (taper or not), in metal plates, the said apparatus being provided with



a spindle attachable to, or connectable directly with, the plate at the part to be cut out, the said spindle or upright forming the working centre of the machine and supporting or steadying the apparatus.

4088. Treatment of Sewage and Refuse Matters, &c., *H. E. Newton, London.*—22*nd September*, 1881.—(*A communication from L. de Rousson, Paris.*) 4*d*.

The object of this invention is to first disinfect or deodorise sewage and different animal refuse, and then extract the nitrogen from them under the form of ammonia or ammoniacal salts, and it consists in treating the matters with an astringent, such as tannin, gall nuts, or other tanning material, and by the addition of a small quantity of milk of lime the sulphohydric acid is rendered practically inodorous, after which sulphate of iron or manganese is added to fix the ammonia by forming a sulphate of that base. The mixture is then mixed with an alkaline liquor and milk of lime and heated in a vessel, the vapours being condensed.

4089. Brakes for Railway Carriages, &c., *L. Silvermann, Westminster.*—22*nd September*, 1881.—(*Not proceeded with.*) 2*d*.

The power for operating the brakes is obtained from the motion of the train itself by employing the rotary motion of the axles to coil a chain upon a barrel on the axle, such chain having one end fixed to the barrel and the other to a spring secured to a shaft carrying another drum connected by a chain or rod with the lever by which the brake blocks are applied to the wheels.

4090. Cleansing Floors, &c., *W. Saunders, Stepney.*—22*nd September*, 1881.—(*Not proceeded with.*) 2*d*.

To a block of wood of triangular form a handle is secured, and to the opposite sides are pivotted arms to carry an india-rubber roller, which acts as a "squeegee." On the side of the block which comes nearest the surface to be cleaned is attached an ordinary cleaning brush.

4092. Cutting and Binding Corn Crops, *J. Howard and E. T. Bousfield, Bedford.*—22*nd September*, 1881. 6*d*.

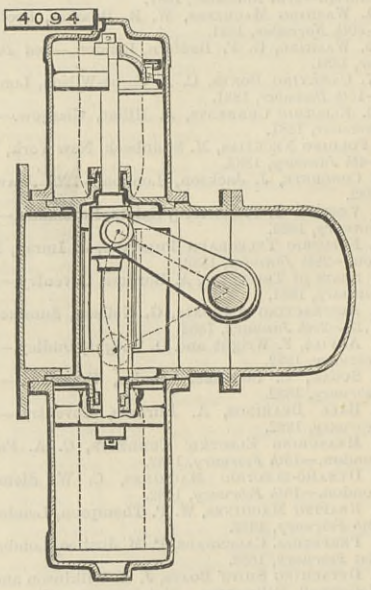
To impart the to-and-fro motion to the sickle of a "Marsh harvester" a lever is fitted to vibrate on a stud, and to one end of it a Pitman rod is attached, while its other end is connected by a rod to the sickle. The mechanism for actuating the binding apparatus and the gathering reel consists of a shaft passing from the rear to the front of the machine, and is cranked in the middle to give a to-and-fro motion to the packing levers. At the rear end of this shaft is a chain wheel, to which a chain extends from the Pitman crank wheel; at the front this shaft carries a bevel pinion to drive the gathering reel, and it also carries a pinion and clutch to drive the binding mechanism. The invention also relates to means for maintaining a proper tension of the canvas webs or aprons; and, further, to means for obtaining a more perfect control of the movable jaw of the knotting hook in the hook device described in patent No. 8[illegible] A.D. 1880.

4093. Improvements in or Connected with Electric Cables, *E. G. Brewer, London.*—22*nd September*, 1881.—(*A communication from P. B. Delany and E. H. Johnson, New York.*)—(*Not proceeded with.*) 2*d*.

This invention is intended to avoid the pressure on the wires of a cable enclosed in a lead pipe, whereby their insulation is endangered, which is effected by forming the intervening lead walls, which separate the various wires, of material which is wholly or partly added to the body of the pipe.

4094. Pumps, *F. P. Preston, J. T. Prestige, and E. J. Preston, Deptford; E. W. de Russett, Anerley; and J. A. Fowler, Deptford.*—22*nd September*, 1881. 1*s*. 8*d*.

This consists essentially in the combination of parts forming the improved pump, in which the barrels of two horizontal or multi-acting pumps are placed opposite to one another in a horizontal or inclined direction, and having a common valve box with one



set of valves and with or without fixed pump barre covers, and containing the working gear for actuating the pistons. The drawing shows a longitudinal vertical section of one arrangement.

4095. Chromatic Printing Machinery, *H. H. Lake, London.*—22*nd September*, 1881.—(*A communication from J. A. Heuse and G. Jouanny, Paris.*) 6*d*.

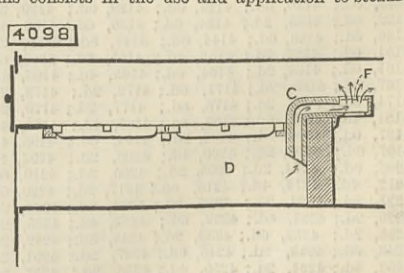
This relates to machines for printing various colours upon a continuous web, and it consists in leading such web of paper from the reel to a cylinder upon which are devices for securing the registering of the separate colours. The paper goes thence to a small roller from which it passes tangentially to a blanket cylinder in direct frictional connection with two cylinders carrying the plates bearing the design to be printed. The paper receives one colour from the first cylinder, and another colour from the second, after which it passes to a drying apparatus, and is dried in the air.

4096. Boxes for Carrying Bottles, *J. Nall, Penistone, York.*—23*rd September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to strengthening the bottom of the box by means of pins passed through the ends and bottom and then rivetted over.

4098. Steam Boiler Furnaces, *W. Ireland, Macclesfield.*—23*rd September*, 1881. 6*d*.

This consists in the use and application to steam



boiler and other furnaces of a hollow or cellular bridge C, formed of a series of separate air passages fitted with grids or gratings F, and each communicatin with the ashpit D.

4099. Unhairing, Fleshing, &c., Hides, Skins, or Pelts, *J. W. Janson, London.*—23*rd September*, 1881. 6*d*.

This relates to improvements on the "Molinier" machines, so that the skin may be worked simultaneously upon both sides, and consists in placing a second knife cylinder under the ordinary india-rubber roller,

and another india-rubber roller beneath the ordinary knife cylinder.

4100. BEER, *H. A. Bonneville, Paris.*—*23rd September*, 1881.—(*A communication from D. Cornilliac, wife of A. Ralu, Paris.*)—(*Not proceeded with.*) 2*d*.

