THE JOURNAL

OF THE

Board of Arts and Manufactures

FOR UPPER CANADA.

APRIL, 1867.

THE PEAT BOGS OF CANADA—CAN THEY BE UTILIZED?

The gradual exhaustion of the coal beds of Britain, and the timber forests of America, and especially of Canada, has for some time past challenged the attention of manufacturers and scientific men, and indeed of the general public. Under such circumstances, it is no wonder that anxious enquiries should be made, and experiments instituted, with a view to utilizing other kinds of fuel for domestic, manufacturing, railway and marine purposes. As applicable to all these uses, peat appears to have a strong claim; while for all but domestic purposes, petroleum and shale oils have many zealous advocates.

Selections from time to time found in our pages, from British and American journals, will have kept our readers pretty well informed of the efforts made to discover new sources of these fuels, and to bring both kinds into use, in as economical a form as coal and wood, for the various purposes to which these have heretofore been applied.

Geologists tell us, with the utmost confidence as to the correctness of their conclusions, that coal will not be found in Canada; and experience forces upon us a conviction of the fact that timber is not only becoming a dear article for building and manufacturing purposes, but very scarce and costly for fuel in all our frontier towns; hence arises a necessity for discovering some economical mode of utilizing our extensive stores of peat, so as to be enabled to apply it for domestic uses, for steam-fuel or for smelting our various iron, copper, or other native ores.

In Sir Wm. Logan's Geological Report, the principal known sources of peat are named, the most western of which is in Sheffield, County of Addington—the next county west of Kingston. We have no doubt, however, that extensive beds will be found in the western section of Upper Canada; one source at least, in Welland, having been already discussed in the public press.

The peat deposit in the township of Sheffield, is described in the Report as of three or four hundred acres in extent—the average depth about four feet, and its quality very superior. Deposits are also found in the rear of the Seigniories of Vaudrueil and Rigaud, L. C.; and in Caledonia, Roxburgh, Osnabruck and Finch; in Clarence, Cumberland and Gloucester—in the latter extending over some 5,000 acres, and in depth generally from eight to fifteen feet, while in some parts bottom has not been found at twenty-five feet. This tract is but three miles from the Ottawa, and therefore quite accessible. In the township of Nepean and Goulborn, near the village of Richmond, are three large peat beds, of from 1,000 to 3,000 acres each. It is also found in Beckwith, and about 3,000 acres in Westmeath. The township of Huntley has about 2,500 acres, from eight to fifteen feet in depth. On the north side of the Ottawa, at Grenville, and at Harrington, are several small areas of peat, of superior quality. Deposits are also found at Mille Iles and Ste. Anne; and at St. Sulpice, a peat bog covers an area of 1,100 acres, of from two to fifteen feet in depth. In the Seigniories of Lavaltrie and Lanoraye, are two bogs with an area of about eighteen square miles, and of an average depth—so far as ascertained—of about eleven feet.

In the fief of St. Etienne, the Seigniories of Champlain, De Léry and Lacolle, Longueuil, Ste. Marie de Monnoir, Riviere Quelle and Ile Verte, the townships of Duquesne and Macpes, and the parish of St. Dominique, are found extensive peat beds, some of them of superficies of from 4,000 to 6,000 acres each. The most extensive beds, however, are found on the Island of Anticosti, being upwards of eighty miles in length and two in breadth; or a superficies of over one hundred and sixty square miles, and from three to ten feet in depth. There are also many smaller bogs on the Island, of from 100 to 1,000 acres in extent.

Knapp's Technology thus describes the formation of peat:—"When the soil of a district assumes the form of a flat basin of greater or smaller dimensions, so that the water which collects cannot freely flow off, but stagnates for a length of time (form a moor), which is not of uncommon occurrence in the temperate zones, and is favored by the tardy evaporation, then water plants of all kinds, sedges, rushes, reeds, algæ, mosses, even shrubby plants, as willows, &c., avail themselves of the propitious situation, and quickly form a thick covering of vegetation. With the change of season these die and fall to the ground, making room for a second crop in the following spring. This goes on from year to year until the hollow bog is completely filled up, although in a very loose manner. The remains of the plants immersed in water quickly undergo decay; they lose their original solidity with the simultaneous evolution of gases (marsh gas, carbonic acid) of a disagreeable and partly noxious odor, at the same time that they take up oxygen from the atmosphere and from compounds contained in the soil and water surrounding them, *e. g.*, sulphates, which they reduce, they become brown and soft, and eventually are converted into an earthy, black-colored mud. The debris of plants, reduced to this state of decay, or in which the process is still going on, is called *peat*."

