tion of that portion thereof which contains and protrudes the lead point, I do hereby claim this particular arrangement and construction, which I esteem as sufficiently characteristic to distinguish it from all others before used or known. I do not intend, however, by this claim, to limit myself to the manner of constructing this instrument in all its minutiæ, as herein pointed out, but to vary it as I may think proper, whilst it remains substantially the same in construction and operation. JACOB J. LOWNDS.

Progress of Practical and Theoretical Mechanics and Chemistry.

On the absolute value of the most common species of Wood employed as Combustibles. BY MESSRS. PETERSON AND SCHOEDLER.

(From the Annalen der Pharmacie, vol. XVII., cahier 2, p. 139.) (Journal de Pharmacie, No. VII., 1836.)

The exact and detailed experiments of Messrs. Gay Lussac and Thenard, have proved that the pure ligneous fibre of wood, that is its skeleton, when completely freed from soluble parts, by means of acids, alkalies, alcohol and water, has the same composition in all species of wood. This result, though possessing interest in a scientific point of view, still affords in practice no basis for calculating the value of the combustible; for what is burned is not mere ligneous fibre, but wood, possessing all the mixtures of ingredients which determine the nature of the tree from which it is derived. But these materials may, like rosin or the oily substances, augment the combustibility; or like some others, they may diminish it. Such were the considerations which induced the authors to undertake the following analysis; and to this long and tedious labour, Messrs. Schoedler and Peterson devoted themselves with uncommon perseverance, in the laboratory, and under the immediate inspection of the illustrious Liébig.

Each species of wood, in the condition in which it comes from the forest, was before combustion with the oxide of copper, reduced to the finest powder, placed in a drying apparatus surrounded with boiling water, and heated in a current of air until the powder lost no more of its weight, then weighed with due care to avoid its attracting any new portion of moisture. The mixture of it with oxide of copper was performed in a hot porcelain mortar, and having been conveyed into the tube where it was to undergo combustion, it was again freed from all hygrometric moisture, by subjecting it to a moderate temperature in an exhausted receiver. The results of the combustion were carbonic acid and water, which served to determine the amount of carbon and hydrogen. All the species of wood left after combustion, a certain quantity, though proportionably very small, of ashes, containing carbonates.

Every analysis, therefore, gives a trifling error in the proportion of the carbon--which, however, never exceeds 2-10 of one per cent.—less than the most common errors of observation, and as we may with sufficient exactness regard the quantities lost, as equal for all the species of wood analysed, the general conclusions derivable from the results are not in the least changed on this account. All the specimens of wood were taken from the trunks of their respective trees.

