

Journal of the Society of Arts.

FRIDAY, JULY 19, 1861.

INTERNATIONAL EXHIBITION OF 1862.

The Council beg to announce that the Guar-

antee Deed is now lying at the Society's House for signature, and they will be much obliged if those gentlemen who have given in their names as Guarantors, will make it convenient to call there and attach their signatures to the Document. Signatures for sums amounting in the aggregate to £425,200, have been attached to the Deed.

GUARANTEE FUND FOR THE EXHIBITION OF 1862.

The following additions have been made since the announcement in the *Journal* for July 5 :—

* * * The names marked with an asterisk are those of Members of the Society of Arts.

NAMES.	AMOUNT.	REPRESENTING THE OBJECTS OF THE SOCIETY—ARTS, MANUFACTURES, AND COMMERCE.
*W. H. Cremer, 27, New Bond-street, W.	£250	Arts.
*Nathaniel Grew, 8, New Broad-street, E.C.	100	Commerce.
J. W. Bradley, 47, Pall-mall, S.W.	100	Commerce.

BY ORDER,

P. LE NEVE FOSTER, *Secretary*.

INTERNATIONAL EXHIBITION OF 1862.

The following arrangements, in addition to those already published, have been made in Foreign Countries and the Colonies in reference to the Exhibition :—

AUSTRIA.

Communications to be addressed to the Exhibition Committee, Imperial Ministry of Commerce, Vienna.

HAMBURG.

Senator A Rütcker, *President*.
Communications to be addressed to G. J. Göschen, 12, Austin Friars, E.C.

LIBERIA.

Gerard Ralston, Esq., Consul General, 21, Tokenhouse-yard, London, E.C.

MECKLENBURG-SCHWERIN.

Monsieur le Comte de Schlieffen à Schlieffenberg, Güstrow, et Monsieur Dippe, Conseiller Grand Ducal au Département des Affaires de Commerce et d'Industrie à Schwerin.

MECKLENBURG-STRELITZ.

The Government of the Grand Duke.

PERSIA.

Agha Mehdi, Chief of the Merchants.

WEIMAR.

The Prussian Commission will act for this State.

THE CAPE COLONY.

A Commission of twenty-four members appointed at Cape Town to act for the Western Province, and of eighteen for the Eastern Province at Grahamstown.

NATAL.

Dr. James Mann, *Hon. Sec.*, Pietermaritzberg.

TRINIDAD.

A Commission of five members appointed, consisting of the Governor, the Hon. C. W. Warner, the Hon. Dr. Mitchell, H. Crügen, Esq., Charles Feez, Esq., and Sylvester Devenish, Esq., *Secretary*.

VICTORIA.

A Commissioner of seventeen members appointed.
Dr. John M'Adam, *Hon. Sec.*, Melbourne.

IONIAN ISLANDS.

A Central Commission of nine members appointed by the Senate.

The Regent, *Chairman*.

H. Drummond Wolff, Esq., C.M.G., *Vice-President and Secretary*, Corfu.

HAWAIIAN OR SANDWICH ISLANDS.

Manley Hopkins, Hawaiian Consul, *London Commissioner*, 4, Royal Exchange-buildings, E.C.

The Commissioners have received information that the following Local Committees have been formed in addition to those already published :—

BRADFORD.

H. W. Ripley, Esq., *Chairman*.
J. Darlington, Esq., *Secretary*.

KILMARNOCK.

The Mayor, *Chairman*.
The Town Clerk, *Secretary*.

MIDDLESBROUGH.

The Mayor, *Chairman*.
John Dunning, Esq., and Dr. J. Richardson, *Secretaries*.

MUCH WENLOCK.

The Mayor, *Chairman*.
R. C. Blakeway, Esq., *Secretary*.

OLDHAM.

The Mayor, *Chairman*.
John Sharples, Esq., *Secretary*.

TEWKESBURY.

J. Yorke, Esq., *Chairman*.
The Mayor, *Secretary*.

YARMOUTH (GREAT.)

The Mayor, *Chairman*.
Town Clerk, *Secretary*.

The following regulations, in addition to those already published, have been issued by Her Majesty's Commissioners in reference to Foreign and Colonial Goods intended for Exhibition:—

106. Every article sent separately, and every package, must be legibly marked with the name of the foreign country or colony of which it is the produce or manufacture, and, as far as practicable, with the name of the exhibitor or exhibitors.

107. The following is the Form of Address which should be adopted:—

To the Commissioners for the Exhibition of 1862,
BUILDING, SOUTH KENSINGTON, LONDON.
From [state Country, and Exhibitor's name.]

To prevent loss, miscarriage, or mislaying, articles or packing cases containing them, which occupy less bulk than two cubic feet, should not be sent separately, but packages under such size containing, as far as possible, the same classes of articles, should be transmitted in combination.

108. Her Majesty's Commissioners of Customs have laid down the following regulations upon the importation of goods intended for the Exhibition:—

a. All packages containing goods intended for the International Exhibition of 1862 shall be specially reported as such, and shall be addressed to the Commissioners of the International Exhibition, or to one of their officers, and be consigned to a duly accredited agent, and shall be accompanied with a specification of their contents and value. They shall be separately entered as intended for the International Exhibition, and the agents in passing their entries shall specify the full contents of the packages, together with the value.

b. Such packages as may be landed in London shall be forwarded unopened to the Exhibition in charge of an approved licensed carman, accompanied by a cart note from the landing officer, giving a description of the packages and the marks and numbers thereon; and in cases where there may be reason to suppose they contain other goods than those for the Exhibition they shall also be accompanied by a revenue officer.

c. Packages landed at the out-ports shall be forwarded with a similar note by railway or other public conveyance, under seals of office, direct to the Exhibition, the officers at the respective ports taking care that the packages bear no private address, and that the documents relating thereto be immediately forwarded to the proper officers of Her Majesty's Customs stationed at the Exhibition.

d. On the arrival of the goods at the Exhibition, no package shall be opened without the knowledge and consent of the officer of Customs, and if the goods be found to agree with the entry or specification, they will, if free, be at once considered as out of charge of the Customs, the entry or declaration being deemed sufficient for all statistical purposes.

e. In the case of all dutiable goods, an account will be taken by the officers of the Crown at the time of the first opening of the packages, but such deficiencies as may occur within the building from any legitimate or unavoidable

cause, the officers being fully satisfied thereof, shall not be charged with duty.

f. That the building be considered, for all practical purposes, a "bonded warehouse;" and that in all cases where dutiable goods shall not be exported, but retained for use in this country, the duty shall be assessed by the officer in charge at the building (and received in the Exhibition by a clerk duly appointed for the purpose), in accordance with the practice now existing in regard to articles found in "passengers' baggage."

g. In the case of dutiable goods for exportation, an entry shall be passed in the Long Room, and bond given for their due exportation; and on the receipt of this entry by the officer in charge of the building, the goods shall be packed in his presence, and, if for shipment at an outport, placed under seal, and forwarded in charge to a railway or other public company; but if for shipment at London they shall be sent in charge of Customs officers, at the expense of the exporter, to be delivered into the charge of the searcher of the station from which they are to be shipped, without further examination, under the regulations applicable to goods shipped direct from the warehouse.

THE MANSFELD COPPER-SLATE MINES IN PRUSSIAN SAXONY.

By W. P. JERVIS, F.G.S., MINING ENGINEER.

(Continued from page 609.)

I have purposely excluded the silicious ores (*Sanderze*) in this description, believing them to be of secondary formation, and produced at the expense of the copper-slate by the infiltration of water, &c. Throughout the Eisleben basin the sand ores are very scarce, and only met with in one restricted spot near Erdmann shaft (*Schaafbreiter Revier*). I attribute their occurrence there to the mass of water which lodged for ages in the adjacent large gypsum grottoes, for the sandstone is only cupriferous below these, and the depth to which it penetrates into the compact rock (less than an inch) seems to be an argument in favour of its not having been originally deposited there. Where sand ores are abundant, as may be seen in old workings, fibrous gypsum in prismatic crystals penetrates not only into the copper-slate and among the sand ores, but also deeper into the *Weissliegendes*, proving, incontestibly, the passage of large quantities of water through the rock, and the fact of the re-arrangement of minerals held in solution. A more decisive argument might be adduced from the frequency of veins of purple and gray copper in the vicinity of faults, perpendicular to the bedding, throughout the thickness of the *Leite*, and precisely similar to the horizontal ones; these could not, evidently, have been produced at the same time as the former.