"This relates to the addition of the febrifuge, antiseptic, stomachic, and antispasmodic principles of orange peel, lemon peel, angelica root, and of the flowers and leaves of wormwood to that peculiarly refreshing analeptic and depuratory beverage beer, and to gaseifying the beer thus produced."

4101. CLEANSING, POLISHING, COLOURING, AND DYEING BUILDINGS, &c., *Baron G. J. C. Liebhaber, France.*—*23rd September*, 1881. 6*d*.

This relates to the use of sulphuric and hydrochloric acid for cleansing stone and other materials, suitable colouring matters being employed to produce the desired colour.

4103. COMBINED CRAMP, NAIL DRIVER, PUNCH AND GAUGE FOR USE WHEN WORKING FLOORING AND OTHER BOARDS, *J. Hardinge, Westminster.*—*23rd September*, 1881.—(*Not proceeded with.*) 4*d*.

This relates to a metal cramp actuated by a ratchet motion by pawls hinged in the upper part, and working in a serrated tongue having also a breast-plate to press horizontally against the unnailed boards. The upper part and front end of the cramp has two arms, between which is swung a shoe to receive a lever or tube in which works a piston forming the nail driver.

4104. PULVERISING AND TREATING OF DIAMONDIFEROUS "BLUE-GROUND" AND OTHER SIMILAR EARTHY MATTERS, &c., *A. J. Struthers, Hawick, N.B.*—*23rd September*, 1881. 6*d*.

The diamond-bearing earth is first softened or treated by steam, hot water, or very dilute acid within the machine, in which it is conveyed or fed forward to beating rolls to be broken up, and thence to sieves or gratings and a crushing cylinder or cylinders to break down the softer earthy matter while leaving the diamonds or hard stone unbroken.

4105. WINDING THREAD ON COP-TUBES OR SPOOLS, &c., *R. Spöndlin, Zurich.*—*23rd September*, 1881.—(*A communication from the Baumwollspinneri and Zwirnerei, Niederutter, Zurich.*) 8*d*.

This consists in a new method of winding thread on paper tubes by covering the inner layers of thread by the outer layers, so that every successive layer is longer than the preceding one and completely covers it.

4106. LAMPS FOR BICYCLES AND OTHER VELOCIPEDES, &c., *J. E. Leeson, Oldham.*—*23rd September*, 1881. 8*d*.

This relates, First, to a spring appliance placed between the lamp and the bicycle, so as to prevent the lamp being extinguished when travelling over rough roads; and Secondly, to the means for attaching the lamp to the axle.

4108. UMBRELLAS, *H. A. Davis, Finsbury Park.*—*23rd September*, 1881.—(*Not proceeded with.*) 2*d*

This relates to means for causing the ribs when closed to lie in close proximity to the stick, and consists in making the stretchers lie within recesses in the notch, and form a receptacle or channel for the ribs which lie within the stretchers.

4109. CURTAIN ROLLERS, &c., *M. F. Rust, London.*—*23rd September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to rollers in which cords, levers, ratchet wheels, and pawls are employed for winding and unwinding the curtain from the roller. The roller is of wood, with metal axes to work in the brackets, which may be placed either vertically or horizontally. One end has a spool to receive the cord, and also a ratchet wheel to hold the curtain in any position by a pawl attached to the cord lever.

4111. DRESSING CASES, &c., *T. H. Mann, London.*—*23rd September*, 1881. 6*d*.

This relates to dressing cases in which side trays or wings are caused to swing outwards on the raising of the lid, the bottom drawer remaining stationary; and it consists of means to cause such drawer to be opened and display its contents at the same time as the side trays.

4112. PRINTING COLOURS ON FIBRES AND FIBROUS SUBSTANCES, *J. W. Stringer, Bradford.*—*23rd September*, 1881. 6*d*.

This relates to an arrangement of printing rollers so as to allow of printing in one machine two or more colours on the sliver of fibrous substances, and it consists in the use of an ordinary slubbing printing machine, which delivers the fibres in a thin flat sliver through the gill-box to the first printing roller, supplied with colour by a felt-covered roller revolving in a colour-box, the sliver passing between the printing roller and a roller covered with india-rubber. The sliver then passes to a second printing roller and receives the other colour desired.

4113. MACHINERY FOR TUNNELLING, &c., *J. D. Brunton, Westminster.*—*23rd September*, 1881. 8*d*.

This relates to improvements on Brunton's tunnelling machine, and consists, First, in an improved method of supporting the machine in the tunnel so as to render it more steady, and at the same time not to interfere with its continuous progression; Secondly, to an improved method of lubricating the chucks and parts adjacent thereto; Thirdly, to a method of applying water to the face of the tunnel while excavating; and Fourthly, to the construction and arrangement of the chucks and cutters.

4114. RAISING AND FORCING WATER, &c., *W. Rainbow.*—*23rd September*, 1881. 6*d*.

This consists in injecting steam or air into the pipe that communicates with the water to be raised, and causing it to pass through a nozzle and receiving cone which leads to the delivery pipe.

4115. FLOOD VALVES FOR DRAINS, *F. Dyer, Camden Town.*—*23rd September*, 1881. 6*d*.

The object is to prevent the inroad of high tides and floods into buildings through the drain pipe, and it consists in forming a valve chamber in the drain pipe, and placing within it a ball float, which, when the valve chamber is filled, completely closes the passage in the drain pipe.

4116. DRAWING CORKS FROM BOTTLES, *J. W. Nottingham, Surrey.*—*24th September*, 1881.—(*Not proceeded with.*) 2*d*.

An ordinary corkscrew is fitted to turn in a collar fixed at one end of a slotted lever acted upon by a combination of other levers, one of which is attached to a standard upon a circular collar or ring to encircle the neck of the bottle.

4118. GIVING CHANGE FOR MONEY, *G. E. Absell, Kentish Town.*—*24th September*, 1881. 6*d*.

This relates to apparatus in which, on a coin being dropped into the proper receptacle, coins of smaller denomination are given in exchange, and it consists in causing the coin inserted to operate mechanism whereby a plate placed under the receptacles for the coins to be given in exchange is released, and can be moved forward so as to allow the requisite coins to pass out of the case. If the coin is not inserted in its proper receptacle, the plate remains locked.

4119. LATHS FOR VENETIAN BLINDS, *A. M. Ross, Edinburgh.*—*24th September*, 1881.—(*Not proceeded with.*) 2*d*.

The laths are made of wood and covered with paper of any desired colour or design.

4120. MECHANICAL CUTTING OR DIVIDING OF STRIPS OF CHENILLE, *W. P. Thompson, Liverpool.*—*24th September*, 1881.—(*A communication from E. Lepainteur, Paris.*) 6*d*.