Species of Wood.	Quantity of the substance burnt.	Carbonic acid.	Water.	Carbon.	Hydrogen.	Oxygen.
1. *Quercus Robur.*	0.353	0.629	0.190	49.270	5.974	44.756
Oak.	0.371	0.665	0.206	49.595	6.163	44.242
	mean	of the	two	49.432	6.069	44.499
2. *Fagus Sylvatica.*	0.360	0.628	0.203	48.235	6.258	45.507
a Red Beach.	0.409	0.712	0.232	48.134	6.296	45.575
			mean	48.184	6.277	45.539
3. *Fagus Sylvatica.*	0.287	0.503	0.164	48.461	6.271	45.268
b White Beach.	0.256	0.450	0.146	48.605	6.330	45.065
			mean	48.533	6.301	45.166
4. *Betula Alba.*	0.316	0.556	0.180	48.652	6.325	45.023
Birch.	0.257	0.446	0.147	48.552	6.424	45.024
			mean	48.602	6.375	45.023
5. *Betula Alnus.*	0.262	0.457	0.145	49.169	6.262	44.569
Alder.	0.232	0.413	0.129	49.223	6.172	44.605
			mean	49.196	6.217	44.587
6. *Pinus Larix.*	0.270	0.492	0.156	50.389	6.413	43.198
Larch.	0.313	0.564	0.175	49.824	6.206	43.970
			mean	50.106	6.310	43.584
7. *Pinus Abies.*	0.256	0.462	0.149	49.901	6.460	43.639
Fir Tree.	0.276	0.499	0.158	49.992	6.354	43.654
			mean	49.946	6.407	43.647
8. *Pinus Picea.*	0.254	0.457	0.146	49.750	6.380	43.870
Pitch Pine.	0.278	0.447	0.100	49.433	6.388	44.179
			mean	49.591	6.384	44.025
	0.261	0.471	0.146	49.898	6.209	43.893
9. *Pinus Sylvestris.*	0.270	0.488	0.153	49.976	6.290	43.734
				49.937	6.250	43.813
10. *Prunus Domestica.*	0.257	0.460	0.135	49.492	5.830	44.678
Plum Tree.	0.233	0.414	0.128	49.130	6.090	44.772
			mean	49.311	5.964	44.725
11. *Prunus Cerasus.*	0.368	0.650	0.208	48.840	6.250	44.910
Cherry Tree.	0.229	0.405	0.130	48.809	6.301	45.890
			mean	48.824	6.276	44.900
12. *Pyrus Malus.*	0.244	0.430	0.139	49.729	6.323	44.948
Apple Tree.	0.302	0.836	0.169	49.075	6.211	44.714
			mean	48.902	6.267	44.831
13. *Pyrus Communis.*	0.278	0.498	0.160	49.533	6.388	44.079
Pear Tree.	0.334	0.595	0.190	49.258	6.314	44.428
			mean	49.395	6.351	44.254
14. *Diospyrus Ebenum.*	0.256	0.460	0.123	49.727	5.333	44.950
Ebony.	0.186	0.336	0.090	49.950	5.370	44.679
			mean	49.838	5.352	44.810
15. *Buxus Sempervirens.*	0.253	0.452	0.147	49.400	6.449	44.151
Box Tree.	0.266	0.471	0.158	49.337	6.593	44.070
			mean	49.368	6.521	44.111
	0.262	0.494	0.149	50.227	6.312	43.461
16. *Ulnus Suberosa.*	0.236	0.428	0.139	50.146	6.537	43.317
			mean	50.186	6.425	43.389
17. *Populus Nigra.*	0.272	0.491	0.152	49.925	6.203	43.972
Poplar.	0.242	0.433	0.440	49.472	6.421	44.105
			mean	49.699	6.312	43.989

Species of Wood.	Quantity of the substance burnt.	Carbonic acid.	Water.	Carbon.	Hydrogen.	Oxygen.
18. *Fraxinus excelsior.* Ash.	0.303 0.214	0.538 0.384	0.166 0.117 mean	49.096 49.616 49.356	6.081 6.068 6.075	44.823 44.316 44.569
19. *Juglans Regia.*	0.308 0.281	0.545 0.501	0.180 0.162 mean	48.927 49.299 49.113	6.487 6.399 6.443	44.586 44.302 44.444
20. *Robinia Pseudacacia.* Acacia.	0.315 0.366	0.552 0.591	0.176 0.192 mean	48.455 48.883 48.669	6.201 6.342 6.272	45.344 44.775 45.059
21. *Tilia Europea.* Linden.	0.247 0.323	0.443 0.575	0.159 0.199 mean	49.592 49.224 49.408	6.882 6.889 6.861	43.526 43.937 44.731
22. *Aesculus Hippocastanum.* Horse Chesnut.	0.254 0.310	0.451 0.550	0.154 0.187 mean	49.096 49.058 49.077	6.729 6.699 6.714	44.175 45.268 44.209
23. *Salix Fragilis.* Willow.	0.259 0.300	0.457 0.530	0.150 0.170 mean	88.828 48.850 48.839	6.429 6.290 6.360	44.743 44.860 44.901
24. *Acer Campestris.* Maple.	0.253 0.290	0.455 0.518	0.143 0.166 mean	49.217 49.390 49.803	6.273 6.340 6.307	44.510 44.270 43.890

Species of Wood.	One hundred parts required for their complete combustion in oxygen.	Subtraction of the quantity of oxygen already contained in each species of wood.	Quantity of oxygen that 100 parts of each kind of wood must absorb for their complete combustion.
1. *Tilia Europea.* Linden.	184.254	43.731	140.523
2. *Ulmus Suberosa.*	182.797	43.389	139.408
3. *Pinus Abies.*	182.024	43.647	138.082
4. *Pinus Larix.* Larch.	181.666	43.584	138.082
5. *Aesculus Hippocastanum.* Horse Chesnut.	182.211	44.209	138.002
6. *Buxus Sempervirens.* Box Tree.	181.426	44.111	137.395
7. *Acer Campestris.* Maple.	180.850	43.890	136.960
8. *Pinus Sylvestris.*	180.744	43.813	136.981
9. *Pinus Picea.* Pitch Pine.	180.911	44.025	136.886