The general N.W., S.E. strike of the rocks is accompanied by a vast number of parallel dislocations of the strata; these are continuous in proportion to their vertical fracture. The principal fault in the Eisleben basin is Schumann's *Rücken* (Schumann's fault), between Erdmann and Martin shafts, nearly perpendicular, and 13 *Lachter* (15 fathoms) deep; it runs for a considerable distance N.W., S.E., in the direction of the strike. This fault, being so important, rendered the construction of the level N. of Erdmann shaft very expensive, apart from the necessity of carrying it for some distance through sterile *Rothliegendes*, with the uncertainty how high the copper-slate might be above the roof until the rock was bored upwards. By following the dip the level has once more reached the copper bed. The fissures accompanying faults are generally filled with carbonate of lime penetrating the sandstone, also sulphate of barytes. When in direct contact with the copper-slate a polished surface is generally produced by friction, and a trace of ore is usually met with. A smaller and more local "throw" is distinguished as a *Horst*, where the copper-slate is commonly more or less

continuous, sometimes curving entirely round the throw; at other times only the calcareous beds are interrupted, and more generally only the *Lette* and *Schramm*, from their plastic character form the connecting link. Galena, with large crystalline faces, is frequently found in the *Dach*, in the immediate neighbourhood of faults (Martin shaft, &c.) also nests of heavy spar accompanied by copper-nickel for the distance of several yards on either side of the fault. Galena is nowhere sufficiently plentiful in the Eisleben basin to pay; the nickel is rare. Where abundant, such dislocations have produced a beautiful phenomenon of plication on the harder *Lette* and *Schramm*; the folds observed at the Martin shaft are half an inch deep, and have a continuous denticulated appearance; the black *Schramm*, on the other hand, has very polished curved surfaces, generally coated with copper pyrites, purple copper, and more rarely native silver. These smooth portions are called *Gleiten* or *Rutschen*; (*gleiten*, to glide; *rutschen*, to slide;) the surfaces are termed *Rutschflacken*, (gliding surfaces). As a rule, where the sand ores are abundant the *Schiefer* above is poor, but near faults the amount of ore procurable from any given area is decidedly greater than elsewhere. This is easily accounted for; the copper ore which is held in solution in water follows the strata in the direction of the dip until it arrives at the fault, where the interruption in its course is sufficiently long to enable the heavier particles to separate and deposit,* so that they soon arrange themselves in tiny veins.

The copper ores are mostly argentiferous, though only the purple copper ore and copper pyrites are rich in silver. It is generally allowed that in the deepest parts of the mines the quantity of silver slightly increases. Bergrath Plümicke shewed me as a great rarity a little specimen of native copper, but this and the native silver have probably been produced by electro-magnetic agency decomposing the sulphuretted combinations.

At Martin shaft the *Lette* is no longer good, but the *Kammschale* is rich; further on the *Dach* is useless. East of the road from Eisleben to Hettstädt the copper-slate is very poor, and contains a very small proportion of silver. These points differ considerably, but we must bear in mind they are many leagues apart, for in a restricted locality corresponding analyses would not vary materially.

The mode of laying out a *Kupferschiefer* mine is entirely peculiar. The shafts proceed at once to the adit, and thence to the copper-slate bed, where they invariably terminate; whereas, in most other mines, numerous levels are driven right and left. Arrived at the ore, a level (*Strecke*) is made in the direction of the strike, with sufficient rise to effect the drainage. At a convenient point an inclined plane (*Querschlag*) is formed in the direction of the dip, ascending or descending perpendicular to the level. It is a custom to make parallel levels start from the *Querschlag* at uniform distances of 30 *Lachter* (34 fathoms) and from their being employed in conveying ore they are designated working levels (*Gezeug Strecke*). Each is furnished with a tramway, and while in course of construction with a 12-inch zinc ventilating pipe, requiring no further current than that produced by the difference of temperature at either open end. The levels are roomy and airy, about 6 feet by 5½, but the inclined cross-courses have to be made much wider, to admit of a double tramway, for the alternate ascent and descent of waggons attached to a wire rope, and set in motion by a subterranean steam-engine, as at Maschinen shaft, where the drum is wound up by a pair of oscillating high-pressure cylinders. Sometimes the uppermost waggon of the descending train is fitted up as a cistern, and filled by a hose; this draws up the full waggons to the level of the bottom of the shaft, and the water is let out into the adit level.

* A somewhat similar phenomenon is observed in rivers where much mineral matter is held in suspension; where the current is impeded, as at the end of a reach, the solid particles tend to deposit in great quantities and form a bank.

Such an arrangement is used at Johannis shaft, Santerhausen, with great success, since there is abundance of water at the higher part of the mine.

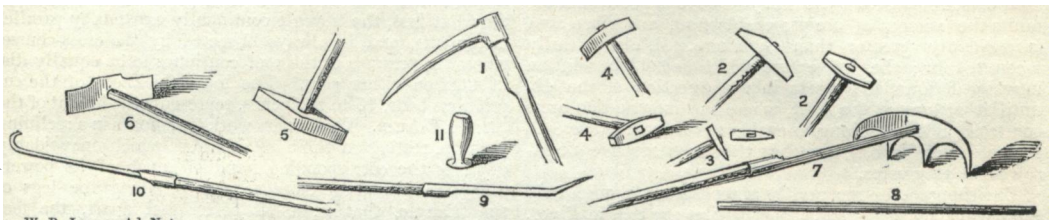
The inclination of the cross-courses entirely depends upon that of the strata, as the floor is invariably formed by the *Weissliegenden*, and the roof made at the expense of the limestone above. The waggons (*englische Wagen*) are constructed of boiler plate; those employed in the cross-courses are much longer than the rest in the levels, which being propelled by young men, are made as light as possible, only weighing 10 *Centner*, and containing 8 to 10 *Centner* of ore. When once these preliminary openings have been completed, the ground is laid out among gangs of miners (*Manschaften*) who commence the formation of *Streebe Fahrten*, that is, the entire extraction of the copper slate. The rock thus undermined would threaten the lives of the men at any moment, and the utter obliteration of the levels, but for a most ingenious device. An equal space of ground is systematically planned out on either side of the cross-course, in the form of a very acute isosceles triangle, the base of which corresponds with the level. Small at first, the triangle continually expands by parallel increments, and is always bisected by the cross-course, where the pressure of the roof continues to be equally distributed on either side. The local thickness of the cupiferous beds, 15 to 24 inches, represents the height of the *Streebe Fahrten*. The miners work for 8 hours in a reclining position, resting on their left shoulder, which unavoidably deprives the corresponding hand of much of its power. They are placed as close as possible along the legs of the triangle, that is, about seven feet apart, the feet of the one above the head of the other. At first, 6-inch billets of fir (*Stempel*) are driven in to support the roof, and columns of rough stone (*Fauler*), 4 to 6 feet square. As the space increases it is filled in with rubbish and worthless slate, carefully packed up like a dry wall, so that eventually the whole roof quietly settles down, only sinking two or three inches by the compression of the stone work, and in no way impeding the men. Thus does the scene of operations continually advance, and the whole of the ore is extracted. The fathom adjoining the actual work is always left free for the passage of boys who drag out the ore to the levels in little wooden boxes tied to their waists. The reader will find a certain analogy with the working of coal mines. A stranger would find the mode of progression through a *Streebe Fahrt* unique and painful in the extreme; narrow wooden shields are strapped on the left shoulder and left leg, and the leathern girdle behind the hips; the miner then wriggles along, worm fashion, on his side, by the alternate advance of his arms and retraction of his legs, sliding on the boards with considerable dexterity. The lowest of these passages into which I had occasion to enter was an ancient and long unused one, 250 feet long, barely twelve inches high, and a dead level! After twenty minutes' violent exertion in a horizontal position, I experienced a very unpleasant sensation of blood to the head; on my return I heard of an elderly captain who had bravely entered, but, getting aground in the middle of his voyage, had to be towed out by main force, by having his legs pulled backwards. Even with the modern workings of 15 to 18 inches, the continual exertion of the limbs in a very unfavourable position, and the pressure on the chest, is injurious in the long run to the miners, and combined with the fine dust from the schists entering the lungs, produces *Dampf*, a very oppressive disease, allied to asthma. The mining authorities do their utmost to guard the men against the pernicious effects of this malady, by allowing its victims to exchange their underground occupations for others at the surface.