This consists in providing the intervals formed between two groups of threads in weaving chenille with a guide formed of two threads, and which constitute an intermediate strand, and between which the cutting blades of any form are made to pass, so as to insure regularity of cutting.

4121. DRIVING BICYCLES AND OTHER VELOCIPEDES, *T. E. Heath, jun., Glamorgan.*—*24th September*, 1881. 6*d*.

This relates to a method of applying the driving force to velocipedes, whereby the rate between the distance travelled by the periphery of the driving wheel and by the pedals may be varied as required; and it consists in applying to the driving axle two drums, each free to revolve in a backward direction, but which when pulled forwards carries the axle round with it by means of ratchets and pawls. To each drum a chain is attached, the other end being secured to the pedal lever, so that they can be shifted along the latter and fixed at various distances from the fulcra, thus varying the speed of the driving wheel.

4122. POCKET COMBINATION KNIFE, FORK, AND SPOON, *L. A. Groth, London.*—*24th September*, 1881.—(*A communication from F. Praunegger, Austria.*) (*Not proceeded with.*) 2*d*.

This consists of a knife, fork, and spoon so combined that they are contained in the handle of the knife, the bowl of the spoon only being outside the handle.

4123. CLOSING OR STOPPERING BOTTLES, &c., *L. A. Groth, London.*—*24th September*, 1881.—(*A communication from F. Praunegger, Austria.*)—(*Not proceeded with.*) 2*d*.

This consists in the employment of an elastic closing pad and of a gripping appliance on bottle or pot-like vessels of glass, porcelain, or other suitable material, the rim or flange of the neck of such vessels being formed with projections at opposite sides to form hold-fasts for the gripping appliance, which consists of a capsule with arms to pass under the projections and compress the elastic pad.

4125. COMBING WOOL AND OTHER FIBRES, *J. F. Harrison, Bradford.*—*24th September*, 1881. 6*d*.

This relates to improvements on patent No. 2009, A.D. 1881, and consists in so adapting a nip to the large circular comb that by means of one pair of drawing off rollers practically the whole of the combed tuft is seized and drawn into a sliver of top, no combed fringe being left as hitherto on the inside of the large circular comb after the said rollers have drawn the sliver, thereby obviating the necessity of employing an additional pair of drawing-off rollers, and consequently of drawing off two slivers as at present.

4126. CONDENSING VAPOURS ARISING FROM THE EVAPORATION OF CANE JUICE, &c., *A. Chapman, Liverpool.*—*24th September*, 1881. 6*d*.

The object is to effect economy in the water employed for condensing the vapours arising from the evaporation of cane juice or other liquors, and it consists in combining an open surface condenser with other parts, so that the vapour condensed in the tubes may be returned in the shape of water over the tubes, and so be utilised to condense the further vapour entering the tubes.

4127. FIRE-ALARM WIRE OR COMMUNICATOR, *B. J. B. Mills, London.*—*24th September*, 1881.—(*A communication from P. A. Charpentier, Paris.*) 2*d*.

The wire through which an electric current is to pass and cause an alarm to sound in case of fire, consists of two copper wires, the ends of which will be connected by means of a metallic soldering effected by the rise of temperature.

4129. SPINNING, DOUBLING, AND PREPARING COTTON, &c., *J. Bastow, Bradford.*—*24th September*, 1881. 6*d*.

This relates to "cap spinning," the objects being to obtain greater uniformity of twist, and enable a longer length to be spun on one bobbin; and it consists in the use of apparatus which will vary the speed of the rollers delivering the fibre to the cap spindles, as the amount of yarn or the diameter on the bobbins is increased by the winding-on process. One mode of effecting this consists of a pair of driving cones which act as an intermediate gearing between the driving shaft and the wheels actuating the delivery rollers, one cone being geared to the driving shaft and the other to the delivery rollers, with a driving strap passing over the two cones.

4130. MANUFACTURE OF PULP FROM CARDBOARD, &c., *W. C. Horne, Bexley.*—*24th September*, 1881.—(*Not proceeded with.*) 2*d*.

The object is to produce cardboard, &c., which shall be both luminous and damp-proof, and it consists in adding to the pulp a phosphorescent powder, and gelatine and saturated solution of bichromate of potash.

4131. MANUFACTURE OR TREATMENT OF LACE CURTAINS, &c., *W. C. Horne, Bexley.*—*24th September*, 1881. 2*d*.

This relates to means for rendering lace curtains and other analogous articles luminous and damp-proof by treating them with phosphorescent powder, and gelatine and bichromate of potash.

4132. OPENING ASBESTOS, &c., *J. Allport, London, and A. Hollings, Salford.*—*26th September*, 1881. 6*d*.

The blocks of asbestos are subjected to a compound knuckle-like action, one being a tearing or drawing motion in one direction, and the other a motion lateral thereto. The apparatus to effect this may be varied, a suitable form consisting of two toothed rollers of pyramidal form caused to rotate with equal or differential surface speed, and one caused to traverse laterally a short distance whilst rotating by means of a cam or otherwise.

4133. PURIFICATION OF ILLUMINATING GAS, &c., *L. T. Wright, Beckton.*—*26th September*, 1881.—(*Void.*) 2*d*.

As the gas leaves the hydraulic main on the way to the exhauster, it is mixed with a small quantity of atmospheric air, and then cleared of tar in a condenser, after which it is heated to from 400 deg. to 500 deg. Fah. by passing through tubes heated by the waste products of combustion from the retorts. The gas is then cooled and passed through closed vessels containing moist animal charcoal.

4134. ALTERING AND ADJUSTING THE ANGLE OF TOILET LOOKING-GLASSES, &c., *E. W. Elmslie, St. Leonards-on-Sea.*—*26th September*, 1881. 6*d*.

The stand consists of an under stationary frame carrying the standards, and a movable or sliding slab to which the bottom of the glass is attached by a hinge.

4135. SHOES FOR WARMING THE FEET, *G. H. Ellis, London.*—*26th September*, 1881.—(*Not proceeded with.*) 2*d*.

The soles of the shoes are made of a hollow case capable of being filled with hot water for the purpose of warming the feet.

4136. APPLIANCES FOR HEATING BY STEAM, *W. Truswell, Sheffield.*—*26th September*, 1881. 6*d*.

This relates to apparatus for heating buildings by means of low-pressure steam, and it consists of a boiler of any suitable construction, to which is connected a water supply pipe provided with a back-pressure valve, such pipe being also connected to a supply cistern close at top and communicating near the bottom with a feed cistern, the supply of water to which is controlled by a ball tap. A chamber connected by a pipe with the boiler is fixed above the level of the water supply, and one or more circulating pipes draw their supply of steam from this chamber and return it to the supply cistern, which is fixed at such a height that the pressure of water will raise the back-pressure valve and keep the boiler always sufficiently charged with water.

