MAY, 1864.

The monthly evening meeting of the Society was held at the Museum on Tuesday, the 10th May. The chair was taken by His Excellency at half-past seven o'clock.

Among the Fellows present were Captain Steward, the Ven. Archdeacon Davies, Dr. Agnew, Hon. Sec., Messrs. F. Abbott, sen., F. Abbott, jun., H. S. Wintle, J. Facey, W. Johnston, L. Susman, G. R. Napier, A. Kennerley, T. Giblin, M. Allport, J. Woolley, J. Davies, M.H.A., J. Barnard, T. Stephens, W. L. Dobson, Dr. Butler, Lieut. Seddon, R.E., &c., &c.

The following gentlemen (having been previously nominated by the Council) were, after a ballot, declared to be duly elected Fellows of the Society:—Professor Neumayer (as corresponding member), Colonel Crawford, and Mr. J. T. Robertson.

The following returns were laid on the table :—

1. Visitors to the Museum during April, 336.
2. Ditto to Gardens, ditto, 1,454.
3. Tench supplied—Mr. Allport, 36; Mr. Hull, 12; total, 42.
4. Seeds received from Dr. Milligan (papers), 43.
5. Periodicals received (the usual).

Meteorological Returns.

1. Hobart Town, from F. Abbott, Esq.
   (*a*) Table for April.
   (*b*) Summary and Analysis of Observations for ditto.
2. Swansea, from Dr. Story, table for March.

The SECRETARY read an Analysis of the Meteorological Observations for April, together with a Health Report for the month, by E. S. Hall, Esq.

The presentations were as follows :—

1. From Dr. Milligan, London, the undermentioned seeds :—Pinus Webbiana, 2 papers Pinus excelsa, 4 do Cedrus deodora, Large Sunflower, 6 papers Stocks, 6 do Asters, 2 do Rhododendron campanulatum, 1 do Rhododendron anthropogon, 1 do Primula cartusoides, 1 do "Jemboo" of India, 1 do of an American Grass, said to withstand excessive droughts. The five last named being new to the Gardens.

17 Papers of Vegetable Seeds, of which a few are new to the Gardens.

2. A Black Cockatoo, from Mr. Watson, of Brown's River.
3. Fern impression found in Seymour Coal; 4. Carraway Seed grown in Hobart Town; and 5. Sample of Colonial Grape Wine, from Mr. Vautin.

The wine was tasted by several members after the meeting, and was thought to be a very pure, genuine, and pleasant beverage. Its cost to the maker, who grows his own grapes, is about fourteen pence per gallon. The Secretary mentioned that Mr. R. P. Adams has also made a very excellent wine from our common Sweet Water grape.

Dr. AGNEW then observed that he wished to bring under the notice of the meeting the subject of "Traction Engines," and their suitability for the carriage of heavy goods and passengers on common roads. About five or six months ago he had noticed, as doubtless had also many of the Fellows then present, a correspondence on the subject in the local newspapers, and the arguments then brought forward by Lieut. Seddon, R.E. (who wrote under the signature of "Why Not"), appeared quite conclusive as to the great value of these engines for the purpose already indicated. He thought, however, as the question was one of great importance, it would be very advisable to obtain some still more practical and authoritative information in reference to it, and had accordingly written home to two large manufacturers, the Messrs. Aveling and Porter, of Rochester, and Bray's Traction Engine Company, London. He had seen in the *Illustrated London News* very favorable reports on the performances of the engines of both these companies, but he thought the latter had two points in its favor, first, the fact that its engines were in constant use in H. M. Dockyards at Woolwich, and also that the Earl of Caithness, so well known as a practical mechanician, was one of its directors. In writing home he had asked if engines of two kinds could be furnished for travelling on the main road between this and Launceston—one with slow speed for heavy weights, such as merchandise or farm produce; the other for the rapid conveyance of passengers. At the same time he had given as accurate an account