Dr. Ure describes the course pursued in ascertaining the commercial value of the products of peat, in Ireland; and gives as the results of the examination the relative quantities produced by 100 parts, the average of the several ordinary varieties experimented on, as

Charcoal	29·222
Tarry products	2·787
Watery products	31·378
Gases	36·616

The average amount of ashes in 100 parts of peat was found to be 3·43.

Sir W. Logan gives the density of peat from the surface of the Bog of Allen, Ireland, as 0·335, or one-third that of water, while the blackish-brown earthy peat, from the lower layer of the same bog, is from 0·639 to 0·672, or double that of the surface. A peat found in Devonshire has a density of 0·850; while a specimen from the bog in Storrington, Canada, was "fine grained, compact, and so heavy as to sink in water," and gave by incineration 3·53 per cent. of a light grayish ash. Other specimens gave as much as 7·27 of ash.

In localities where coal and wood are expensive, peat is an excellent and economical substitute fuel for domestic uses. The solidified or compressed peat, made under Gwynne's patent, in Great Britain, is said to evolve no opaque smoke in burning, no sulphurous acid is set free, the heat is quickly raised and quickly diffused, the ashes do not form clinkers, and the peat does not contain any metallic sulphuret, or other substance that is likely to produce spontaneous combustion. It is also a valuable fuel for the manufacture of iron, and is for this purpose largely used in France, Sweden and parts of Germany, producing a quality of iron much superior to that manufactured with coal. The *Montreal Gazette*, recently noticing the first bloom of iron made with pure peat fuel in Canada, pronounces it of a quality equal to the best Swedish iron. The bar was bent by a vice, when cold, and "doubled up close at right angles with an edge, without a crack or flaw appearing, the outer corners remaining smooth and sharp: a test which it is said no coal-iron in Canada will stand."

Overman, in his work on "the manufacture of Iron," speaks of peat as being of little value to the American people as fuel, because of the abundance of wood and stone coal in the country; but admits that, in a charred form, it is "a most excellent fuel for the blacksmith's forge, in case-hardening, tempering and hardening steel, forging horse-shoes, and particularly in welding gun-barrels.

Fairbairn says that the iron ores of Balcarry Bay, in Ireland, yield 70 per cent. of iron; and if they were worked, and peat used for fuel, they would make iron equal to Swedish charcoal iron—that the ore, the peat, and good limestone are cheap and abundant; and on account of the purity of these materials, iron of the greatest strength and ductility can be made; which, from its non-liability to corrode, would be well adapted for marine purposes. The writer of the article, "Iron," in the Encyclopedia Britannica, says if the Irish iron mines were more extensively worked, and peat fuel used in the smelting operations, the "iron would probably be of the very best quality, and might rival the famed Swedish charcoal iron." "In Austria, all the iron is smelted with charcoal or carbonised peat, and is in consequence of the first quality." "The superiority of the Swedish iron has long been acknowledged, and till recently it has been unrivalled. This arises not only from the purity of the ore, but in consequence of its being smelted with charcoal only." From experiments recently made, in Europe as well as in this country, carbonised peat appears to be as superior to wood-charcoal for the manufacture of iron, as wood-charcoal is to coal. If this is so, with our extensive and superior native iron ores, and immense fields of peat, combined with our other rich mineral resources, what stores of wealth the Province has in reserve!