Species of Wood.	One hundred parts required for their complete combustion in oxygen.	Subtraction of the quantity of oxygen already contained in each species of wood.	Quantity of oxygen that 100 parts of each kind of wood must absorb for their complete combustion.
10. *Populus Nigra.* Poplar.	180.617	43.989	136.628
11. *Pyrus Communis.* Pear Tree.	180.135	44.254	135.881
12. *Juglans Regia.*	180.134	44.444	135.690
13. *Betula Alnus* Alder.	178.540	44.587	133.953
14. *Salix Fragilis.* Willow.	178.752	44.801	133.951
15. *Quercus Robur.* Oak.	177.971	44.499	133.472
16. *Pyrus Malus.* Apple Tree.	178.171	44.831	133.340
17. *Fraxinus Excelsior.* Ash.	177.820	44.569	133.251
18. *Betula Alba.* Birch.	178.252	44.023	133.229
19. *Prunus Cerasus.* Cherry Tree.	178.039	44.900	133.139
20. *Robinia Pseudacacia.* Acacia.	177.602	45.059	132.543
21. *Fagus Sylvatica.* White Beech.	177.478	45.166	132.312
22. *Prunus Domestica.* Plum Tree.	176.813	44.725	132.088
23. *Fagus Sylvatica.* Red Beech.	176.373	45.539	130.824
24. *Diospyros Ebenum.* Ebony.	173.288	44.810	128.478

The first of the above tables requires no explanation. In the second the quantities of oxygen which 100 parts of each species of wood absorbs from the air, in effecting its complete combustion, have been calculated. These represent the relative values of the woods as fuel, since the quantities of heat developed by combustion are proportional to these quantities of oxygen.

It will probably excite, at first, some surprise that the different sorts of wood do not follow the order, which their price or their value in common life seems to assign them.

The proportion of carbon contained by them will be found pretty nearly equal, but the chief difference is in that of the oxygen. When therefore, we consider that 100 parts by weight of hydrogen, require for combustion 800 parts of oxygen, while 100 of carbon demand but 262 of oxygen, it will be easy to understand why the wood of the linden tree, which contains a large portion of hydrogen, should develope more heat by its combustion, than that of the beech, which contains but a small proportion of the same ingredient.

It follows, likewise, from this view, that the value assigned to the woods in common life, is quite independent of their absolute *combustible value*, and must be determined by other considerations. For the domestic purposes of heating apparatus, as in kitchen fire-places, stoves, &c., a fuel is required which is less remarkable for giving an intense, than a moderate, durable, heat; consequently those species of wood will be preferred which abound least in hydrogen, and have a higher proportion of carbon. The linden, the firs, and the pines, are rich in hydrogen. This it is, chiefly, which, united with a certain proportion of carbon, yields the gas that constitutes the flame of a wood fire. These kinds of wood yield a quick and an intense heat, with a brisk flame, leaving a light and scanty charcoal. On the quantity of hydrogen in wood depends that of the charcoal remaining after combustion, for the hydrogen forms with the carbon, carburetted hydrogen gas, and necessarily takes up *some* of the carbon. With beech, on the contrary, it produces a short flame, proportionally much less vivid, and it is to the remaining coals, which continue to glow for a long time, that so high a value is attached. Oak, both with regard to these properties, and to its actual value, holds a middle rank between these two species of wood.

If we could construct our fire-places according to the exigencies of each kind of wood, the value of each kind for the purposes of life, would be exactly expressed by its place in the second table. But this is not the case. The following example shows how this value is equalized. Throughout the north the chief fuel employed is the wood of fir and pine. In those countries, however, it is not burnt in cast-iron stoves, but in those of clay or masonry, by which the quick and intense heat is absorbed and retained by the stoves, which give it out but slowly. Here then the heating apparatus *is* constructed according to the fuel, and to attain the same end fir and pine will be preferred, weight for weight, to beech wood.

In regard to the quantity of charcoal which the carbonization of each species of wood will yield, it must be inversely proportional to the quantity of its hydrogen; for the more hydrogen there is, the more carbon will it take up in forming carburetted hydrogen gas, and the less carbon will there be left. Results in practice, on a large scale, are entirely in accordance with this view of the subject. What has already been said applies to woods taken in equal weights. But wood is generally bought and sold by measure,* and consequently a difference in price arises from the difference of specific gravity in the different kinds.