as possible of the nature of the road itself, its length, its various inclines or gradients, &c., and the fact of snow occasionally lying, in the winter season, many inches deep in the midland districts, was also alluded to. Before reading the replies, received by last mail, to these letters, he would beg permission to read the following extracts from an article in the *Mechanics' Magazine*, of January last, which he thought was a sufficient answer to the question which had been so frequently asked—Why, if these engines are as efficient as is stated, have they not long ago superseded the use of horses on common roads and elsewhere? "When we reflect that a speed of fifteen miles an hour has been maintained on good turnpike roads for long journeys by steam power, we will see how small was the chance which horse power would have had for the conveyance of mails and passengers, who often regard speed as everything, against such a rival. Had it not so fallen out that the Manchester and Birmingham Railway was inaugurated just at the time it was, our roads would long ere now have been almost wholly given up to the traction engine and steam omnibus. The attention of the engineer would not have been directed into a different channel." "It (the traction engine) may be regarded as the progenitor of the railway locomotive and a glance at the past will show that its career has been distinguished by a series of mechanical successes which seldom fall to the lot of inventions, so dissimilar to anything presented by the records of the past. Reasoning by analogy we are justified in assuming that a machine which has been constructed with success in the infancy of the mechanical engineer's art, can present no difficulty now, and the *experimentum crucis* of examining into these questions and circumstances of traffic presented daily all over the country prove that the traction engine now performs its task with an ease and punctuality which leave little indeed to be desired. Its use is, in short, no longer an experiment. It will no longer bear to be treated as such. The competition between steam and horses on the road is no longer a question of mechanics, but of pounds, shillings, and pence, and viewed in this way, steam has every advantage." "Formerly we were told that traction engines spoiled the roads. We hear little of this now, experience proving the contrary." "We never yet heard of a dangerous accident resulting from the use of steam on common roads, and a somewhat extended personal experience goes to show that with the most moderate care horses will pass an engine as easily as they will a carriage." He (Dr. Agnew) also stated that the same magazine contained reports of two large meetings of road trusts in England, at which a motion was made to the effect that means should be adopted for prohibiting traction engines from travelling on the highways during the day, on the plea that they took up too much room and that they would be a cause of accidents by frightening horses. In both cases the motion was at once negatived—in one, by a majority of 30 to 3, and the other by 50 to 2. This, he thought, was very important, as coming from men who were enabled to form an opinion on the matter from personal observation.

The following report on the subject, by a Select Committee of the House of Commons, as long back as 1831, was read :—

"That sufficient evidence has been adduced to convince your committee—

"1. That carriages can be propelled by steam on common roads at an average rate of ten miles an hour.

"2. That at this rate they have conveyed upwards of fourteen passengers.

"3. That their weight, including fuel, water, and attendants, may be under three tons.

"4. That they can ascend and descend hills of considerable inclination with facility and safety.

"5. That they are perfectly safe for passengers.

"6. That they are not, or need not be, if properly constructed, a nuisance to the public.

"7. That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses.

"8. That they admit of greater breadth of tire than other carriages, and, as the roads are not acted on so injuriously as by the feet of horses in common draught, such carriages will cause less wear of roads than carriages drawn by horses.

"9. That rates of toll have been imposed on steam carriages, which would prohibit their being used on several lines of roads, were such charges allowed to remain unaltered."

Allusion was also made to the case of Messrs. Koll, Greig, & Co., carriers between Glasgow and Kilmarnock, who have practically acknowledged the inferiority of horse draught by adopting the traction engine for their business;

and also to the fact of the Earl of Caithness having travelled in a steam carriage at the average rate of twenty miles an hour, on the common highway from London to Edinburgh.

The following letter from Messrs. Aveling and Porter, of Rochester, was then read :—

"Rochester,
"February 19th, 1864.

"Sir,—We are in receipt of your obliging favor of the 23rd December last, and, as the most complete reply to your enquiries, we send you a copy of our catalogue, with illustrations and descriptions, of our traction engines.