At Dartmoor, England, peat is cut by the convicts, and stored up; from this a highly illuminating gas is made, with which the prisons at Prince Town are lighted. The charcoal left is used for the prison fuel, and for sanitary uses (for which latter purpose it is a valuable article), and the ashes are finally used to improve the poor land of the neighbourhood. According to the experiments of Dr. Letheby, one ton of peat furnished as much as 14,000 cubic feet of illuminating gas, which, when passed through an alkaline mixture, was found to be free from sulphur; in this respect having a decided advantage over coal gas.

In Great Britain and in the United States, many patents have been taken out for the cutting and preparation of peat for fuel; but owing to the competition of cheap coal, or the want of perfectness in the machines and processes patented, most of these exterprises have resulted in failure. There is reason to hope, however, that the mode of manufacture and machinery recently patented by James Hodges, Esq., in this country, and in operation during a portion of last season in an extensive bog on the line of the Three Rivers and Arthabaska Railway, will result in success.

Dr. T. Sterry Hunt, of the Geological Survey, in referring to Mr. Hodges' process, says:—"Peat and its charcoal might probably be advantageously introduced into domestic use amongst us. In Paris, where peat-charcoal is largely consumed, its price is about that of wood charcoal. Peat has lately been tried for puddling iron in Montreal, with satisfactory results, as might have been expected from the success which has so long attended its use for such purposes in Europe. Mr. Hodges has moreover made an ingenious application of peat to the smelting of iron, by moulding a mixture of magnetic iron-sand with pulped peat, into bricks, which, when dried and treated in a proper furnace, readily yield malleable iron by a single operation, the particles of ore being enveloped in a reducing matrix. This sand is found in considerable quantity on the shores of the lower St. Lawrence, and wherever it can be cheaply obtained may probably be wrought with advantage by this method. Mr. Hodges has farther suggested the application of this process to the treatment of artificially pulverized magnetic and specular iron ores, which in the vicinity of the great beds of these ores, so abundant in this country, can probably be obtained at a much less cost than iron-sand; so that the process, if we may judge from the results of the first experiments, is destined to render our peat deposits very serviceable for the manufacture of iron."

We have now before us a pamphlet published by Mr. Hodges, illustrating and descriptive of his machinery and mode of operation. The subject being a very important one, we shall make very full extracts from the pamphlet, and regret not having the wood-cuts with which it is illustrated, to publish with this notice.

The writer says:—

"Heretofore, it has been the practice to build large manufactories, drain the bog, lay down tramways, make roads, cart the Peat to the works, manufacture it, dry it by artificial means, or conveyed to drying grounds to become air dried. This has always been found an exceedingly costly process, particularly when works upon a large scale have been attempted. Indeed, when it is considered that in drying by evaporation 50,000 tons of fuel per annum, an acre and a half of ground must be covered every day during the working season, the thing seems almost impracticable, at a cost likely to enable the manufacturer to compete with other fuel. To attempt by artificial means the evaporation of seventy-five tons of water, in order to obtain fifteen tons of Peat fuel, is practically out of the question.

"To surmount these difficulties, which have upon so many occasions proved fatal in attempts to manufacture Peat fuel to commercial advantage and profit, the idea was conceived that a manufactory complete might be made to float about in the bog, excavating, pulping, manufacturing and spreading out the pulped Peat to dry, until some seventy per cent. was evaporated, or it was fit for carriage to the store or to market. After three years' experience, the writer has arrived at the conclusion that it may be effected in the following manner:

"An extensive undrained bog, from eight to twelve feet depth,—or, if deeper the better,—having been selected, the first process is to trace out at some distance from the margin, a counter level line of say several miles in extent. Along this line, a space of some nineteen feet in width must be cleared and the live moss or turf entirely removed; by the side of this a space ninety feet in width is to be cleared and drained to receive the pulped Peat.

"At one end of the counter line before-mentioned, a barge or scow eighty feet long, sixteen feet beam and six feet deep, must be constructed and launched into a hole dug in the bog to receive her. The barge or scow is to contain all the machinery necessary for the complete manufacture of the Peat.