Every three months (*Quartal*) the progress of the *Streebe Fahrten* is indicated on a large plan as the work of the 1st, 2nd, 3rd, and 4th quarter, and at the close of the financial year the extremity of the levels is marked by a cross with the date.

The tools employed in extracting the softer slate are a pick (*Keilhauer*), by which the men undermine the firmer

slate, besides which each carries a string of gads or hammer-heads (*Eisen*), into which a stick loosely driven fresh every time serves as a temporary handle, and saves him from the concussion produced by the sledge (*Schlegel*). For blasting in the levels, round borers (*Böhr Eisen*) a foot long are used; the loose material is picked up in triangular shovels (*Schaukel*). Convenient smithies are established at the bottom of the mines for the repairs of these tools. Previous to laying the tramroads low wheel-barrows (*Schiebharrn*, literally shoving carts,) are employed, which the youths (*Karrlaufer*) do not touch with their hands, but propel by a strap passing over their shoulders. One *Karrlaufer* is allotted to so many men, of whom some are reckoned as expert miners, (*Hauer* or *Vollhauer*), the rest as apprentices (*Lehrhauer*). The ore which each gang of men extracts is kept by itself until the end of the month, when it is examined by the captains, and they are paid accordingly; but the waggon-lads have fixed wages. This constitutes a two-fold classification into "tribute" or contract work, (*Gedingarbeit*), and

work for wages, (*Lohnarbeit*). With the former class a fresh contract is made every month, and if they do not agree to the terms, a bargain is struck more in accordance with the combined interests of employers and employed. In case of any unforeseen difficulty, such as the increased hardness of the rock or a considerable body of water, the men have the right of appeal and are paid an equivalent. This is a most equitable system, for the miners profit in proportion to their diligence. When the ore reaches the surface it is distributed among a number of elderly men, (*Klauber*.) to be broken up and sorted. The sorters are arranged in a line on one side of a railway running on the summit of a wall. Each man is sheltered from the weather, sitting under a wooden frame, with his feet hanging over a pair of bins. He is provided with a dividing hammer, (*Scheidehammer*), one end of which is flat and sharp, so as to laminate the slates. Throwing away the useless rock, he lets fall the rich ore into one bin and the poor into the other, after breaking it up into fragments of a cubic inch or two ready for roasting.



W. P. JERVIS, Ad. Nat.

TOOLS EMPLOYED AT THE MANSFELD MINES.

1. Pick (*Keilhauer*). 2. Sledge (*Schlegel*). 3. Gad (*Eisen*) 4. Klauenhammer. 5. Scheidehammer. 6. Kracke. 7. Schlackenharke. 8. Borer (*Bohrreisen*). 9. Lufteschippe. 10. Abziehhaken. 11. Crucible (*Kupfer Tutchen*).

After so detailed an account of the Eisleben basin, it would be tedious to enter into too many particulars regarding that of Sangerhausen. The mines are there worked high above the valley at the edge of the basin; the beds inclining towards the Goldene Aue the drainage is far more easily effected, than near Eisleben, which is ten miles to the east. Few shafts are at work, and those on a small scale, between Morungen and Gross Leinungen, five or six miles above Sangerhausen. The neighbourhood of the mines hitherto spoken of is all cultivated land; these are in the midst of extensive royal plantations of underwood, and the ground is very hilly as it forms part of the Hartz.

The territory of Morungen, as we have seen, belonged in former times to the Counts of Mansfeld, and later fell into the hands of the Counts of Einsiedel. The mines have been generally worked independently of the rest; in the last century they were farmed by the Brothers Bethmann, of Frankfort, and were only acquired by the Mansfeld Company in 1834; they continued the system of smelting and selling the Sangerhausen copper separately for several years, having an idea it was better suited for the brass manufacturers, but now no difference is made, all is refined together.

The chief workings around Carolus and Johannis shafts are connected together internally; the former is 51 *Lachter* (55 fathoms) deep, the latter 52 (56 fathoms), to the Gonna adit level, and 12 more to the deep workings (*Tiefbau Sohle*). Drainage is already effected by the Segen Gottes level, the entrance to which is above Sangerhausen. Most of the ore is here found in the *Weissstiegenes*, thus: in the Carolus shaft, a square *Lachter* yields 12 *Centner* of silicious ore, and 36 *Centner* of poor copper-slate. The slate is not always remunerative in itself, but the slightly cuprififerous *Dach* and *Kopf* are extracted from lack of better materials as a flux. The silicious ores are 1½ to 2½ inches thick, of which the upper inch is rich, containing 10 per cent. of copper; the rest is poor, not exceeding 5 per cent.; they are separated for the convenience of roasting, and then stamped.

One or two important faults run through the "sett," accompanied by rich masses of copper-nickel now largely ex-

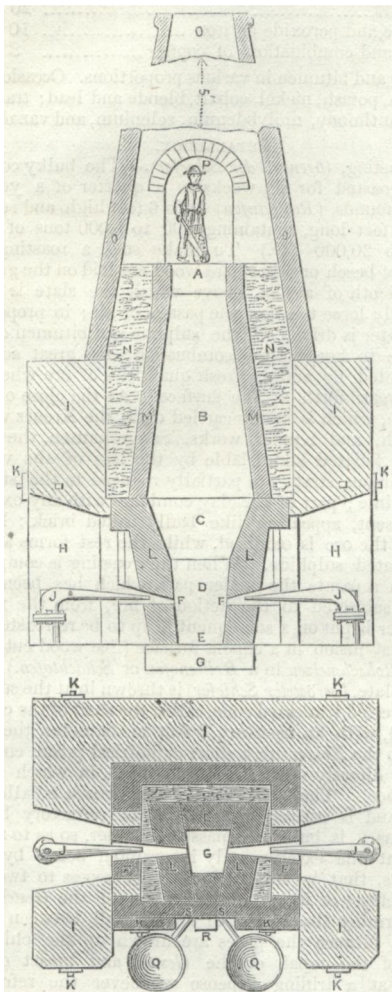
tracted, occurring on both sides of the dislocation, disseminated in the most complete manner in heavy spar. After long exposure, the nickel ore becomes covered with oxide, nickel ochre; sometimes the whole lump is thus altered. It is invariably accompanied with cobalt, which is made apparent under similar circumstances by a roseate blush of earthy erythrene. A singular history is connected with the 4th experimental shaft (*vierte Versuchs Schacht*). It had been worked for copper-slate, when improvements in the art of smelting proved that the highly silicious ores could be turned to advantage without loss in the slags, so the whole ground was laid open again. The shaft and levels are now in operation for the third time along the fault, to extract the copper nickel, a substance so long considered prejudicial to other ores—the miners' great enemy. It is well-known that cobalt owes its name to Kobold, the evil spirit of the German miners. Nickel comes from an obsolete word *nicken*, and signifies something very bad. The assertion is not entirely groundless; nickel and cobalt are arsenuretted ores, and never found together with the sulphuretted combinations of copper, which they in a measure replace. It is only lately that we know the great utility of these ill-named metals.

Every half year a general sampling takes place before the dividends are declared, and the scheme for the following six months published. A lock-up chest, containing several hundred-weight of ore, is filled at each part of the mines. This undergoes the preliminary smelting operations at the works in special assay furnaces (*Probiröfen*.) When brought to the state of a rich matt (*Spurstein*), a labelled bottle of each sort is forwarded to the laboratory at the Gewercken Haus, at Eisleben. The assay *Centner* here made use of (*Probergewicht*), is the 10,000th part of the commercial weight.