According to the experiments of Mr. Bull, in the United States, a cord of dry wood contains in pounds, the following quantities, viz:

		Of Charcoal.
Shell bark hickory,	4469 lbs.	36 bushels.
Chesnut white oak,	3955	36
White oak,	3821	39
Red heart hickory,	3705	32
Shell bark white oak,	3464	32
Red oak,	3254	30
White beech,	3236	33
Black walnut,	3044	31
Yellow poplar,	2516	27

* In France, wood has for several years been sold by *weight*.

Yellow pine,	2463	33
Jersey pine,	2137	26
Pitch pine,	1904	33
White pine,	1868	30

It follows, that under an equal volume of hickory, oak, or beech, there is far more matter capable of generating heat, than in the case of poplar or of any of the pines.

Soft and light wood offers to the oxygen a larger surface, since it burns more readily and perfectly than the harder and more compact varieties. The latter only undergo a process of distillation from the interior parts, and when the included gases have been burnt, there remains a residuum of carbon from nineteen to twenty-five times greater than in the case of the lighter woods.

The experiments of Peclet have demonstrated clearly that the radiant heat of ignited gases, that is of flame, is infinitely weaker than that of red hot coal. Hence it results that the proportion of radiant heat must be very different in burning the different kinds of wood. The harder and more compact any species of wood is, and the less it contains of hydrogen, the greater is the quantity of radiant heat it is capable of producing. The soft woods give the least quantity of radiant heat. We ought then to reject the soft woods containing much hydrogen, from all those processes of heating which particularly require radiant heat. To heat boilers where the radiant heat is to be applied directly to the surface heated, in open fire-places and stoves, the hard woods are to be preferred. But when the object is to produce a high temperature at a certain distance from the fire, as in stoves and furnaces of masonry, in the manufacture of porcelain and glass, the wood which produces the most charcoal has the least value, for the furnace is choked up with coals, without producing the effect of a flame which extends on every side, and applies directly, by contact, to the surface to be heated.*

Manufacture of Sulphate of Soda. A new process for obtaining this salt has been secured by patent to Richard Phillips, Lecturer on Chemistry at St. Thomas' Hospital, and which he thus describes:

It is well known that when certain kinds of the persulphuret or bisulphuret of iron, commonly called iron pyrites, or martial pyrites, and sometimes merely pyrites, are exposed to the action of the air and of moisture, the sulphur which the pyrites contains is, for the most part, by oxidizement, converted into sulphuric acid, and the iron which the pyrites contains is also, by oxidizement, converted into oxide of iron, and the sulphuric acid and oxide of iron thus formed, combining, they constitute with water a solution of sulphate of iron, copperas, green copperas, or green vitriol, with an excess of sulphuric acid, and the heaps of pyrites which are thus exposed to air and moisture for the purpose of preparing sulphate of iron, or green vitriol, are called copperas, or pyrites, beds. The liquor which is yielded by the action of the air and moisture upon the pyrites of these copperas beds, is an aqueous solution of sulphate of iron or green vitriol, with excess of

* The use of pine and other soft woods is, however, preferable in steam boilers, where a great extent of fire surface is intended to be exposed to the contact of flame. TR.

See Annales de Chimie et de Phys. for July, 1835, for a valuable paper by M. Berthier, entitled, *Examen de quelques combustibles.*

sulphuric acid, and this liquor I call "the entire liquor," meaning thereby that it contains the whole, or nearly the whole, of the sulphuric acid formed by the action of the air, and of moisture, on the sulphur of the pyrites in the copperas beds, as above described.