"At one end of the scow is placed a pair of large screw-augers eleven feet in diameter, which, being provided with proper shafting and gearing, are made to revolve by means of a steam engine placed on the rear of the vessel. These augers or screw excavators bore out the Peat in precisely the same manner that a common auger bores itself into wood; and the scow being made to move onwards as the boring proceeds, it follows that a canal nineteen feet wide, of from four to six feet deep, is formed, in which the scow with her burden of machinery floats, the water from the adjacent Peat draining into and filling the canal as fast as it is made, the usual speed of the scow being some fifteen feet per hour.

"A competent engineer should determine and lay out the canal level, as well as arrange its water supply, upon which depends in a great measure the successful working of the whole.

"The Peat when bored out or excavated by the screws, is delivered into the barge, and conveyed by means of an elevator to a hopper, into which it is tumbled. It then passes through machinery which removes all sticks, roots, and eventually destroying the fibre, reduces the Peat to a homogeneous mess of soft pulp, like well-tempered mortar.

"This pulp then passes into a long spout or distributor, which extending at right angles over the side of the scow, spreads out the pulp upon the levelled moss by the side of the canal, in a thin slab nine inches in thickness and ninety feet in width.

"After the slab of pulp has been deposited for a couple of days, or in hot weather for a shorter period, it begins to consolidate and show symptoms of cracking. Immediately any cracks make their appearance it must be marked out by drawing a framework, carrying curved knives placed six inches apart, across it. A few days more hardens the pulp, so that by the aid of boards a man can work on it, and mark it longitudinally with cuts eighteen inches apart.

"In about a fortnight the shrinkage of the pulp slab causes the cuts made in it to open, and the whole presents the appearance of an immense floor covered with bricks eighteen inches long, by six inches wide. As soon as the bricks are sufficiently hard to bear handling, they are separated and "footed," that is stood up on the ends, five in a stook, with one across the top, in which position they remain until dry enough to be removed to the store or market.

"In the manufacture of Peat fuel, considerable experience is required, and unless attention is paid to matters of detail, apparently of little importance, serious loss may be the result.

"In forming or uncovering the canal track, nothing more is required than that the turf or live moss, about six inches in thickness, together with the roots of all trees upon the surface of the bog, should be removed, and as upon all undrained bogs, the roots of such stunted trees as grow there are all on the surface, this operation is easily accomplished.

"In the preparation of the pulp beds great care is required, and a surface should be obtained as level and even as possible. The roots of all trees must be removed, and this is more readily accomplished with the trees themselves, by which means considerable labour may be saved, one man pulling them down on one side, while another with an axe cuts the lateral roots at some distance from the stem, leaving the smaller portions behind. The long grass, shrubs and rank mosses are cut down with a short scythe, and used in filling up any irregularities on the surface. Drains from nine to twelve inches deep should also be cut and covered over with the spare turf taken from the canal track. The soil from the drains may also be used in levelling and filling up inequalities in the pulp bed. In some places where the growth of shrubs has been very rank and coarse, the turf upon the whole surface of the pulp beds has been cut into strips and inverted, but it is better to cut drains, and leave the turf in its natural position. The soft pulp, when poured upon it in a semi-fluid state, advances, lava-like, pressing down any small branches of shrubs and the long grasses which may be standing in the way.

"The pulp should not be deposited nearer than five feet of the canal, and upon this space may be placed any surplus moss or turf from the uncovering of the canal track, which will not only keep the pulp in place, but also form a road and towing path for the canal. At the rear or ninety feet from this bank, a double thickness of turf is all that is necessary to complete the pulp beds.

"The canal track and pulp beds being prepared, and the scow with its machinery in position, nothing more is required than to set it in motion, giving the necessary feed, say one and a half inches for each revolution of the screw excavators, which may be increased to three inches, or more if necessary. As the screws revolve, they cut off continuous slices of the Peat, which, by the assistance of a couple of men, are delivered through the rear of the shield the screws work in, into a well in the bow of the scow. These men also remove any large masses of extraneous material, such as pieces of wood, roots of trees, &c., which may work in. It is sometimes required when working in Peat, which is very full of roots, to have a man placed in front to remove them, as they are brought up by the knives of the screws, roots as much as a man can lift being occasionally excavated.