ASSAY WEIGHTS.

<i>Komm.</i>				
10 =	1 Cent.			
100 =	10 =	1 <i>Quantchen</i> .		
300 =	30 =	3 =	1 <i>Centner</i> (assay weight.)	
1,000 =	100 =	10 =	1 <i>Loth</i> .	
30,000 =	3,000 =	300 =	30 =	1 <i>Pfund</i> . = 500 <i>grammes</i> .

tions of coke, fluor-spar, and slags from the preceding operations, as well as from the manufacture of concentrated matt and black copper.



W. P. JERVIS, Ad. Nat.

Scale $\frac{1}{10}$

CUPOLA (*Schachtofen* or *Brillenofen*).

A. Gicht. B. Schacht. C. Kohlsack. D. Gestell. E. Level of tap holes (*Rase*). F. Form. G. Sohlstein. H. Archways (*Formenwalbe*). I. Masonry casing. J. Tuyères (*Tuse*). K. Iron stays (*Anker*). L. Reverberatory stone. M. Masonry. N. Ashes. O. Brick chimney. P. Archway entrance. Q. Basins (*Tiegel*). S. Breast of furnace.

Having gradually descended, and been subjected to a very elevated temperature by the ordinary blasts, the sulphuretted copper ores tend to become concentrated into a mass, easily separating by its weight from the lighter slags, the fluor spar at the same time forming gaseous combinations, which go up the chimney. One of a pair of tap-holes is now forced open by driving in the clay plug, whereby the red-hot slags gradually flow out in the viscid condition of molten lava, accompanied by the matt, into the hearth (*Heerde*), an hemispherical excavation in the ground in front of the furnace, about $3\frac{1}{2}$ feet in diameter: the blast meanwhile forces out a small ghastry pale jet of grayish-blue flame, accompanied by dense white fumes, resulting from the combustion of a mixture of the oxides of zinc and antimony: occasionally the flame is tinged green by the gasification of a small quantity of oxide of copper. It is to carry away these highly suffocating compounds that the furnace is supplied with the double wall in front, so that, notwithstanding the quan-

tity continually issuing forth, no inconvenience is felt by the smelters. At the end of an hour or two the basin begins to fill, the matt settling to the bottom. A man now proceeds to remove the upper part of the slag (*Schlacken-kopf*) in a cake (*Schlackenfell*), dragging it out of the building with a strong rake (*Harken*); the most plastic part, however, is formed into blocks in iron brick-shaped moulds, about 18 inches long; a second man immediately lifts off the end of the frame and removes the block (*Formatstein*) into the open air by the aid of a long hook (*Haken*). This operation is carried on with considerable rapidity, and in no way interferes with the duties of the smelters. The bricks are their perquisite: they are sold on the spot as a building material, for 5s. per hundred. During the six to eight hours in which the products flow in this manner into the basin, the slags are removed 15 to 20 times. To be good, they must be basic silicates, and are known to be clean when black in the mass, with green bottle-glass bubbles. The lower part of the slag is opaque red, being highly cupriferous, and is set aside to add to subsequent charges. The basin being filled, the first plughole is stopped up with clay, and the other one opened to fill the remaining basin. In this manner alternate conical cakes of matt (*Rohstein*), weighing from 10 to 12 cwt., are procured. A rod with a ring at the end is thrust into the centre, and when cold enough it is lifted out and broken into fragments, for the convenience of smelting. The first matt ranges from 23 to 58 per cent. of copper, and has a coarse irregular fracture and somewhat metallic aspect. The formation of matt in cupola furnaces is carried on at the following works, called *Rohhütten*:—

Kupferkammer Works	...	Burgörner.
Kreutz	''	} Leimbach.
Katharinen	''	
Eckhardt's	''	
Mittel	''	} Eisleben.
Ober	''	
Kupfer	''	Sangerhausen.

Analysis of the Rohstein Matt.

	P. cent of Copper.	Corresponding Formulae.	Authorities.
1. Kupferkammer Works	27.30	...	} Official MSS. for 1857.
2. Ditto	to 29.60	...	
3. Ditto	23.58	4 (FeS, ZnS, NiS) Cu ₂ S	
4. Ditto	to 31.70	...	} Bruno Kerl.
5. Eisleben	48.25	...	
6. Ditto	36.60	...	} Official MSS. for 1857.
7. Ditto	to 38.20	...	
8. Mansfeld	42.10	...	} Bruno Kerl.
9. Katharinen	43.62	FeS, Cu ₂ S	
10. Sangerhausen	47.27	FeS, Cu ₂ S	
11. Ditto	52.44	6FeS, 7Cu ₂ S	
12. Ditto	58.60	...	

The ores at Sangerhausen are chiefly silicious and highly refractory. They undergo preparatory stamping, and are freed as much as possible from quartz by washing in a ginging machine (*Slossheerde*). Good limestone is wholly unprocureable in the neighbourhood, but is partly substituted by the *Dach*, notwithstanding which it may be observed that far more fluor spar is employed than at Eisleben or Mansfeld. The air is here heated to about 325° Fahr., or 130° R, in its passage through four rows of zig-zag tubes contained in a spacious chamber, through which the flames of a step-grate furnace circulate freely. This contrivance, called *Lufterhitzungs Apparat*, is heated with dusty brown coal. The Sangerhausen matt is denser than that from Leimbach, and is sent off to the Eisleben works. Eckhardt's works, the newest of all (not yet completed) form a magnificent pile of buildings on the hill-side north of Leimbach, and contain some ponderous machinery for supplying the blast. The fires were first lit on the 22nd of January, 1860. To bring them up to the requisite temperature with charcoal and coke required six weeks, but eight days is quite sufficient for old furnaces after the usual repairs.

3. Second roasting (*Concentration*). The broken-up

PROPORTION OF CHARGES PER FUDER (60 CENTNER) OF ORE.

	ECKHARDT'S WORKS. Leimbach.	KREUTZ WORKS. Leimbach, 4 furnaces.	KUPFERKAMMER WORKS. Burgörner.	KUPFER WORKS. Sangerhausen.	MANSFELD MINES, according to Bruno Kerl (not specifying any works.)
Roasted Slate	60 Centner.	60 Centner.	60 Centr.	24	60 Centner.
Cupriferos limestone (Dach)	" "	" "	" "	6	
Silicious ores (Sand-erze)	" "	" "	" "	30	
				60 Centner.	
Slags from reverberatory furnaces (Spur-schlacke)	2 "	" "	From Leimbach 3 "	2.5 to 3 "	} Unspecified.
Slags (unspecified)	" "	3.5 to 4 "	" "	" "	
Scum of purification of matt (Kratz) ..	4 to 6 "	" "	" "	" "	
Fluor Spar	4 "	4 "	3.5 "	15 "	Do.
Coke, Westphalian or English	7 Tonnen.	" "	" "	" "	4.75 Tonnen,
" Wettin or Berlingas works. }	" "	" "	" "	" "	or 5.6 "
" unspecified	" "	7.5 Tonnen.	{ with cold blast 5.5 Tonnen. " hot " 6.5 "	heavy coke 7.5 to 8 Tonnen. light " 10 to 10.5 "	
	4 Fuder or 240 Centr. are thrown in every 24 hours The charges are renewed 28 to 30 times every 12 hours.	4 Fuder per 24 hours; each producing 5 to 5½ Ctr. of 1st matt, (Rohstein).	3½ Fuder passed in 24 hours, each yielding 5 Ctr. of matt.	Produce per Fuder, 6 to 6½ Centr. 2 Fuder smelted daily. The furnaces are smaller than those of Leimbach. Average analysis:— Copper 45.00 Silver 0.07 Sulphur 20 to 22.00 Iron, &c. 33 to 35.00	Operation lasts 5½ to 6 hours. Average produce 4 to 4½ Ctr. of matt per Fuder of roasted ore.