"The engine described in p.p. 4 and 5, is the one especially adapted for goods traffic on the high roads. This will travel with a load of, say 20 tons, at the rate of two miles per hour, over most roads, and at twice that speed with half the load, viz., 10 tons at four miles per hour. Engines made to travel faster than this one can only be geared for speed at the expense of power—and fast passenger engines we have never attempted to make, nor do we remember an instance of a successful one being turned out. The class of engine required for this traffic is of so entirely different a nature from what we make, that we have always declined entering upon the experiment.

"We should be glad to establish a system of traction engines upon the road you mention, and we hope from a perusal of our catalogue that you may believe in the feasibility of doing so, and write us again accordingly.

"If you could instruct any of your English correspondents to act for you, and make it their business to see our engines, and judge for themselves of their adaptability, we should have much pleasure in giving them every opportunity in our power of doing so.

"We are, Sir,
"Your obedient servants,
"AVELING & PORTER.

"Dr. Agnew, Hobart Town, Tasmania."

Extracts from the pamphlet accompanying the letter were read showing that the engine was capable of drawing, at a rate of six miles an hour, waggons laden to the extent of 20 tons, along common roads; and up and down inclines twice as steep as any between Hobart Town and Launceston, at the rate of three to four miles an hour.

The following was the answer from Bray's Traction Engine Co. :—

"Bray's Traction Engine Co. (Limited),
"17, Warwick-st., Regent-st., London, W.,
"February 19th, 1864.

"Sir,—In reply to your favor of 16th December last, we beg to furnish you with the following particulars respecting this Company's engines, and send, per book post, a pamphlet containing full description of the same.

"The price of a 20 horse-power (nominal) engine with two cylinders 9" diameter by 15" length of stroke 120 lbs. working pressure of steam, is £1,500.

"The price of a passenger engine, capable of travelling at the rate of 12 miles an hour, £1,250.

"The price of an engine (10 horse-power nominal), with two cylinders, 7" diameter × 15" length of stroke, 120 lbs. working pressure of steam, is £1,250.

"If fitted with all the extra appliances for transmitting power as described in pamphlet, £200 per engine extra.

"The above prices include delivery at London, Liverpool, Bristol, or Glasgow, but not, the packing or shipping charges, which are borne by the purchaser. The cost of packing is about £25.

"The terms of payment are net cash, payable in three instalments, as customary with the trade.

"The engines are constructed in every respect of the very best quality of workmanship and materials with the view of keeping the cost of maintenance and repair as low as possible.

"Being supplied with double acting pumps, they act most efficiently as steam fire engines, whilst they can also, if required, be fitted with the various appliances for transmitting power, before referred to, so as to adapt them to all the purposes of fixed or portable, as well as traction engines.

"They can thus be used for ploughing, driving machinery, sawing or felling timber, pumping, hoisting, &c.

"The engines are geared for two speeds—with heavy loads from 2½ to 3 miles an hour, and with light loads or empty waggons from 5 to 6 miles per hour:

"The foregoing are the averages of speed on a fair level road, all circumstances, such as stoppages for water, being taken into consideration. The speed, however, may be increased even beyond six miles an hour, though that is a sufficiently high rate for a heavy goods engine to travel.

"The weight of a large engine is about 14 tons, and of the second size, about 10 tons. The width, from outside to outside of driving wheels, is about 7 feet, though of course this is increased, if the wheels are made very wide to admit of the engine travelling over soft ground.

"The engines are respectively about 21 and 18 feet long over all by about 10 and 9 feet high to the top of framing. The driving wheels are 7ft. 6in. by 6ft. 6in. in diameter, by 12 to 15in. wide; the steering wheels are 3ft. 6in. and 3ft. in diameter, by 10 to 12in. wide.

"The consumption of coke or steam coal is in the large engine about 84lbs. per mile, in the smaller machine about 56lb., per mile taking the average of roads. In Woolwich dockyard the engine does not burn more than about 2½ cwt of coke per day. The fire box can be constructed to admit of wood being used as fuel if necessary. The tanks contain about two hours' supply of water, and a day's supply of fuel can be carried on the engine.