"After the Peat is delivered into the well, it is carried by means of an elevator and tumbled into a hopper, from which it passes through the stick and fibre catcher, the pulping and distributing trough, without any assistance whatever, it being only necessary to see that the stick catcher is kept clear, and occasionally, when the pulp is too stiff or dry, to turn on a pump until it is reduced to a proper consistency.

"The levelling of the pulp should be done as evenly and as smoothly as possible. A few days experience will enable any intelligent man to accomplish this, and upon its being well done depends, in some measure, the quality of skin upon the Peat, so essential, not only in shedding the rain and preventing cracking from the sun, but also for giving a permanent toughness to the bricks.

"The crew of the scow, all told, will number six, including the master, who keeps the knives of the screw-excavator clean, and sees that all are going on right. Two men at the screw-excavators, one engine-man, one man levelling the pulp, and one man to attend to the stick-catcher and the pulping spout."

The process for marking and cutting the pulp beds for the formation of bricks or blocks, and other subsequent manipulations, are fully explained in the pamphlet. The following experiment was made for the purpose of ascertaining the effect of frost upon the pulp beds:—

"Early in the month of October, 1865, the writer, for the sake of experiment, dug a canal nearly a mile in length, nineteen feet wide, five feet deep, pulped the Peat excavated, and deposited it alongside of the canal, where it formed an embarkment thirty-six feet wide, and two feet six inches deep. This bank subsided considerably, until the frost set in and penetrated during the winter to a depth of fifteen inches. Below this depth the pulped material was uninjured, and on the following summer, when dug out and cut into the shape of bricks, it dried, became hard and solid, making excellent fuel, while the whole of the upper or frozen portion was little better than unpulped Peat. The embankment was firm and elastic to tread upon, and all that could be desired as a formation for railway purposes; but it never became hard, neither was it, during the hot days of July, dry to a greater depth than half an inch. This embankment remains as perfect as when first formed, and to an engineer is well worth a visit of inspection."

Dr. T. Sterry Hunt, makes the following calculation on the possible produce of our peat bogs:—
"The peat machine of Mr. Hodges, cutting, in ten hours, a canal of one hundred and fifty feet long,

nineteen feet wide, and five feet deep, and extracting from this the material for fifty tons of dried peat, would require 9,782 such days to work over a square mile of peat bog; which would yield 489,100 tons of peat fuel, or in round numbers nearly half a million of tons, as the produce of a layer five feet thick. By a subsequent partial drainage, it would, in many cases, be possible to get from the deeper bogs, a second layer equal in thickness to the first. For a country like Canada, this supply of fuel has a great value, and its development by the invention of Mr. Hodges promises to be very important for the industry of the Province. The experiments with peat fuel on the Grand Trunk Railway have proved so satisfactory that the Railway Company has made a contract for five years, for a large supply, which after the first year is to be at the rate of 300 tons a day."

In the next number we will give the results of experiments made in burning peat on this railway, the report on the manufacture of iron with peat fuel, &c.

MILK WEED, OR SILK WEED, AND THE CANADIAN NETTLE.

A short Treatise on the Milk-weed or Silk-weed, and the Canadian Nettle, viewed as industrial resources, by Alexander Kirkwood. Read before the Ottawa Natural History Society, 15th February, 1867. Ottawa: Hunter, Rose & Co. 1867.

This little work is a plain, useful, practical account, explaining the qualities and the mode of cultivating and preparing them, of several plants, natives of our country, which may possibly have an important influence on its future prosperity. The Milk-weed, or Silk-weed, is known to most people in Canada; and though bearing a pretty and curious flower, is chiefly noticed as a troublesome weed. Botanically it is a species of Asclepias, and belongs to a family which has long been remarked in various parts of the world for the tenacity and fineness of its inner bark fibre. The common Canadian Nettle is another plant at present only noticed as an offensive weed, which stands in near relationship with hemp and with the exquisitely beautiful China grass, and which from the general character of the family to which it belongs might be expected to yield a useful textile material; but whatever their capabilities may be, these plants have been hitherto neglected amongst us; and the attempts made in Europe and amongst our neighbours in North America, to use the fibre of the Asclepias, have not yet led to successful results, or attracted much attention. We believe this is not to be attributed to any great real difficulty, but to the insulated character of the attempts made, and to the want of accessable information on the subject. We therefore sincerely thank Mr. Kirkwood for his very useful labour, and must express our hope that a large circulation will be given to his tract; and that some at least among his readers will be induced to try experiments on such a scale as may prepare the way for the most promising of these plants, if not all of them, being cultivated for profit.