Rohstein matt is roasted for a fortnight in little bins (Stadeln), enclosures 10 feet by 12, with a five-foot wall on three sides. The once roasted matt (einfuriger Stein) contains lumps scarcely distinguishable from natural grey copper ore, that is, having equally metallic lustre, but not so easily scratched with a knife; the rest simply clots together, and is only tarnished like purple copper ore. After it has all been broken up by boys, the least changed part is removed to the adjoining bin, and once more roasted with a fresh quantity of wood. The product is twice roasted richer matt, called indifferently zweifuriger Stein, Gaarröst, and gerüster or concentrirter Rohstein. The same operation of comminution and sorting is repeated on the richer matt in the enclosure itself, by lads, who would almost appear to enjoy the dense suffocating fumes of sulphurous acid, which threaten at once to stifle the stranger bold enough to watch them. One Ctr of matt requires for roasting 0.1 Tonne of charcoal, and 0.1 Stuck of underwood.

4. Treatment of the roasted matt (Gaarröst) at Kreutz and Kupferkammer works in reverberatory furnaces (Flammconcentrationsöfen) to complete the formation of a pure matt. These furnaces have a rectangular base 14 feet by 20 feet, and are 5 feet high. Being subjected to great lateral thrust at a very elevated temperature, they are firmly strapped together by wrought iron stays (Anker). At one corner is the Fuchs, from which a canal leads to a lofty brick chimney. The bed is double and approached by two iron doors; that on the side serves for charging the matt (Einsatz Thür); the working door in front (Arbeits Thür) is to enable the men to stir up the matt with oblong scrapers (Krücken) to prevent caking, and give free egress to the sulphurous acid, as well as to expose fresh surfaces to the oxidizing flame.

The following is an actual example of the proportions observed in the reverberatory furnaces at Kupferkammer works in September, 1860:—

Roasted matt (Rost).	Slags (Schieferschlacken).	Sand.	Wettin Coal.	Riebstadt brown coal.
1st Week.				
From Kupferkammer Works	Ctr. 226	Ctr. ...	Ton. 20	Ton. 29.0
" Friedeburg "	226	12	18	23.5
" Leimbach "	226	12	18	23.5
Total	682	24	56	86
2nd Week.				
Total	722	57	38	129
				91

19 charges (Sätzen or Chargen) are treated weekly after the furnace is in order, about equal quantities of three kinds of matt. A single charge at the various works is given in the following page.

After two charges the matt, an almost pure disulphide of copper, Cu₂S is allowed to fall into water, whereby it is reduced to a fine state of division, like gravel (Granaillen), a recent improvement, which, combined with the subsequent pulverization under heavy millstones, greatly expedites the separation of the silver.

5. Desilvering process (Entsilberung).—Before describing the present system it may be well to say a word or two in chronological order about the discarded methods.

a. Formerly the silver was separated from the copper by means of lead (geseigert). The saiger or liqution process was very expensive, and particularly inapplicable to ores so poor in silver, and where such prodigious quantities of copper had to be treated, for the lead had to be brought all the way from the Hartz. In the desilvering process one-fifth of lead was employed to four-fifths of copper, to render the alloy fusible. This was moulded into discs, and subjected to liqutation; the cakes were placed upright in rows on the sides of a distinct furnace, over a narrow opening; the intermediate space was now filled with charcoal, and the alloy raised to a regulated temperature: the silver leaving the copper combined in preference with the lead for which it had greater affinity, and by slow cooling the two latter metals were spontaneously squeezed out together, the discs roughly preserving their original form. The lead was then cupelled in a Treibheerd, represented in the cut on the next page, which I sketched from an ancient painting in St. Andreas Church at Eisleben; the little cupola on the right of the engraving was what was employed for the first fusion of the copper slate; the water-wheel supplying the blast. The litharge from the cupellation of the argentiferous lead was fused with fresh copper, while the silver and lead still remaining with the copper was extracted by "sweating;" that is, the discs were piled up in the furnace and slowly heated at a gentle temperature, to permit of the separation of a fresh quantity of lead; the remaining mass was once more heated, but more violently, and with access of air, so as to facilitate superficial oxidation. After repeating these alternate operations, the liquated discs were plunged into water to detach the oxidized crust.



Die Gluth bringt guth.

1. Cupelling furnace (*Treibherd*). 2. Litharge. 3. Cupola (*Krummofen*). 4. Matt flowing out. 5. Removal of Slag. 6. Water-wheel for supplying the blast. 7. Wheel-barrow (*Schiebkarrn*) as still employed.

	KUPFERKAMMER WORKS.	KREUTZ WORKS.	MANSFELD MINES, ACCORDING TO BRUNO KERL, NOT SPECIFYING ANY WORKS.
1st Charge, Roasted matt	38 Ctr.	42 Ctr. after 8 or 9 hours slags removed	Once roasted matt 12 Ctr.
			Twice " " 12 "
			24 Ctr.
Sand.	3		4
Brown coal.	12 to 13 Tonnen.		(By volume) Riebstedt brown coal . 8.5 Vol. English coal 7.5 " (By weight) brown coal 8 Ton.
Roasted matt.			After 2½ hours add— Once roasted matt 6 Ctr. Twice " " 6 " 12 Ctr. Treat four-and-a-half hours, then remove slags.
2d Charge, Roasted matt		42 Ctr. treated same way.	24 Ctr.
Sand.			3 Ctr.
Additional roasted matt.	The concentrated matt (<i>Spurstein</i>) yielded in 1857 63 to 68 per cent. of copper.—(Official M.S.S.)	Two charges complete an <i>Abstich</i> , when the concentrated matt is withdrawn, yielding 74 per cent. of copper. In 1857, 70.44 to 75.6 per cent. of Copper.—(Official M.S.S.)	12 Ctr. Two charges require 18 to 20 hours, and yield concentrated matt (<i>Spurstein</i>), containing 70 to 76 per cent. of metal. Ctr. Zoll lbs. Gran. Copper 36 to 40 Fine Silver 251 slag 36 to 40 slagged copper (atmos.) 1.5 ... Copper in mechanically mixed matt 10.0 ...

b. At the commencement of this century amalgamation with mercury took the place of this tedious method of alloying with lead. This was still a most complicated affair, and required a very extensive apparatus, much machinery, and, above all, much expensive mercury, 10-96 *Loth* per *Centner* of copper, or $\frac{1}{3}\frac{1}{5}$. It is only within the last 12 or 14 years that Messrs. Augustin and Ziervogel imagined anything at all suitable for the desilverisation of the ores.

c. The salt process of the former gentleman was at once adopted at the Gottesbelohnung works, a palatial establishment newly built for the amalgamation process on either side of the company's road from Hetstätt to Eisleben, by Leimbach. Augustin's process was a gigantic stride in advance; it consisted of roasting the concentrated matt in a reverberatory furnace, by which the sulphides of iron, copper and silver were converted by the oxidising action of air at a great heat into their corresponding sulphates, or vitriols (FeO.SO_3 , CuO.SO_3 and AgO.SO_3) but at the very elevated temperature required for the formation of sulphate of silver, the others were almost entirely decomposed into peroxide of iron and oxide of copper (Fe_2O_3 and CuO), with the evolution of sulphurous and sulphuric acids (SO_2 and SO_3). The sulphate of silver and any remaining sulphate of copper were at once treated with salt thrown into the furnace. Chlorides of silver and copper were formed, and sulphate of soda (AgCl , CuCl and NaO.SO_3). The chloride of silver was then treated with a hot saturated solution of salt, by which it was dissolved, and ready to be precipitated by copper. The overjoyed shareholders voted Herr Augustin something like 63,000 *Thaler*, (£9450) when Herr Ziervogel struck out his water process. This was tried in its turn and found to supersede the device of his rival; the generosity of the Mansfeld company seemed to have forsaken them on this occasion; perhaps they feared that startling improvements might follow in too rapid succession, at any rate they are said to have given Ziervogel 800 *Thaler* (£126.) The salt process is still employed in Saxony, however inapplicable here, where the whole of the matt is desilverized at the Gottesbelohnung works by