The use of this entire liquor (on account of the large quantity of sulphuric acid which it contains) is one of my said improvements in the process of manufacturing sulphate of soda. For this purpose I take sixty parts (by weight) of common salt; frequently called muriate of soda, and sometimes chloride of sodium, and put it into a reverberatory furnace of the usual construction, and I add to it such a quantity of the entire liquor before described as would, if mixed with a sufficient quantity of an aqueous solution of acetate, nitrate, or other convenient salt of lead, give a precipitate of sulphate of lead which would weigh, after proper washing and drying, about one hundred and sixty parts, these one hundred and sixty parts of sulphate of lead, indicating the presence of sulphuric acid equal to about fifty parts, by weight, of concentrated liquid sulphuric acid, or oil of vitrol, and which are required for the decomposition of sixty parts of common salt, so as to convert it into sulphate of soda. I also take the specific gravity of the entire liquor, and on future occasions when its specific gravity is the same, or nearly so, I determine the quantity of it to be used with sixty parts of common salt, by its specific gravity alone, and without repeating the trial as to the quantity of sulphate of lead which is yielded by a given portion of it. And I may here observe that the greater the specific gravity of the liquor, the greater will be the advantage to the manufacturer.

The entire liquor, and common salt, being well mixed in the reverberatory furnace, I heat the mixture, as usually practised in the decomposition of common salt by sulphuric acid, occasionally stirring it, until acid vapours cease to arise from it; the residue of this operation is a mixture of oxide, or peroxide, of iron and sulphate of soda, and usually a small but unimportant quantity of common salt; I heat this residue in water to, or nearly to, its boiling point, in any convenient vessel, and when the water is nearly or sufficiently saturated, I suffer the peroxide of iron to subside, and the clear solution being conveyed to proper vessels, it yields, by cooling, crystals of sulphate of soda.

Having now described what I consider to be the best process for obtaining sulphate of soda by decomposing common salt with the entire liquor, I will proceed to describe another of my said improvements, which consists in the use, when circumstances render it eligible or convenient, of the crystalized sulphate of iron, green copperas, or green vitriol, obtained from the entire liquor (or in any other mode) by the usual processes.

For this purpose I reduce about one hundred and fifty parts, by weight, of the crystallized sulphate of iron, or green vitriol, to powder, and mix it with sixty parts, by weight, of common salt, and I heat the mixture in a reverberatory furnace in the same manner as before described, and I treat the residue in the same way as already described with reference to the residue obtained when the entire liquor is used.

Another of my said improvements consists in the use of the solution remaining after the separation of the crystals of sulphate of iron in the ordinary process of making green vitriol, and which solution is termed the "mother waters;" the strength of this solution, and the quantity of it to be used with a given weight of common salt, I determine by means of the proportion of sulphate of lead which it yields, exactly in the same manner as described with respect to the use of the entire liquor; I also take its specific gravity for the reason already stated with respect to the entire liquor, and I treat the mixture and residue as already mentioned with regard to those processes previously described. Rep. Pat. Inv.

Means of facilitating the expression of oil from seeds. A patent was taken in March, 1835, by Henry Walker Wood, of London, for applying a diluted acid, (muriatic acid for preference) previously to pressure, whereby the seed, it is alleged, will part more thoroughly with the oil. The following is the method he prescribes—"Take about one hundred pounds of seed, and, during the time that it is being ground, sprinkle it regularly with about three pounds two ounces of muriatic acid, diluted with about six pounds and a quarter of water; this is supposing the acid to be of 1160 specific gravity. By the process of grinding and sprinkling, the diluted acid will be intimately mixed with the ground seed. This mixture of seed, acid and water, is to be permitted to stand for some hours, twelve will be generally found sufficient, though the time will vary, depending on the quality of the seeds, but this will be soon ascertained by practice, and a short time longer or shorter will not materially influence the result of the process. The mixture is next to be submitted to pressure by placing it in bags, and disposing the same in the press, in the following manner; first, a bag of seed, next a plate of iron, then a bag of seed, and so on. I prefer an hydraulic press, and the pressure is to be exerted in the usual manner. By this improvement it will be found that the seed will part with the oil more thoroughly, and a larger quantity of oil will be obtained from a given quantity of seed than heretofore. Having now described the invention, and the manner of performing the same, I would remark, that although I have stated exact quantities of acid and water to be applied to a certain quantity of seed, yet I do not confine myself thereto, as it will be found that the quality of the seed will in some degree vary the quantities of the diluted acid, which will produce the best effect, but this must in a great measure depend on the judgment of the workman, which can only be obtained by practice, but the above quantities are given as average quantities; nor do I confine myself to the use of the particular acid named, or to the applying the diluted acid precisely at that part of the operation called grinding, as the same may be mixed subsequently but before the pressure is applied. Ibid.