"A large engine will draw about 30 tons on ordinary roads, with gradients, say one in twelve, while a small one will draw about 15 tons. On hard, smooth, level roads, a much greater weight than above quoted can be drawn with ease (see experiments detailed in pamphlet, p. 17).

"The Company also supply waggons capable of carrying from 8 to 10 tons of goods, mounted on springs, fitted with proper couplings, break-power, arrangements for backing, &c., complete to accompany engines, which they track accurately, either singly or in train, even in turning corners at right angles, price £100 each.

"The price of passenger cars capable of holding say 20 passengers, fitted complete, £200.

"For dockyards or arsenals, or any fixed work, two attendants (one a skilled mechanic) would be sufficient for the engine, but when long distances have to be traversed, another laborer or two would be necessary to attend to waggons, &c.

"The following is an estimate of the daily expenses of a large engine and waggons, supposing they work 250 days in the year, and that twelve waggons were employed so as to allow four being always loading, four unloading, and four in transit:—

	£ s. d.	£ s. d.
Wages—Driver, who can also do repairs	0 7 6	
,, Steerer	0 4 6	
,, Stoker	0 3 0	
		0 15 0
Fuel—1 ton coke or coals		1 0 0
Stores, grease, tallow, oil, and cotton waste		0 3 6
Maintenance and repairs on engine 10 per cent.		
Depreciation on ditto 10 ,,		
Interest on outlay 5 ,,		
Total 25 per cent. on say £1700	1 14 0	
Ditto on waggons 15 per cent. on £1,200	0 14 6	
		2 8 6
Margin for tolls and other contingencies		0 13 0
		£5 0 0

"An engine will draw four waggons loaded with 8 tons each, say 32 tons on any ordinary road, at a speed of about three miles an hour. It would, therefore, take such a load a distance, say, for example, fifteen miles, and return with the empty waggons the same distance, 30 miles in all, in one day of ten hours.

"The cost of this would be, as shown, £5, or at the rate of 2½d. per ton per mile, whereas if a load could be found for the engine to bring back equal to the one it took, the cost would be reduced to exactly one half, or otherwise in proportion to the load. The price would probably be increased abroad by the higher rate that would have to be paid for labor and fuel.

"The snow would not make any difference as to the working of the engine, the wheels being fitted with "spades" or "teeth" capable of being protruded or withdrawn at pleasure (see pamphlet, p. 3).

"It will not be requisite to have an additional steering wheel to the engine,

there being two already, which are perfectly capable of turning the engine and waggons round the sharpest corners.

"Trusting that this information will be sufficient for your purpose, and induce an order.

"We are, sir,
"Your obedient servants,
"Bray's Traction Engine Co.,
"Pro J. BUBB.

"Dr. Agnew,
"Hobart Town, Tasmania."

Extract from a letter from the same Company to H. C. Seddon, Esq., R.E., date, 19 Feb., 1864:—

"The price of a passenger engine, fitted so as to be capable of travelling 12 miles an hour, with the number of passengers mentioned in your letter, up an incline of 1 in 12, is £1,250."

Mr. Seddon calculates this would give a speed of upwards of 30 miles an hour on a level road. The number of passengers mentioned was one hundred.

From their pamphlet, extracts were read from reports on the performances and capabilities of their engine, from engineers, farmers, officers of Her Majeety's dockyard, &c., &c. One from the celebrated engine makers Penn and Son, speaks of "the successful manner in which they (traction engines) have removed the large portions of the machinery for the engines of the Warrior and Black Prince, under every circumstance of weather, in loads varying from 25 to 35 tons, exclusive of truck, &c." * * * * "We have not found your engine to be so destructive to the roads, on account of the great breadth of the wheels, as horses' feet, when drawing a heavy load."

Mr. R. Armstrong, C.E., states :—"The nearly two hours of unexampled rough work you have just now with me seen it go through, the up and down hill, steeper even than one in seven, jolting, twisting, and knocking about, over deep holes, and round sharp corners with so much ease, and no detriment whatever that I can discover, ought to be satisfactory to any one, &c. * * * It may fairly be considered as a strong compact dray horse which will not make but *mend* a common road, &c."