d. Ziervogel's water process (*Wasserentsilberung*). The shot of concentrated matt, as in Augustin's method, is finely ground under heavy millstones and introduced into the reverberatory furnace, where the complex sulphides are allowed to oxidize. The furnaces have two floors, the powdered matt being introduced into the upper one, and continually raked about to expose fresh surfaces to the action of the air; the flame from the lower bed does not enter this floor, but only circulates round it. On removing these substances from the furnace the sulphate of silver, being soluble in water, is at once separated from the oxides of iron, copper, nickel, zinc, &c. The whole charge is distributed in vats (*Gefässe*), placed in a line on the upper floor of the building, and boiling water poured over them. The sulphate of silver with any traces of sulphate of copper speedily dissolves and runs out of the perforated bottom, on which are placed in succession several sized sieves, each finer than the last, and commencing with a wicker-work disc. The solution flows through a pipe into a lower series of vats, each containing 3 cwt. of impure black copper; chemical decomposition immediately ensues; the sulphuric acid leaving the silver attacks the bars of copper, which rapidly disappear, the liquid acquiring the well-known deep blue tint of copper vitriol; the silver is simultaneously liberated as an impalpable mud of cement silver (*Cement Silber*). After 24 hours the liquid has settled, and the vitriol is drawn off with a syphon into a third row of vats, coming in contact with fresh copper. The liquid is conducted into a reservoir, whence, after depositing any blue vitriol, it is pumped up to the vats again. The silver is thoroughly washed previous to being smelted in a small reverberatory furnace.

(To be continued.)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Thirty-first Meeting of the British Association for the Advancement of Science will commence in Manchester on Wednesday, the 4th of September, 1861, under the presidency of William Fairbairn, Esq., LL.D., F.R.S.

The General Committee will meet on Wednesday, the 4th of September, at one p.m., for the Election of Sectional Officers and the despatch of business usually brought before that body. On this occasion there will be presented the Report of the Council, embodying their proceedings during the past year. The General Committee will meet afterwards by adjournment.

The First General Meeting will be held on Wednesday, the 4th of September, at eight p.m., when the President will deliver an Address; the Concluding Meeting on Wednesday, the 11th of September, at three p.m., when the Association will be adjourned to its next place of meeting.

At two Evening Meetings, which will take place at eight p.m., Discourses on certain Branches of Science will be delivered. There will also be other Evening Meetings, at which opportunity will be afforded for general conversation among the members.

The Committees of Sections will meet daily, from Thursday the 5th of September to Wednesday the 11th of September, inclusive, at ten a.m., precisely.

The Sections will meet daily, from Thursday the 5th of September to Tuesday the 10th of September, inclusive, at eleven a.m., precisely.

The following are the titles of the Sections to which Communications may be presented:—

- Section A. Mathematics and Physics.
- „ B. Chemistry and Mineralogy, including their applications to Agriculture and the Arts.
- „ C. Geology.
- „ D. Zoology and Botany, including Physiology. Sub-section D.
- „ E. Geography and Ethnology.
- „ F. Economic Science and Statistics.
- „ G. Mechanical Science.

Notices of Communications intended to be read to the Association, accompanied by a Statement whether the Author will be present or not at the meeting, may be addressed to Professor Phillips, M.A., LL.D., F.R.S., Assistant-General Secretary, University Museum, Oxford; or to R. D. Darbishire, Esq., B.A., F.G.S., Alfred Neild, Esq., Arthur Ransome, Esq., M.A., and Professor Roscoe, B.A., Local Secretaries, Manchester.

Gentlemen desirous of attending the meeting will find in the Reception-room (The Portico, in Mosley-street) blank Forms of Proposal, and may make their choice of being proposed as Life Members, paying ten pounds as a composition, or annual subscribers, paying one pound annually and an admission-fee of one pound (making together two pounds on admission); or Associates for the Meeting, paying one pound. Ladies may obtain tickets, through the application of a member, in the Reception-room, price one pound each ticket. These tickets are transferable to other ladies only.

Home Correspondence.

CHARCOAL AIR-FILTERS.

SIR,—My attention has been drawn to a letter by Mr. Jasper W. Rogers, in your *Journal* for the 5th of July, on which I propose to make a few remarks.

The power of charcoal, especially of wood charcoal, to absorb and destroy gaseous emanations from putrifying matter, was never claimed by me as a discovery of my own. Previously to 1854, when I first published on the

subject, charcoal had always been described as possessing antiseptic properties, as could be seen by reference to any of the systems of chemistry published previously to that year. In my lecture at the Royal Institution, I quoted Professor Graham's Chemistry, 2nd edition, 1850, and the last edition of Turner's Elements, 1847. The same was also the opinion of Mr. Jasper W. Rogers, as will be seen from the following quotation, page 24 of my "Lecture at the Royal Institution," third edition, 1855. Having recommended the "covering of a burial ground to the depth of two or three inches with coarsely-powdered charcoal, to effectually prevent any putrid exhalations finding their way into the atmosphere," I also recommended "that charcoal should be introduced into all coffins, as it not only favours the decomposition of dead bodies, but prevents them from being injurious to the living." I then go on to state, that "I was not aware till very recently that Mr. Jasper Rogers, C.E., of Dublin, had proposed a similar application of peat charcoal some four or five years ago. Mr. Jasper Rogers' object was not merely to prevent the escape of effluvia, but to retard the decomposition of the bodies by means of the supposed antiseptic properties of charcoal."

It is plain, therefore, from the above quotations, that Mr. Rogers, as may be seen by his statements as published by the Irish Amelioration Society, believed in the antiseptic properties of charcoal, and that I had not so completely ignored his labours on the subject as anyone reading his letter of the 17th of June would be led to suppose. The only discovery which I claim in regard to charcoal is its oxidizing power, by which, from the large amount of condensed oxygen contained in its pores, amounting to between 9 and 10 volumes, it rapidly oxidizes the effluvia and miasmata emitted by decaying substances, and resolves them into the simplest combinations they are capable of forming, their carbon being converted into carbonic acid, and their hydrogen into water.

A knowledge of the oxidizing property of charcoal naturally led me to the construction of the charcoal air-filter, which consists of pieces of charcoal varying in size from a filbert to a walnut, interposed between sheets of wire gauze, through which the impurities of the atmosphere are made to pass by filtration.

The invention of the charcoal air-filter is, it appears, also claimed by Mr. Rogers. The only proof of his claim with which he has favoured us, is a quotation from the Windsor paper of the 27th of October, 1849, in which he describes the deodorisation of a cesspool as follows:—"By a simple arrangement, Mr. Rogers placed a comparatively small quantity of peat-charcoal accurately granulated, resembling gunpowder in appearance, in such a position in contact with the wall as to intercept the gases as they rose, holding the charcoal in its place by a slight wooden boarding." Now I maintain that, on Mr. Rogers' own showing, this is no air-filter at all. In a filter, the gases must have the power of passing through and through the charcoal. He says that the peat-charcoal, in as fine grains as gunpowder, was heaped up against a wall, and supported, no doubt at the bottom, by a slight wooden boarding. It is clear, therefore, that the effluvia issuing from the cesspool under such arrangement, could not pass through the charcoal—the wall on which it rested would effectually prevent that—and that, therefore, the charcoal only acted by its surface attraction as charcoal had many years previously been known to do. Had Mr. Rogers covered over the cesspool with wire gauze, and then placed a layer of charcoal upon it so as to compel all the gases evolved to pass through the charcoal, as is now the invariable practice in such cases, that would have been to employ an air-filter, but to leave, as he did, the cesspool open, and merely to lay down a quantity of charcoal at the side of it, is not to employ an air-filter at all.

What I call upon Mr. Rogers to do, therefore, is to bring forward any printed statements dated previous to 1854, announcing the fact that charcoal is an oxidizer, and likewise that he will produce a published description of

his air-filter of a similar date. Till he does this, I, for one, refuse to admit his pretensions.