4137. OBTAINING MOTIVE POWER BY MEANS OF COMBUSTIBLE GAS OR VAPOUR, &c., *R. Watson, Glasgow.*—*26th September*, 1881. 6*d*.

This consists in the system or mode of obtaining motive power by burning a combustible gas or vapour under pressure, wherein air and the gas or vapour are compressed and are burned continuously, and an engine is worked like a steam engine by the increased pressure due to the burning.

4139. COATING AND PRESERVATION OF METALS AND METALLIC SURFACES, &c., *T. S. Webb, New Kent-road.*—*26th September*, 1881. 4*d*.

This consists in coating all surfaces not destroyed by exposure to a red heat with glasses containing as essential constituents protoxide of lead, boracic acid and silicic acid, and varying in composition from 73·3 per cent. protoxide of lead, 14·6 per cent. boracic acid, and 6·1 per cent. silicic acid, to 89·3 per cent. protoxide of lead, 7·5 per cent. boracic acid, and 3·2 per cent. silicic acid, and applying such compounds to the articles under treatment, preferably when held in suspension in water or paraffine oil as a bath under pressure, and subsequently heating.

4140. MULES FOR SPINNING WOOL, COTTON, &c., *T. H. Blamires, Huddersfield.*—*26th September*, 1881. 8*d*.

This relates to the employment of apparatus whereby the return or back scroll band is dispensed with.

4142. CONSTRUCTION OF WHEELS OR PULLEYS, *C. F. Brodie, Aberdeen.*—*26th September*, 1881.—(*Not proceeded with.*) 2*d*.

The wheels or pulleys are constructed with removable rims or tires.

4143. PRODUCTION OF EMBROIDERY, *J. Renals, London.*—*26th September*, 1881.—(*A communication from J. Steiger, Herisan, Switzerland.*) 6*d*.

This relates to the production of guipure embroidery, and the embroidery upon loose or open fabrics, such as net, by means of the embroidery machines.

4144. APPARATUS FOR CHECKING THE RECEIPT OF MONEY TAKEN FOR THE USE OF PUBLIC WATER-CLOSETS, &c., *J. N. Maskelyne, London.*—*26th September*, 1881. 6*d*.

Applied to the inside of the door of the water-closet or lavatory is a bolt to be shot by the person using the closet, which will actuate a counting mechanism.

4145. SOCKETS FOR CASTORS, *D. Mackie and J. C. Jopson, Birmingham.*—*26th September*, 1881.—(*Not proceeded with.*) 2*d*.

The sockets are made solid, drawn from wrought metal.

4147. ROASTING COFFEE, CHICORY, &c., *W. R. Lake, London.*—*26th September*, 1881.—(*A communication from D. Strang, New Zealand.*) 8*d*.

This relates to the process of roasting coffee, chicory, cocoa, and other like substances, by hot air instead of by the hot fumes and gases arising from the combustion of charcoal or other fuel.

4148. JOINTS OR APPARATUS FOR SUSPENDING OR SUPPORTING SWING LOOKING GLASSES, &c., *H. Skerrett, Birmingham.*—*26th September*, 1881.—(*Not proceeded with.*) 2*d*.

According to one arrangement the axis of the joint on which the swing looking glass turns is made split or divided longitudinally nearly through its whole length, the solid or undivided end being attached to a carrying plate which is affixed in a central position to the side or edge of the frame of the swing looking glass.

4149. TREATING COPPER AND PRODUCING THEREBY A NEW METAL OR ALLOY, *A. Getchell, Boston, U.S.*—*26th September*, 1881.—(*Not proceeded with.*) 2*d*.

This consists in adding to the copper when at or near a red heat a composition composed of potash (or soda), alum, bone dust (or other phosphate), and zinc (or tin).

4150. APPARATUS FOR DISPLAYING CLOTHING IN SHOP WINDOWS AND OTHER PLACES, *F. McIlvenna, Liverpool.*—*27th September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to a means for dispensing with the set screws, springs, &c.

4151. FIREPLACES AND GRATES FOR WARMING ROOMS, &c., *W. P. Thompson, Liverpool.*—*27th September*, 1881.—(*A communication from J. M. Cook, Cincinnati, U.S.*) 6*d*.

The fireplace grate is constructed of a back-plate, a grated fire-box adjacent thereto, and provided with a smoke-flue projecting through an opening in said back-plate, and a fire-box inclosing and retaining frame, which forms an ornamental front, and is perforated to allow the heat radiated from the rear of the fire-box to enter the room.

4152. APPARATUS FOR HEATING DWELLING-HOUSES, &c., *W. R. Lake, London.*—*27th September*, 1881.—(*A communication from B. R. Hawley, Chicago, U.S.*)—(*Not proceeded with.*) 2*d*.

Air is employed as a circulating or heating fluid. The air is given a continuous and rapid movement in an endless path through a heater, suitable conducting pipes and sheet metal radiators.

4153. STOP COCKS FOR LIQUIDS AND GASES, *H. Hughes, Loughborough.*—*27th September*, 1881. 4*d*.

This relates to the insertion of an india-rubber or elastic lining cemented or fastened in the stop cock.

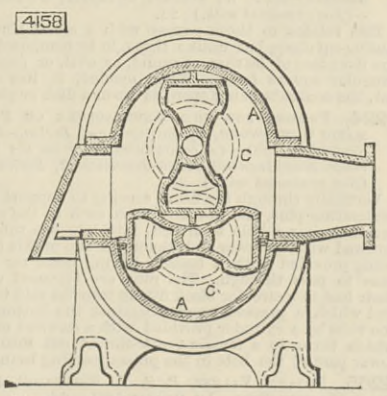
4155. NAVIGABLE VESSELS, &c., *C. Simpson, Liverpool.*—*27th September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to a new construction or adaptation of the hull of a ship or vessel to make it suitable for a novel system of and apparatus for propelling by the action of steam, and the alternate ejection and indrawal of water.

4158. ROTARY BLOWERS AND PUMPS, *F. M. Roots, Connersville, U.S.*—*27th September*, 1881.—(*Complete.*) 6*d*.

This relates to rotary blowing engines and pumps in which two or more rotating abutments co-act together and with the shell in which they are encased to force a current of air or gas in one direction without permitting backward escape under pressure. The case consists of two semi-cylindrical flanged shells A secured between end-plates, and in it the rotating abutments C are mounted one above the other, the form of which will be seen in the drawings. Means are provided to adjust the abutment shafts in case the bearings wear unequally.