As to the power of the engine in dragging with ease, over bad roads, and even on soft boggy ground where no road existed, such loads as no waggon drawn by horses could attempt, Lieutenant Halkett (14th March, 1862), says: —"It had three waggons attached loaded with 9,000 bricks, the weight of the load, including waggons, being about 30 tons, with which it went to Clapham Common. On the hard road the draught indicated was about 1,800 lbs., increasing in some cases where it was very muddy—there having been about forty-eight hours' previous rain—to as much as 2,200lbs. The train went on the grass, which was very soft and slippery from the rain, and drew the load along without difficulty, the draught being about 3,000 lbs. The wheels of the engine let an impression in the ground about the depth of half an inch, whilst the waggon wheels made tracks as deep as two inches. For the purpose of experiment the train went on a *very boggy piece of turf*; after moving over it for a short time the waggon wheels sunk to the depth of six inches in a bad place, whilst those of the engine were scarcely two inches deep. The draught power exerted increased to 4,500lbs., when the wheels of the engine slipped round without moving the train. The driver having gone so far on the plain surface of the wheel, then brought the auxiliary power of the blades to bear, throwing them out about 1½ inch, which exactly doubled the power of the engine, since the dynomometer registered over 9,000 lbs., and the engine drew on the load without further difficulty. In order that he might be understood, Lieutenant Halkett explained that Telford averaged the draught of waggons at one-thirtieth of the load, or about 70lb. draught on a spring to every ton weight of the waggon and load together; but this may be increased by bad roads and appliances to 100lb. per ton. The engine, therefore, had shown its *ability to draw from 100 to 130 tons* on a good level road. These figures are quite independent of the power exerted by the engine to move itself. This result he considered entirely satisfactory, since no traction engine had hitherto been found capable of exerting a greater draught power than 4,500lbs. It was, therefore, calculated that on increasing the breadth of the tire of the wheel, and putting on slower gearing, by the use of his rail system of agriculture to guide the implements, one of these engines could draw with ease thirty ploughs after it, ploughing five inches deep, at a speed of about 1½ mile per hour, or plough sixty acres per day, &c."

From *The Illustrated London News*, May 29, 1838,—"The next experiment

was drawing a load of ten tons up Dover-hill, a gradient* varying from 1 in 7 to 1 in 11; it went up with perfect ease, and also came down with the same load. * * * The engine is an 8-horse, and is fitted with Baron's patent cup surface boilers, and is worked to a pressure of 60lbs. to the square inch. The weight of the engine is 6 tons. * * * The carriage was loaded with three 68-pounder guns, of a total weight of 20 tons, and steamed away from the Royal Arsenal, past the Royal Artillery Barracks, with the utmost ease, although this portion of the journey was a considerable incline, &c."

The Times of November 13th, 1858, says:—"It was put through a course of tests in dragging heavy loads of timber *at a speed of six miles per hour*, along the stoned thoroughfares, winding round the narrow curves, and performing a rapid circle in the presence of the Commissioners, as well as Sir John Rennie, the engineer, and the various authorities of the yard. The Commissioners expressed themselves extremely satisfied, &c."

Again, at a trial at Uxbridge, 28th April, 1860,—"There could not have been found a worse road for a trial than the one selected, abounding in sharp turns, bridges of sudden rise and pitch, and the fearful Chandler's-hill; but they proved of no impediment to the way of the engine, which has continued at work all the week."

On another occasion (*The Express*, March 30th, 1861),—"The large engine was attached to a "total load of about 38 tons," in the presence of the Marquis of Breadalbane, the Earl of Caithness, Mr. John Penn, Mr. Mathews, and many scientific gentlemen. On leaving the factory the road for some distance has a gradient of about 1 in 15, but the engine drew the immense load with the utmost ease at about three miles per hour, &c."