In conclusion, I may mention that I have carefully read through Mr. Rogers' patent for peat-charcoal, dated 1848, and that neither the oxidating power of charcoal nor the air-filter is once mentioned in it. All charcoal filters, many hundreds of which have been applied to the sewers for some years past by the eminent engineers, Messrs. Rawlinson and Haywood, contain wood charcoal only in pieces of considerable size, from about a quarter of an inch to an inch in magnitude, for in truth it is not easy to conceive how it would be possible to disinfect the gases issuing from the sewers with air-filters containing granulated peat-charcoal of the size of grains of gunpowder, as Mr. Rogers asserts that he has done, without entirely obstructing ventilation. I am, &c.,

JOHN STENHOUSE.

17, Rodney-street, Pentonville, W., July 12th, 1861.

PRIZES FOR SKILLED WORKMANSHIP.

SIR,—I speak under correction, but shall we do quite right by giving prizes for graining or imitations of marbles, &c.? Had we not better encourage devices on wood or slate, so as to enrich them, and still let the material appear for those who want ornament beyond what the varnished surface gives. The common yellow deal is a beautiful wood when varnished, but pitch pine is gorgeous. Then, if there be no paint and putty, good work *must* be put in.

Those who do not think the above woods good enough, can use others. Do let us try to lead the people out of shams. I may be wrong, but I, having had a great deal to do with workmen of all kinds, have long thought that we can find amongst a hundred engine and machine fitters more really good men than amongst the same number of grainers or imitators. I think the truth of workmanship practised by the former has a tendency to elevate the mind. I am, &c.,

L.

Richmond, 15th July, 1861.

Proceedings of Institutions.

BARNSTAPLE LITERARY AND SCIENTIFIC INSTITUTION.—The sixteenth annual report, presented to the annual general meeting, held March 27th, 1861, says that the past year has not been marked by any unusual features. The income from members' subscriptions, aided by the munificent annual contribution from Mr. Rock, has enabled every department of the Institution to be maintained in a proper state of efficiency; and in the appropriation of the income the council have endeavoured so to arrange the same as not to give undue prominence to any one department at the expense of others. The number of members has for several years past maintained an average, and in that respect this year shows but little difference from the preceding. There has, however, been a considerable increase each successive year in the demand for free membership, which the council have reason to believe is mainly caused by the increased facilities for class instruction offered by the Institution. There are at present 326 members, including 90 free members under Mr. Rock's foundation. The building of the Institution, which is rented for a long term of years on a repairing lease, is now in perfect order, a good deal having been expended on the repairs during the last few years. The council regret that the intention of the legislature to exempt literary institutions from the payment of local taxes has been frustrated by a technical flaw in the statute, and for the last year or two the local rates and taxes assessed on the Institution have formed a considerable addition to the rent and annual outlay. The establishment of the meteorological observatory in connection with the general system of observations throughout England, has proved a valuable feature, as it not

only assists the great end of the advancement of science generally, but gives a position to the Institution as one of the meteorological stations of England, and the only one within a circuit of forty miles. The observations are regularly and accurately taken from first-class standard instruments, by the librarian, under the superintendence of Mr. T. Mackrell and a small committee, and after being tested at Greenwich Observatory are published with the Registrar-General's Quarterly Report. The reading rooms are now amply supplied with daily and weekly newspapers and periodicals. The claims made upon the resources of the Institution by the other departments have again restricted the expenditure on the library; nevertheless a considerable number of books in all classes of literature has been purchased during the year, and on the whole the library is now in a most satisfactory condition, the number of volumes amounting to 4,910, the total issue for the past year having been 9,260. The plan of printing a catalogue of the books having been found, after the publication of two editions and several appendixes, not only costly, but of questionable utility, inasmuch as the latest compilation was, from the regular growth of the library, necessarily incomplete as soon as issued, the council have decided to substitute a single MS. catalogue, to lie on the library table, in which the title of every book will be entered alphabetically, with cross references. The student and general reader will thus be able at a glance to ascertain what books on any given subject are to be found on the shelves. A list of the books recently added, and which are always most in request, will be suspended in the library, and occasionally printed if it should be desirable. On the important subject of class instruction the Committee report, that the courses which have been provided for the various classes have met with an average amount of appreciation, and have in some individual cases been pursued with untiring diligence and attended with marked success. Some of the results of the studies of the Drawing Class give evidence of great ability in the students, needing only assiduous cultivation to be fully developed. The average attendance has been eleven, and the conductor remarks, "there have been several very industrious pupils among them." Classes for the study of the French and Latin languages have been conducted with some success, but the teachers complain of the hindrance to the progress of the pupils resulting from their inability or indisposition to study at home in the intervals of class teaching. The results of the class would be much more satisfactory if future pupils could be induced to adopt this course, so that the time actually spent in class should be employed in testing their progress and guiding their course of study, rather than in the mere preparation of lessons. In addition to the foregoing, an Arithmetic Class has been well conducted by the assistant master of the Wesleyan Day-school; and though the same faults have to a great extent characterised the attendance in this class as those before alluded to, a few young men have regularly attended, and good results have been obtained. The register of attendances in these four classes shows the following results:

	Pupils.	Lessons.	Average Attendance.
Arithmetic ...	20 ...	30 ...	9
Latin ...	11 ...	31 ...	7
French ...	15 ...	38 ...	8
Drawing... ..	20 ...	39 ...	11

On the subject of Lectures the Council cannot make a very satisfactory report. In the earlier stages of the Institution this department depended entirely on the gratuitous assistance of gentlemen resident in the neighbourhood, or occasional visitors, whose services for a few years proved eminently attractive, but it was found after a while that amateur lectures altogether failed to secure an audience. The Council then resorted to professional lecturers, with occasional musical and other entertainments, and these, at the commencement, attracted such large audiences as to necessitate the engagement of a larger room for their delivery,

which also enabled the Council to appropriate the lecture-room as a reading-room, a step much required from the small size of the original first-class reading-room. It has, however, for the last two years, been found that the interest excited by this department is decreasing, and lectures or entertainments, even of the most attractive character, scarcely ever secure a full room. Furthermore, owing to the distance from London, and the lack of kindred Institutions in the neighbourhood who could unite in engagements, there has been found a great difficulty in inducing first-class lecturers to visit Barnstaple, and the terms of those who have been engaged are too high to render it possible to make their lectures at all remunerative. The report furnished by the Lecture Committee says that, "it is quite clear that the present system of engaging lecturers of assumed first-class position and high terms must be abandoned, and a smaller room, more frequent and less expensive lecturers engaged, and efforts made to enlist the services of amateurs.. The correspondence which the present Committee has had with lecturers, prove that the means of the Institution are not equal to engagements of first-class talent, and as a great difference of opinion exists on this subject, it is impossible to depend on securing for a gentleman of great attractions elsewhere, a large or paying audience in Barnstaple." The Council, with the greatest regret, announce the retirement of Mr. Chanter from the office of Honorary Secretary, which he has held with so much credit to himself and advantage to the Institution from the day of its foundation. Mr. J. G. King, who has for several years past given valuable assistance on the Class Committee, has kindly consented to accept the office. The abstract of accounts shows that the receipts have been £343 9s. 5d., and that there is a balance of £26 15s. 8d. in hand.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

- Par. Num. *Delivered on 25th June, 1861.*
- 360. Appointments to Offices—Return.
 - 367. Public Accounts—Second Report from Committee.
 - 198. Bills—Industrial Schools (Scotland) (Amended).
 - 199. " Church Endowment Act Amendment.
 - 200. " Church Rates Law Amendment (No. 2).
 - Schleswig-Holstein—Maps.
 - Sanitary Condition of Barracks and Hospitals—Report of the Commission.
- Delivered on 26th June, 1861.*
- 292. Loan Societies—Abstract of Accounts.
 - 352. East India (Civil Service) Bill—Return.
 - 333. Army (Military Reserve Fund)—Return.
 - 194. Bill—Public Houses (Scotland) Acts Amendment.
- Delivered on 27th June, 1861.*
- 33 (5). Trade and Navigation Accounts (31st May, 1861).
 - 359. Staffordshire Mining and Potteries Districts—Returns.
 - 361. Navy (Iron Cased Ships)—Return.
 - 205. Bill—Greenwich Hospital.
- Delivered on 28th June, 1861.*
- 336. Jersey—Return.
 - 370. Scottish Universities—Paper.
 - 376. Rags—Return.
 - 381. War with Russia—Votes of Credit (Excess of Expenditure)—Statement.
 - 382. Revenue Department—Non-Effective Charges (Excess of Expenditure)—Statement.
 - 206. Bills—Industrial and Provident Societies.
 - 207. " Attorneys and Solicitors (Ireland) (Amended).
 - 208. " Book Unions.
- Delivered on 29th June and 1st July, 1861.*
- 356. Public Bills and Committees—Return.
 - 324 (A. 1). Poor Rates and Pauperism—Return (A).
 - 203. Bills—Crown Suits—Limitation.
 - 209. " Drainage of Land (as Amended by the Select Committee).
 - 204. " Copyright of Designs.
 - 210. " Labourers' Cottages (Amended in Committee, and on Re-commitment).
 - 211. " Inclosure.
- Delivered on 2nd July, 1861.*
- 346. Wexford Harbour—Return.
 - 380. Transport Service—Report from Committee.
 - 338. Chelsea New Bridge—Return.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED

[From Gazette, July 12th, 1861.]