Hancock's Steam Carriage. One or two of this gentleman's steam carriages have been travelling without intermission since the 11th of May last. That steam locomotion on common roads is both practicable and safe to the passengers and the public, he has proved; it now remains for him to show (which it will be seen by the following letter, containing a statement of his late performances, he promises shortly to do,) that his travelling has been economical, so as to return a fair profit to any capitalist who may embark his money in a speculation of the kind.

Mr. Hancock is now the only engineer with a steam carriage on any road. Sir Charles Dance, Colonel Maceroni, Dr. Church, Messrs. Ogle, Summers, Squire, Russel, Redmond, Heaton, Maudsley, Frazer, and a host of others—where are they? Echo answers—"Where!" Strange to say, however, we see steam carriage companies advertised, whose engineers have either never yet built a carriage, or whose carriages when built have never stirred out of the factory yard!

Sir.—Tuesday evening, the 20th inst., completed twenty weeks continued running on the Stratford, Islington, and Paddington roads, during this year, and I beg to hand you as faithful an account as I can of the performances of my carriages.

Since the last notice in your Magazine, a new carriage, the "Automaton," has been brought upon the road, the only difference between which and those preceding it is, that the engines are of greater power (having cylinders of twelve inches diameter, whilst those of the others are of nine inches,) and the carriage altogether of larger dimensions than the others, it having seats for twenty-two, whilst they are only calculated for fourteen passengers. It is an open carriage like the "Infant;" and although only calculated for the accommodation of twenty-two passengers, it has carried thirty at one time, and would then have surplus power to draw an omnibus or other carriage containing eighteen more passengers, without any material diminution of speed; its general rate of travelling is from twelve to fifteen miles per hour. On one occasion it performed (when put upon the top of its speed, and loaded with twenty full grown persons) a mile on the Bow-road, at the rate of twenty-one miles per hour.

The first time the "Automaton" was brought upon the road, (the latter end of July) it conveyed a party to Romford, and back, at the rate of ten to twelve miles per hour, without the least interruption or deviation in its working, although it was the first, or as I may call it, the day of proving, nor has it required any repairs whatever to this time.

After this digression in describing the "Automaton," I will return to the actual work done on the public roads and streets of the metropolis during the last twenty weeks, or five months, in as concise a manner as I can:

The miles run, about	4,200
Passengers carried,	12,761
Trips—City to Islington and back,	525
Do. do Paddington do.	143
Do. do Stratford do.	44
Supposing the carriage had always been full, the passengers carried would have been	20,420
Average time a carriage has run each day—5 hours 17½ minutes.	

An exact account of the number of times that the carriages have gone through the city in their journeys has not been kept, but I should suppose that it must be more than 200. For the last five weeks a carriage has been at the Bank twice a day, viz. between the hours of 2 and 3 and 5 and 6 in the afternoon.

It was on one of the morning trips from Stratford to the Bank, through the city, that the steamer became entangled with a waggon at Aldgate; and which, I am happy to say, is the only accident worth recording. The shafts of the waggon were swung by the contact, against the projecting front of a shop; the damage done was trifling, and occasioned by the wheels of the steam carriage having got into the iron gutter, and out of which it is not an easy thing to gain the fair surface of the street with any ordinary carriage in so confined a situation as that part of Aldgate in which the accident happened; and it should be observed, that this occurred in making way for another carriage passing at the time.

I will now give you an account of all other accidents (which have all happened to the damage of the steamers themselves,) viz. the chain pulley of the "Enterprize" once broke on the axletree; the same occurred once to the "Infant," which were permanently and immediately replaced by castings from the same pattern, with a greater thickness of metal, and which have since stood well.

The severe test afforded by the state of the City Road and onward to Paddington, caused these failures, for the pulleys had stood well on the other roads, for many miles.

Another accident was a hind-wheel of the "Erin" coming off in the New Street, near the Bank, on which occasion the carriage sunk only about eight or nine inches, in consequence of the frame-work of the machinery taking the ground; and so little was the coach thrown out of the level, that the inside passengers were surprised when informed that the wheel was off. The concluding accident was by the steerage chain of the "Infant" being too slight, and breaking at Islington, when the carriage turning short round, with one of the fore wheels against the curb, the wheel was broken. This wheel was an old one, of much slighter construction than I now make them.

In the early part of the five months' running, the close-bodied carriages, "Erin" and "Enterprize" were about equally employed—in the latter part, and to the present time, in consequence of the fine weather, the open carriages "Infant" and "Automaton" have been running.