The Times of October 29, 1861, says:—"A new engine of great power and improved construction performed the operation with marked success. Each truck load exceeded 35 tons weight, exclusively of the engine weighing another 12 tons. It climbed the steep ascent leading from the factory, and through the narrow windings and acclivities with apparent ease, and performed the distance of about two miles in half an hour. Messrs. Penn and Son, who were present, witnessed with satisfaction the performance of the traction engine, and expressed their satisfaction, &c."

On another occasion "An engine was set to work three ploughs in form over a light loamy soil, the ground rather wet; the quantity of work in a day of ten hours was at the rate of six acres, at a cost of not more than 4s. per acre * * The land was as effectually ploughed as if it had been done by horses."

Finally, remarking that the facts just noticed must speak for themselves, Dr. Agnew mentioned that Mr. Askin Morrison had informed him he had written home by last mail for one of these engines, leaving it to his agent to select it from any manufactory he chose. There are now many makers, and each may have some peculiar excellence. We may hope, therefore, to see a traction engine fairly at work in the course of 8 or 10 months at furthest.

Mr. Morton ALLPORT then read a paper on the Trout and Salmon Ova, explaining at the same time the arrangements of the hatching ponds by means of a colored drawing.

At the conclusion of the paper discussion ensued as to the future management of the young trout and salmon, but it being Mr. Allport's intention to report upon this subject in a future communication it is not further referred to at present. One of the original in boxes which the ova came from England, shewing the manner in which they were packed, was exhibited.

Archdeacon DAVIES suggested that it would now be well to consider what measures should be taken to express the sense which he was sure we all felt of the obligation we were under to Mr. Ramsbottom, Mr. Youl, Messrs. Money Wigram and others, who had all worked so well together in carrying out this great enterprise of the introduction of the salmon.

Mr. T. GIBLIN was sure that the Royal Society would only be too anxious to do all that lay in its power to give due honor and credit to all concerned in the undertaking; but he also thought, considering the great national importance of the work which he now hoped was about to be crowned with entire success, that the whole colony as it were, should through their representatives in parliament take further action in the matter, and either by a vote of thanks or by some more substantial means, shew their sense of the great service that had been rendered to Tasmania.

After further discussion it was agreed that for the present the matter

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* The gradients on the Sandhill at Launceston, and on the hill at Pontville, are one in twenty and some parts one in eighteen. The steepest portion of the Main Roads a short rise south of Pontville Bridge which is one in fifteen.

should be allowed to rest with the "Commissioners for the Introduction of the Salmon," with the understanding that the Royal Society was willing and anxious to respond to any suggestions that might be offered as to the best mode of expressing its appreciation of the zeal, energy, and intelligence which had been so happily exercised in conducting the great experiment thus far towards a successful issue.

The SECRETARY was glad to direct attention to one portion of Mr. Allport's paper where it was shewn that the original idea of introducing the ova was due to this Society, which also first took action in the matter by the appointment, from among its members, of a committee whose duty it was to consider the best means for giving practical effect to the idea. The Society received a grant of public money—a small grant certainly, only £200 a-year, yet he had heard it said that this was too much, and that we made no return for the money. This could only have been said by some one ignorant of what we had done, and what we have been at all times anxious to do for the good of the colony as the proceedings of this evening alone might testify. In future, at all events, it could not be repeated as we had now returned to the public a hundred-fold what we had received, by having been in some degree instrumental in initiating a movement so fraught with benefit to the community.

Archdeacon DAVIES proposed (Mr. Johnston seconded) a vote of thanks to Mr. M. Allport and Dr. Agnew for the very interesting communications they had brought before the meeting.

His EXCELLENCY, in conveying thanks, observed he was very happy in doing so, as he cordially agreed with the motion. He could not but express the extreme gratification he felt at the good fortune which at last had so deservedly attended the efforts made to introduce the salmon ova, and was sanguine that a splendid success would eventually crown the exertions of those who were still engaged in carrying out the enterprise.

The meeting then terminated.