- Dated 16th March, 1861.*
668. E. C. Morgan, Norwich—Imp. in protecting ships and fortifications.
- Dated 20th March, 1861.*
698. A. Symons, 63, Southwark Bridge-road—Imp. in apparatus for propelling and steering vessels.
- Dated 25th April, 1861.*
1038. R. Gray, Sheffield—Imp. in the mode of hardening and tempering crinoline, flattened wire, or sheet steel. (A. com.)
- Dated 2nd May, 1861.*
1094. J. C. Wilson, 25, Bucklersbury—Imp. in the break or stopping gear of centrifugal machines.
- Dated 13th May, 1861.*
1216. A. C. Vautier, Charenton le Pont (Seine), near Paris, and M. Uzielli and Co., 9, Mincing-lane, London—Imp. in obtaining fibrous materials and paper pulp from various trees, shrubs, and plants.
- Dated 18th May, 1861.*
1276. F. O. Ward, Hertford-street, May Fair, Middlesex—Imp. in manufacturing manure and in obtaining accessory products.
- Dated 25th May, 1861.*
1322. E. H. C. Monckton, Parthenon Club, Regent-street—Obtaining and applying magnetic motive power, which invention is also applicable to other useful purposes.
- Dated 30th May, 1861.*
1346. W. B. Roof, 7, Willow-walk, Kentish-town, Middlesex—Imp. in window seats for the prevention of accidents.
- Dated 31st May, 1861.*
1368. The Right Hon. Lord C. Beauchamp, Riding Manor House, Northumberland—Imp. in apparatus for propelling vessels.
- Dated 5th June, 1861.*
1412. M. Dodsworth and W. Smith, New Malton, Yorkshire—An improved boot and shoe-cleaning machine.
- Dated 6th June, 1861.*
1422. J. Wright, 42, Bridge-street, Blackfriars—Imp. in the method of and apparatus for separating foreign matters from the droppings from carding machines and for returning the residue thereunto. (A. com.)
1428. J. Rust, Lambeth Glass Works, Carlisle-street, Lambeth, Surrey—An improved composition or preparation for hardening and preserving stone and cement.
1436. A. Smith, Hull—Imp. in drying, sweetening, purifying, and otherwise improving wheat and other grain, and in apparatus for the same.
- Dated 7th June, 1861.*
1440. W. Riddle, 1, Barford-street, Islington, and H. G. Coombs, 17, Union-street, Southwark—Imp. in shop-fronts.
- Dated 8th June, 1861.*
1462. J. Roman, Liverpool—Imp. for economizing fuel in evaporating and concentrating, chiefly applicable to the manufacture of chemicals and in the apparatus connected therewith.

- Dated 10th June, 1861.*
1484. C. F. Varley, 4, Fortess-terrace, Middlesex—Imp. in electric telegraphs.
- Dated 15th June, 1861.*
1534. H. J. Kennard, 38, Great George-street, Westminster—Imp. in apparatus for excavating sand and gravel under water.
- Dated 18th June, 1861.*
1558. R. Fell, 9a, Great Saint Helen's, London—Imp. in obtaining motive power and in apparatus employed therein.
- Dated 22nd June, 1861.*
1604. A. L. Le Harivel, 33, Tufnell-park-road, Upper Holloway—Imp. in the manufacture of paper papier maché cardboard and other similar articles.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1693. J. F. Spencer, Newcastle-upon-Tyne—Imp. in steam engines and the machinery and apparatus connected therewith.—3rd July, 1861.

PATENTS SEALED.

[From Gazette, July 12th, 1861.]

July 12th.

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| 116. A. G. Lasserre. | 129. R. W. Swinburne. |
| [From Gazette, July 16th, 1861.] | |
| July 16th. | 239. C. E. Crawley and T. Schneider. |
| 133. G. Lewingdon. | 249. H. Phillips and J. Bannehr. |
| 149. R. M. Latham. | 261. S. W. Warren. |
| 152. C. W. Lancaster, J. Brown, and J. Hughes. | 271. J. J. De Arrieta. |
| 173. R. Henderson. | 333. C. White. |
| 181. W. Clark. | 345. J. H. Johnson. |
| 185. W. Wilson. | 765. E. Briggs and S. Fearnley. |
| 195. D. J. Fleetwood. | 1143. G. Cole, J. A. Jaques, J. A. Fanshawe, & T. Galpin. |
| 205. A. F. Yarrow and J. B. Hilditch. | 1279. B. F. Stevens. |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[From Gazette, July 12th, 1861.]

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| July 8th. | 1549. C. N. Kottula. |
| 1545. W. Simons. | July 9th. |
| 1547. J. Broadley. | 1591. J. Fowler, jun. |

[From Gazette, July 16th, 1861.]

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| July 11th. | July 12th. |
| 1565. N. Defries. | 1613. J. Spence. |
| 1626. W. Tasker, jun. | July 13th. |
| | 1634. T. Bailey. |

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[From Gazette, July 12th, 1861.]

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| July 9th. | 1624. G. F. Wilson & G. Payne. |
| 1512. G. A. Biddell. | |

[From Gazette, July 16th, 1861.]

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| July 11th. | June 13th. |
| 1558. T. Wright. | 1554. E. H. Brindley. |
| 1569. J. Lockhart, jun. | |

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4373	May 25.	Perpetual Vermin Trap	Colin Pullinger	Selsey, Chichester.
4374	" 31.	{ Improved Piston for Brass Musical Instruments	Joseph Pimlott Oates	Erdington, near Birmingham.
4375	June 14.	Improved Angle Iron	{ Edward Peyton and	Bordeley Works, Birmingham.
4376	" 17.	Davies's Improved Plough	{ Wm. Fothergill Batho	Higher Walton, near Warrington.
4377	" 21.	{ Improved Muzzle and Sight-Protector for Rified Guns	Edward Davies	Fisher-street, Birmingham.
4378	" 21.	{ Cottam's Noiseless Manger Shackle and Guides for Halter Rein	Thomas Turner	
4379	" 27.	{ Design for Sinks, Surface-gullies, Rain-spouts, and Closets, and their connections to Drains	Cottam and Co.	2, Winsley-street, Oxford-street, W.
4380	" 27.	{ Improved form of Prism for Binocular or Stereoscopic Microscopes, Telescopes, and Cameras	J. G. B. Marshall	Rokey House, Stratford, E.
4381	July 2.	The Elcho Scarf	John Benjamin Dancer	Cross-street, Manchester.
4382	" 6.	Three-Die Stock	Thos. Harris Toms	Staining-lane, City, E.C.
4383	" 8.	{ Feeding Trough for Sheep and other Animals	Easterbrook and Allcard	Albert Works, Sheffield.
4384	" 8.	A Clasp or Buckle	Thos. Perry and Son	Bilston.
4385	" 11.	The Elcho Firing Screen	Thos. Bent Wilkins	Great Charles-street, Birmingham.
4386	" 12.	A Sash Fastener	Lord Elcho, M.P.	21, St. James's-place, S.W.
			Joseph Downing	102, Irving-street, Birmingham.