4158



4160. TUNNELLING AND ROCK-BORING MACHINERY, *F. B. Doering, Trefriw, North Wales.*—*27th September*, 1881. 6*d*.

This consists partly in the combination with the twist bar of a second or check bar and other parts, for the purpose of effecting the turning of the tool with certainty; also constructing rock drills or boring machines with a piston valve at each end of the cylinder, and with a port at each end at right angles to the cylinder. Other improvements are described relating to the air compressors.

4162. MANUFACTURE OF PAPER PULP, *H. Olrick, London.*—*27th September*, 1881.—(*A communication from M. L. Keen, Monroe County, U.S.*)—(*Not proceeded with.*) 2*d*.

The invention is applicable to boilers of any form, but by preference spherical, revolving on suitable horizontal trunnions, and adapted to receive a liberal quantity of stock and to expose it to the action of chemicals with heat. Steam is admitted through the trunnions and through passages connecting therefrom, either outside or inside of the shell, leading from the trunnions to points which come alternately at the lowest and highest points of the boiler as the latter slowly revolves.

4163. TREATMENT OF BREWERS' WASTE, &c., *A. G. Salamon, Clapham Park.*—*27th September*, 1881. 4*d*.

This relates to treating the waste known as "bottoms," "grounds," and "returns," whereby the gelatinous matter contained therein is recovered in a solid or semi-solid form, and the fluid portion in a bright state.

4164. CHRONOGRAPHS, *W. H. Douglas, Stourbridge.*—*27th September*, 1881. 6*d*.

This relates to improvements in chronographs by which an extra minute hand and dial index and an extra second hand are shown with the ordinary hands upon the usual dial face; or the extra minute hand and extra second hand may be shown upon a back dial if preferred.

4166. BARRELS FOR BEER, &c., *W. Smedley, Burton-on-Trent.*—*27th September*, 1881. 4*d*.

This consists of a cup applied to a cask for holding an ordinary cork for closing the tap hole when required.

4167. BICYCLE SPRINGS AND SADDLE COMBINED, *J. F. Walters, Bayswater.*—*27th September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to a special construction or arrangement of bicycle springs and saddle combined, whereby a rigid yet sufficiently elastic or yielding seat is produced capable of adjustment to suit the height above the backbone, and also its distance from the fork.

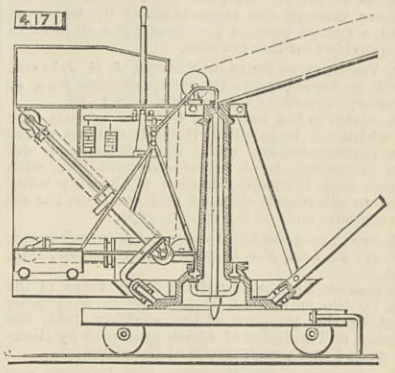
4169. PRODUCING MORE COMPLETE COMBUSTION OF GAS, &c., IN LAMPS, *F. W. S. Stokes, London.*—*27th September*, 1881.—(*Not proceeded with.*) 2*d*.

At the upper end of the glass chimney is fitted a transverse disc or cover, having an opening through its centre, preferably circular in shape, and of less diameter than the top of the chimney, the size of the opening being proportioned to the amount of light to be produced. By this arrangement the rapid passage of air through the chimney is checked.

4171. PORTABLE HYDRAULIC CRANES, *C. R. Parkes, Millwall.*—*27th September*, 1881. 6*d*.

This consists in using the cylinders, valves, and all the working parts of any movable hydraulic crane to serve as a counterpoise to the load to be raised, without the aid of the usual tail-jib balance.

4171



4172. ROUSING BEER, *F. Miller, Essex.*—*27th September*, 1881.—(*Not proceeded with.*) 2*d*.

The apparatus is in the shape of a beehive or inverted basin, thickest towards the edge and gradually thinner towards the dome, which is perforated and has attached to its top a ring by which the rouser is attached and manipulated.

4173. APPLYING ORGAN PEDALS TO PIANOFORTES, *H. J. Rummens, Brixton.*—*27th September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to applying pedals for actuating certain keys of a pianoforte, and consists in causing the pedal to release a weight or spring, which acts on the front or back end of the key by the intervention of "rollers," "trackers," "stickers," "back falls," "squares," or other suitable appliances, whereby the action of the hammer is made dependent upon that of the weight or spring, and not upon that of the pedal itself.

4175. CRUSHING OR GRINDING MILL, *W. P. Savage, Lynn.*—*27th September*, 1881.—(*Void.*) 2*d*.

The mill is provided with differential speeded rollers of about equal diameter, the speeds of such rollers being variable by changing the gearing.

4176. TREATING AND PREPARING CLAY, &c., *J. Gillespie, Garnkirk, N.B.*—*28th September*, 1881. 8*d*.

This consists in fitting angled guide plates in front of the grinding rolls in grinding pans to shift the clay across the face of the rolls, or to discharge it from the pan, and also forming a pug mill round the central driving shaft of the pan. The air contained in ground clay is driven off or forced out by means of steam. Articles of hollow-ware are supported externally while being built up by means of strips of sheet iron secured by screws, and internally by means of sand or other yielding substance which will give way to allow for shrinking. Articles of hollow-ware which are pressed out instead of being built up are made longer than required, the prolongation serving to support the article while drying. Special floats are used to transport the articles from place to place.

4177. SMOKE-CONSUMING FIRE-GRATES, *G. E. Wolff, Hamburg.*—*28th September*, 1881.—(*Not proceeded with.*) 2*d*.

The fuel is laid on a horizontal grate and kindled, and the draught is arranged to force the smoke from above to descend through the fuel and between the bars, and thence to flues and to the chimney.

4178. SUPERHEATING STEAM, *C. D. Abel, London.*—*28th September*, 1881.—(*A communication from A. Estrade, Perpignan, France.*) 6*d*.

This relates to apparatus for superheating steam in steam generators, consisting of an extension of the steam pipe into the fire-box or furnace of the boiler, such extension being surrounded by a tubular water jacket, through which the water of the boiler is made to circulate.

4179. CARDING ENGINES, *J. Beard, Ashton-under-Lyne.*—*28th September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to self-stripping carding engines, the objects being to lift the flat nearest the taker-in, clean and grind it, and put the clean flat to work near the doffer, and to repeat these operations automatically; also to set each flat separately.

4181. WALKING-STICK OR CANE WITH OPERA-GLASS COMBINED, *L. M. Promis, Philadelphia.*—*28th September*, 1881.—(*Not proceeded with.*) 2*d*.

The head of the cane is hollow, and is formed with a concealed lid, and within it is fitted an opera-glass, with the barrel made up of rings to allow of adjustment. This opera-glass is lifted out and replaced by a folding handle.

4182. MAKING PAPER AND "BOARD" FROM VEGETABLE, ANIMAL, OR MINERAL SUBSTANCES, &c., *G. Tidcombe, jun., Watford.*—*28th September*, 1881. 6*d*.