In Canada we believe that Mr. Freed, of Hamilton, may justly claim the merit of having first directed attention to the economical value of the Asclepias fibre. The species which attracted his notice was Asclepias incarnata, the swamp Silkweed. It was, we think, in 1855 that he exhibited the fibre of this plant at one of the shows of the Toronto Horticultural Society, when the excellence of its quality was publicly noticed by Professor Hincks, who made some attempts to interest practical men in the subject, but without success. The plant being naturally an inhabitant of swampy ground, Mr. Freed introduced it into his garden to test its growth in dry situations, and cultivated it successfully.

In 1860, as Mr. Kirkwood informs us, he exhibited the fibre in Hamilton, when Judge Logie took up the subject, and sent his interesting article to the Botanical Society of Canada, in whose annals it was published. Mr. Kirkwood himself has succeeded well in preparing the fibre of Asclepias Cornuti, and a little trial will show which of the species is on the whole preferable for cultivation.

If we think of the vast extent of the demand for textile materials, and the price which is readily paid for those which have any considerable merit, we must feel the importance of adding them to our objects of culture.

Flax is already becoming with us an important article. Hemp might undoubtedly be raised with advantage, being naturalized as a weed and growing luxuriantly; but if we have native plants whose fibre is at least equal in value to most of the articles in use, and which promise to be cultivated with very moderate trouble and expense, the inducement to try what can be done with them is surely sufficient to prevail over indolence or unwillingness to adopt new plans.

In the case of flax, the seed adds considerably to the value of the crop, and the demand for the oil increases its importance to the country, nor would we at all wish to turn aside from their course those who are engaging in its culture; yet if we can raise more cheaply a not less useful material, an important stimulus must thus be given to the great work of extending cultivation over our waste lands, and making them contribute to the national wealth.

It may be fairly assumed that for some time it will be difficult to keep up with the world's demand for good textile materials, so that their production must be profitable, not to mention the temptation which their presence amongst us would offer to manufacturing enterprize.

It appears that the claim of the Canada Nettle is to be a good substitute for hemp—that it would answer the purpose seems certain. The practical question is which is most deserving of our attention. As a perennial herbaceous plant the nettle would give less trouble in culture, but the hemp would probably have a stronger, loftier growth, which, assuming the quality of the fibre to be about the same, would give it an advantage in respect to the yield. The Nettle may deserve trial in some situations; but considering that we could easily raise hemp equal to the best in the market, it would perhaps be wiser to cultivate the article itself than its substitute.

Mr. Kirkwood has sought information diligently from the best sources, has added much that is valuable from his own experiments, and has communicated what he has collected with clearness and conciseness, so as to be a safe practical guide. We presume there is a slight mistake in calling (p. 9) the Syrian dogbane the true Asclepias Syriaca, and stating that it grows as far north as Upper Silesia, since it seems to be settled that in giving the name *Syriaca*, Linnaeus was under a mistake, supposing our plant identical with one named by Clusius, which is now called *Calotropis procera*, and which belongs to the natural family, though not to the genus Asclepias. This genus is found in a wild state only in America, though our plant has long been naturalized in Middle and Southern Europe, and has there been noticed as a textile plant. The beautiful silky seed down, though too brittle to spin alone, was carded with cotton, so as to add its lustre to the strength of the latter. It appears from Mr. Kirkwood's statement, that our ingenious neighbours in the United States have recently found the means of using this down with wool and silk, as well as with cotton, and even of spinning it alone. This, of course, adds greatly to the value of the crop, as the excellence of the stem fibre seems certain.

Mr. Kirkwood's Treatise should be read throughout the country; and we trust when read it will not be laid aside and forgotten, but will be taken as a guide in experiments cautiously made, with a view to the extensive cultivation of a plant which Providence has bestowed on our country, and which may probably be made a source of national wealth more valuable than the gold mines which it begins to be supposed that we possess.