I have occasionally examined the boilers and engines of all the carriages, and found that the engines have in most parts actually improved, whilst the boilers and fire-places have suffered a deterioration, less than could have been expected, from the use they have undergone.

It may be remarked, that both boilers and machinery are suspended on well-acting springs, and which accounts for the state of all the parts being so well preserved. Some of the boilers have been in use for two or three years.

There have been consumed in the before mentioned traffic, 55 chaldrons of coke, which is equal to 76 miles per chaldron, or about $2\frac{1}{2}d.$ per mile for fuel; but this on long journeys would be much reduced by the application of the moveable fire-place, patented by me about three years ago, as our greatest expenditure of coke in these short journeys is in lowering and again raising the fire.

I cannot conclude without noticing with gratitude, the general civility and attention which I have met with, and my pleasure in discovering that the antipathies which existed in the earlier part of my career are gradually subsiding, and that, in fact, I never now meet with incivility, excepting with a few carters or draymen, who consider the introduction of steam-carriages as an infringement upon the old established use of horse flesh.

Years of practice have now put all doubts of the economy, safety, and superiority of steam travelling on common roads at rest, when compared with horse travelling; and I have now in preparation calculations founded upon actual practice, which when published will prove that steam-locomotion on common roads is not unworthy of the attention of the capitalist, though the reverse has been disseminated rather widely of late by parties who do not desire that this branch of improvement should prosper against the interests of themselves.

After twelve years of incessant labour in steam-locomotion, yours, &c.

WALTER HANCOCK.

Stratford, Sept. 22, 1836.

Lond. Mec. Mag.

Anti Attrition Compound. To one part of lime water (a saturated solution of lime) add one part of olive oil, unite them well by thorough stirring or agitation, and they form a soapy compound of the consistence of cream. If too weak for the purpose, more oil may be added. This compound is said to be better than pure oil for the lubrication of small works.

For cogs or teeth of wheels, whale or common oil may be taken in the proportion of one part to two of lime water. It assumes the consistence of thick paste, when a small quantity of carbonaceous matter, such as plumbago, or soot, may be added and well incorporated.

For this compound a patent was taken out in England, by N. Partridge, in December, 1835. Lon. Jour. Arts and Sciences.

Lubrication by Water. Sir,—I perceive in the report, of the *Times*, of the proceedings of the scientific meeting at Bristol, that Dr. Lardner suggests placing water-pots before the wheels of a train of railway carriages to reduce the friction. The fact of a train running lighter on a wet day is well known to every engine driver; and it occurred to me to avail myself of the water leaking from the boiler, or tender, passing it, in the first instance, into the ash-pan, from which the excess drops in a small jet behind the engine wheels; thus the engine passes over the dry, and the tender and train over the wetted part of the rail. In the event of the boiler being so tight that the leakage would be insufficient, two small tubes, with regulating cocks, should pass from the tender, or cistern, and discharge a small jet on the rails as the train passes along. I shall feel obliged by your insertion of this letter in your earliest Number, in order to advance my title to the priority of this useful adaptation of what would be otherwise lost water.

Yours, &c. W. J. Curtis. Lon. Mec. Mag.

Progress of Civil Engineering.

Traction on Rail-ways.

From an article in the Dublin Review, No. 1, (May, 1836) on "*The Rail Road System in Ireland.*"

A modern Railway may be defined to be a perfect Road—hard, dry, and level, presenting the least possible resistance from irregularities of surface or inclination. Vehicles properly contrived, and furnished with wheels and axles, peculiarly constructed to move along the iron tracks with the least friction; and the untiring mechanical engine, compressed into the smallest useful compass, mounted on a carriage, supplied from a portable boiler, with steam at a high pressure, and yoked in front of the frame to be moved, give forth an irresistible power, transporting passengers and merchandize with a speed and economy wholly unattainable by means of animal resources.

The force necessary to move any given load on a horizontal line, is expressed by writers on mechanics in terms of the load itself. On a Railway extremely well laid, and in good order, with the bearing perimeter of the wheels turned perfectly true; with the best fitted axles, properly lubricated, and the iron rails clean and dry, or quite wet, the friction is reduced to its lowest terms. By friction is to be understood the sum of the obstruction to the movement of the carriage or train of