The board pulp is led between two travelling wires over larger rollers, and when set the wires that then receive it are placed out of the level for leading off the water from the pulp. The pulp then passes through a drying machine in a hot chamber between two wires or hot felts or heated plates, or streams of desiccated air are introduced to carry off the moisture. When dry, the board is slit by circular knives or saws running at a higher speed than the board, and at the same time cross-cut by heavy cross-cut knives.

4183. Bricks and Potteryware, &c., *R. Stone, King William-street.*—28*th September*, 1881. 4*d.*

River mud is run directly through corrugated rolls, and roasted ground lime, or hot or waste ground chalk, or roasted sand is added, so as to absorb the moisture, and the clay is then made up into bricks, pipes, tiles, &c., such articles, after the first burning, being allowed to cool, and then reburnt at a much higher temperature. Pipes thus formed may be used as boiler tubes, being first encased in iron pipes. The machine for moulding the articles is provided with plungers and a ram worked by cams, so as to force the clay through dies, preferably of polished plate-glass, the openings in such dies being smaller at the supply end, and for a certain distance, and of the correct size of the article at the delivery end.

4185. Treating Calcareous Bricks, *F. H. F. Engel, Hamburg.*—28*th September*, 1881.—(*A communication from J. A. A. Renck, Germany.*) 4*d.*

In order to prevent bricks cracking or breaking up by the slacking of any lime they may contain after being burned, they are brought direct from the oven whilst still warm and placed in pits, which are then filled with water. The latter combines with the lime and kills it, without causing the bricks to crack, and when the operation is completed the bricks are removed, and are then ready for use.

4186. German Yeast, *G. W. von Nawrocki, Berlin.*—28*th September*, 1881.—(*A communication from C. Paulmann, Hanover.*) 4*d.*

This consists in the manufacture of German yeast from grains by the application of sulphuric acid, or muriatic acid, or sour clarified wash residue.

4187. Heating Water by Gas for Baths, &c., *G. W. Wigner and R. H. Harland, London*—28*th September*, 1881. 6*d.*

This relates to the heating of water in circulating pipes for supplying baths, &c., and consists principally to applying or directing the flame of a burning mixture of gas and air against the outside of a portion of the circulating pipe itself which passes through the burner.

4190. Steam Engines, *H. S. Swift, Lower Norwood.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

The object is to increase the power of the engine by removing the necessity of the exhaust steam having to be forced out from the cylinder into the condenser through the same channel by which it entered, a special passage governed by a slide valve being provided for this purpose.

4192. Ventilating Ships or Vessels, *J. H. Johnson.*—29*th September*, 1881—(*A communication from C. Archer, Norway.*—(*Not proceeded with.*) 2*d.*

This relates to the use of an inverted syphon pipe from which air is expelled through suitable outlet valves communicating with the atmosphere and drawn in through inlet valves communicating with the ship's hold, the rolling motion of the ship being utilised to alternately exhaust and compress the air at the opposite ends of the syphon pipe.

4194. Apparatus for Intermitting Audible Signals, *F. W. Durham, New Barnet.*—29*th September*, 1881. 6*d.*

This consists in working the cock or valve of the signal by the movement of a piston in a cylinder subject to the pressure of the working fluid, the admission and emission of which are timed by clock-work wound up by each stroke of the piston.

4195. Compound or Mixture for Coating the Surface of Iron to Prevent the Formation of Rust, *C. J. Davidson, Wolverhampton.*—29*th September*, 1881. 4*d.*

A solution consisting of 2 oz. of gutta-percha dissolved in 12 oz. of resin spirit is boiled with 5 oz. of camphor in 2 quarts of linseed oil, and to the compound or mixture thus obtained is added a solution consisting of 3 oz. of caoutchouc dissolved in 1 lb. of turpentine, and there is added also 2 lb. of plumbago or 2 lb. of white lead, and also 3 pints of linseed oil, 1 lb. of copal varnish, and 8 oz. of liquid terebine.

4197. Umbrellas, *J. Minière, Paris.*—29*th September*, 1881. 6*d.*

This relates to an umbrella which can be closed with one hand, and consists of three parts:—First, a spring for keeping the umbrella open; secondly, a traction wire which operates the spring; and thirdly, devices for preventing the stick from being worn by the friction of the spring.

4198. Armour-plates for Ships, &c., *W. R. Lake, London.*—29*th September*, 1881.—(*A communication from H. Reusch, Dillingen-on-the-Saar, Germany.*—(*Void.*) 2*d.*

The intimate connection of the base of the armour-plate, which is of iron or soft steel, with the hard steel cast on the same, is considerably promoted or increased by treating the surface of the said base with alkaline silicates or boracic salts.

4200. Brushes for Domestic and Medical Purposes, *A. Bottin, Brussels.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

The back is made hollow so as to serve as a reservoir or receiver for any desired liquid, and a number of hollow teeth perforated at the ends or points are substituted for the hairs in ordinary brushes, so that when the brush is in use the liquid, by passing into the hollow teeth and out through the perforations therein, can be distributed as desired.

4201. Oxide of Iron, &c., *E. A. Parnell, Swansea.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in improvements which relate, in the First place, to the production of oxide of iron from sulphates of iron—ferrous and ferric—and, Secondly, to the production of oxide of iron from the chloride of iron produced in tin-plate works when hydrochloric acid is employed for pickling the iron plates, and to the recovery of hydrochloric acid therefrom.

4203. Vessel or Appliance for Heating or Retaining Heat in Liquids or Beverages, such as Milk, Tea, and Coffee, *J. T. Goudie.*—29*th September*, 1881. 6*d.*

This consists in the construction of a heating or heat retaining vessel or receptacle with an inner and outer bag of rubber, rubber and cloth, or other flexible and water-tight material, connected together to form a pocket for the reception of a bottle, flask, or other article, and also a chamber between the walls of the bags to contain hot water or other liquid, means being provided for filling in such liquid.

4204. Appliances for Securing Casements, &c., *H. Parsons, Dulwich.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in an application for securing casements and doors when entirely or partly closed, constituting at once a staybar and fastener inaccessible from outside.

4205. Counting and Arranging Needles for Papering, *V. Milward, Worcester.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

Fixed on the base plate of the machine is a pair of guide rails upon which a needle receiving plate having raised sides works. Upon the said guide rails is supported a rectangular compound hopper, the said hopper consisting of a box open at top and bottom and divided by a series of vertical parallel plates into the required number of divisions. Into these divisions the needles of different sizes to be counted and arranged are put. The open bottom of each compartment of the compound hopper is occupied by a roller or cylinder having in its cylindrical surface one, two, or more longitudinal grooves or depressions. One end of each roller is provided with a pinion, and the teeth of a horizontal rack engage with the said pinions so as to couple or gear the whole of the rollers together. By passing the rack backwards and forwards, rotary motion is simultaneously given to the whole of the rollers, the motion of the rack being limited to the range necessary to produce a complete rotation in each roller.

4206. Washing Clothes, &c., *T. W. Walker, Hanley.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to the construction of self-acting washing machines or portable circulating clothes boilers.

4210. Boats or Vessels, *S. Pitt, Sutton.*—29*th September*, 1881.—(*A communication from R. P. Pictet, Geneva.*) 6*d.*

This consists in a special form for the bottom of boats. The curves are always of the parabola family, with concavity directed downwards.

4212. Purifying Sewage, *P. Spence, Manchester.*—29*th September*, 1881. 4*d.*

This consists, First, in the purification of sewage, after allowing gritty matter to settle therefrom, by the direct application thereto of salts of alumina or of alumina and iron in sufficient quantity to make a clear and nearly colourless effluent, and the recovery of the alumina and oxide of iron, for subsequent use in the same or in a similar process; Secondly, in the use of the residual magma after separating the recovered alumina and iron in solution as a manure.

4214. Treating Seaweed to Obtain Useful Products, *H. E. Newton, London.*—29*th September*, 1881.—(*A communication from L. de Roussen, Paris.*) 4*d.*

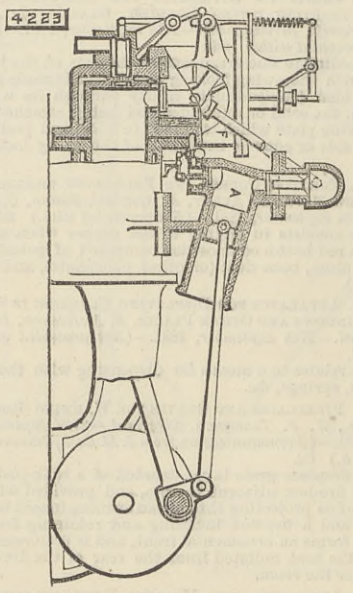
The improvements are based upon the fact that seaweed is capable of being made an abundant source of ammonia and carbon as primary products, the iodine, bromide, and other salts being regarded as secondary or bye-products.

4216. Protection of Factories, &c., against Fire, *E. Leonard, Philadelphia.*—29*th September*, 1881. 6*d.*

This relates to fire-extinguishing apparatus of that class in which pipes arranged within a building are connected with a water main or supply, and provided with valves arranged in connection with devices, which, when the temperature inside the building rises to a certain degree, cause or allow the said valves to open and distribute the water from the said pipes.

4223. Gas Motor Engines, *C. W. King.*—30*th September*, 1881. 6*d.*

This consists in combining a compressing pump A with a burner and receiver F lined with refractory



non-conducting material, for producing hot products of combustion to be used in obtaining power by expansion in a cylinder.

4217. Weighing Machines, *T. Moore, South Stockton-on-Tees.*—29*th September*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to the construction of a weighbridge.

4218. Treating Mineral Pyrites, &c., *J. R. Francis, Swansea.*—30*th September*, 1881.—(*A communication from H. Wurtz, New York.*) 4*d.*

This consists partly in the consolidation of all varieties of granular sulphurets into cakes, lumps, or blocks by mixing therewith metallic iron in comminuted or divided form, and causing this iron to rust and then form hydrated oxide or a basic salt in the interstices of the mass by admixture with a saline solution.

4220. Metal Wheels for Vehicles, *W. R. Lake, London.*—30*th September*, 1881.—(*A communication from L. May, Ungarisch Ostra, Austro-Hungary.*) 6*d.*

This consists of a wheel whose nave is constructed entirely of iron, steel, or other malleable metal, and is composed of a tube and rings of angle iron or other metal pieces.

4221. Portemonnaies or Purses, *W. Morgan-Brown, London.*—30*th September*, 1881.—(*A communication from F. W, Schwarz, Offenbach, Germany.*)—(*Not proceeded with.*) 2d.

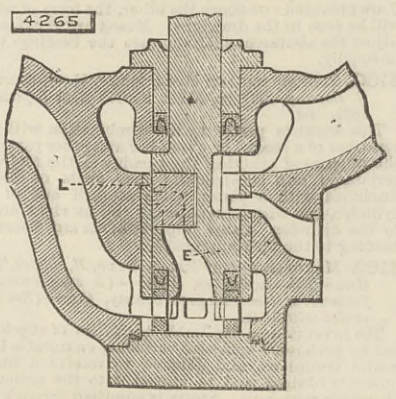
This relates to those purses with a metal rim or folding-up clasp, but unlike those, it is composed of one flat piece of leather, of round, or oval, or even of irregular square form. When opened, it lies out flat, the contents being open, as upon a dish or plate.

4224. Presses for the Manufacture of Prismatic Gunpowder, *H. Springmann, Berlin.*—30*th September*, 1881.—(*A communication from the Berliner Maschinenbau-Actien-Gesellschaft, Berlin.*)—(*Not proceeded with.*) 2*d.*

Vertically through the beam serving to support the perforating pins, and in a line with each of the compressing dies a hole is drilled, into which a tube is screwed with its lower end, the upper end of this tube being provided with a bottom having holes for the pins to pass through. The pins are fastened with their foot in a circular block fitting into the said tube, and which is pressed upward against the bottom of the tube by a cylinder provided with a screwed neck, which turns in a female screw-thread cut into the lower part of the hole in the pin-supporting beam.

4265. Rotary Valves, *P. G. B. Westmacott, Newcastle-upon-Tyne.*—1*st October*, 1881. 6*d.*

This consists of an improved rotary valve having a



mouth formed in radially moving pieces L in the plug E.

4222. Safety Valves of Steam Generators, &c., *A. C. Henderson, London.*—30*th September*, 1881.—(*A communication from V. Bablon, Paris.*)—(*Not proceeded with.*) 2*d.*

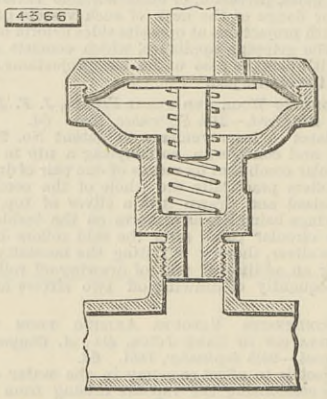
This consists, First, in making safety valves cylindrical and hollow, and mounting them at their lower extremities on the seat, which latter is fixed to the boiler; Secondly, in furnishing the said valves inside and a little below the dome, with a piston or diaphragm which divides the chamber into two parts, one, the ower portion, constituting the seat chamber, and the other, or upper part, which is limited below by the piston and above by the dome.

4226. Window Sashes and Frames, *C. Hook, Somerset.*—30*th September*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in suspending both sashes from the opposite ends of chains passing over pulleys at top of the window frame.

4366. Pneumatic Brake Apparatus for Railway Trains, *G. Westinghouse, jun., London.*—7*th October*, 1881. 6*d.*

This consists in combining with a non-automatic pipe and cylinder on a carriage a pipe and cylinder



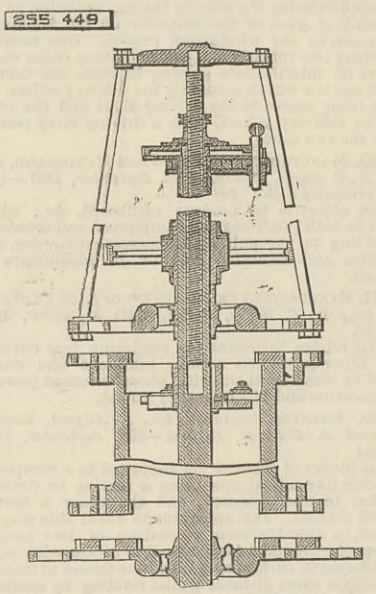
arranged to work automatically, the cylinder having an opening governed by a cock or valve connected to a piston or flexible diaphragm subject to the pressure in the non-automatic pipe.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

255,449. Metal-boring Machine, *Daniel W. Pedrick, Philadelphia, Pa.*—*Filed December* 20*th*, 1881.

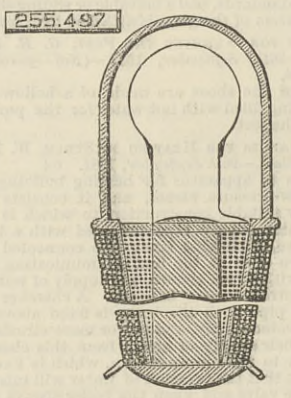
Claim.—(1) In an apparatus for boring cylinders the combination, substantially as set forth, of a bearing plate having a central opening for the passage of a boring bar, a bearing or thrust plate having a central socket for the reception of a feed screw, and coupling rods by which said plates are connected one with the other. (2) In an apparatus for boring cylinders the combination, substantially as set forth, of a boring



bar, a feed screw concentric therewith, a gear journalled upon a casing which is fitted to move with the boring bar longitudinally on the feed screw without rotating with the boring bar, a sectional or divided nut pivotted to said gear, and a clamp by which said nut may be made to either engage with or be removed from contact with the feed screw.

255,497. Incandescent Electric Lamp, *Phillip H. Diehl, Elizabeth, N.J.*—*Filed January* 10*th*, 1882.

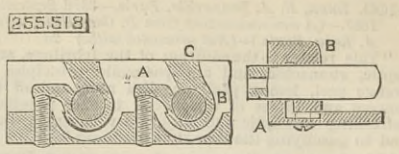
Claim.—(1) An electric lamp consisting of a hermetically-closed glass globe, a light-giving part inside of the globe, a secondary coil supported within the globe and placed in circuit with the light-giving part, and a primary coil arranged exterior to said globe and in inductive relation to the secondary coil,



substantially as set forth. (2) The combination of a glass globe containing the light-giving part, an extension made integral therewith, and secondary coil supported at the interior of the extension and placed in circuit with the light-giving part, and of a primary coil arranged exterior to the globe and in inductive relation to the secondary coil, substantially as specified.

255,518. Spindle-step Rail for Spinning Frames, *Francis Leclère, Philadelphia, Pa.*—*Filed December* 21*st*, 1881.

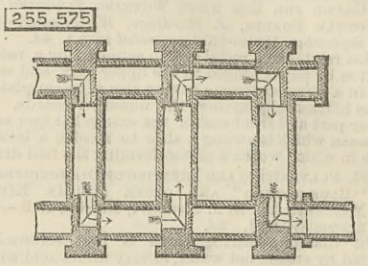
Brief.—The step rail is provided with yielding spring bearings, which, when in engagement with a set screw, clasp the step rigidly, thus permitting the vertical adjustment of said step. *Claim.*—A spindle-step rail A, provided with a clasping bearing B, which is cast with the rail, said bearing having a rigid connection with the rail, as at C, and being free from said rail at



all other points, substantially as and for the purpose described.

255,575. Beer Cooler, *Charles J. Boff, Boston, Mass.*—*Filed August* 15*th*, 1881.

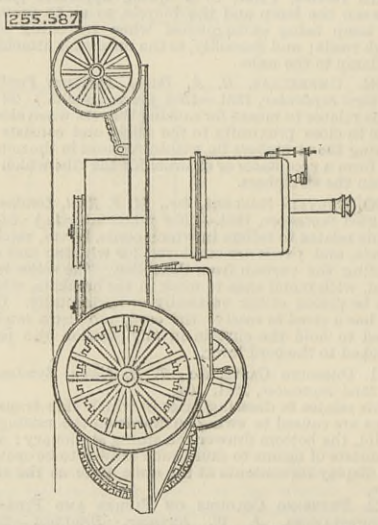
Claim.—(1) In a beer cooler the combination of two longitudinal pipes, a series of transverse pipes intersecting the longitudinal pipes at points between the



ends of the latter, and a series of removable plugs extending transversely through the longitudinal pipes at points opposite the ends of the transverse pipes, and constructed to direct the flow of beer from the longitudinal into the transverse pipes, all substantially in the manner and for the purposes set forth.

255,587. Steam Ploughing, *Fritz Brutsche, Berlin, Germany.*—*Filed July* 9*th*, 1881.

Claim.—(1) The snatch block carriage mounted upon swivelled wheels I I¹, and composed of a frame Q Q¹, sheave P, having pinion, cog wheel, concentric pulley, band, shaft, sheave or pulley R, keyed upon said shaft, and provided with the clutch, band drum S, vertically adjustable upon shaft, means for adjusting said drum, clutch fixed in the bottom plate of the carriage frame, and band V, having the link or eye W at its free end,



constructed and combined substantially as and for the purpose herein shown and specified. (2) The combination, with a fixed pair of anchors, of a snatch-block carriage, engine, and chains connecting the snatch block with the engine, as described, so that after the band which connects the snatch-block carriage with anchor has been shifted to and coupled with the next anchor, the snatch-block carriage may be drawn into its operative position in a line with anchor and the engine by the operation of the latter and the chains which connect it with the snatch block, substantially as and for the purpose herein shown and set forth.

CONTENTS.

The Engineer, May 5th, 1882.