Board of Arts and Manufactures

FOR UPPER CANADA.

TRADE MARKS.

Trade Marks registered in the Office of the Board of Registration and Statistics, and open for inspection at the Library of this Board.

(Continued from page 36.)

Clark & White, Woodstock. This Trade Mark consists of a five pointed star in the centre, with the letters C. C. O. C. W., placed at equal distances between the points of the star, &c.; and surrounding the whole the words "Cedar Creek Oil Refining Co." and "Clark & White." Vol. A. fol. 159, No 131. Dated Feb. 25th, 1867.

ANNUAL EXAMINATIONS.

Directors and Members of Mechanics' Institutes are reminded that this Board proposes to hold its fifth annual examinations, for awarding of certificates, in accordance with the programme published in the January No. of the Journal, during the third week in May next. Names of intending candidates, with subjects of examination, should be sent to the undersigned by the 1st of May.

W. Edwards,
Secretary.

Board of Arts and Manufactures

FOR LOWER CANADA.

LIST OF EXHIBITORS,

AND THE ARTICLES SENT FROM THE BOARD OF ARTS AND MANUFACTURES FOR L. C., TO PARIS EXHIBITION.

E. Gingras, & Co., Quebec.—Double family sleigh, and light cutter.
John Dawson, Montreal.—Collection of planes.
John Higgins, St. Hillaire.—Collection of axe and hammer handles.
Smith & Cochrane, Montreal.—Collection of machine made boots and shoes.
F. H. Symn, Montreal.—Traverse and lifting jack.
J. & W. Hilton, Montreal.—Three sets bed-room furniture in black walnut, butternut, and basswood, commercial samples.
J. T. Bigelow, Montreal.—An assortment of cut nails, spikes, brads, tacks, shoe bill, &c., in all, over 500 varieties.

J. Wright, Quebec.—One ladies' riding saddle.

C. Corneil, Quebec.—One gentlemans' saddle.

Hon. P. J. O. Chaveau, Montreal, Supt. of Education, L. C.—Collection of school books used in Lower Canada; and models of desks, forms, benches, &c., used in Normal schools.

Morland, Watson, & Co., Montreal.—Twenty-four and sixty-six in. circular saws, rip, cross-cut, mulay, pit, and billet-web saws; cut nails, spikes, &c.

J. McDougall, & Co., Montreal.—Three cast-iron railroad car wheels.

Donovan, Moran, & Co., Montreal.—Polish grain, pebble, buff, and split leathers.

A. Larue, & Co., Three Rivers.—One cast-iron car wheel, and samples of iron.

S. Davis, Montreal.—Collection of cigars.

Frothingham & Workman, Montreal.—Fifty-nine different kinds of axes and adzes, planing mill, hay and straw knives, picks, hoes, drilling, masons' blacksmiths' chipping, rivetting and other hammers.

Starke, Smith, & Co., Montreal. — Collection of tobacco.

Alex. Gordon, & Co., Montreal.—Platform, beam, and counter scales.

Lymans, Clare, & Co., Montreal. — Samples of hemlock, spruce, cedar, Canada balsam, sunflower, and linseed oils, oil-cake, and samples of dressed flax.

Desire Larichiliere, Laprarie.—Collection of splints and other surgical appliances.

John Lovell, Montreal.—Collection of school books.

Wm. Peacock, Montreal.—Collection of cricket-bats and wickets.

Thomas Ecroid, Montreal.—Pebble grain and upper leather, and satin finish calf-skins.

Mosely & Rickert, Montreal.—Enameled, patent, pebbled, buff and split leathers.

John Boyd, Montreal.—Collection of cloth, hat, shoe, and other brushes.

L. J. Campbell, Montreal.—12, 10, 8, and 6 inch leather belting.

G. Barrington, Montreal.—Trunks and valises.

Jacob Dewitt, Montreal.—Collection of buckskin mits and gloves.

W. H. Rice, Montreal.—Samples of wire-work and wire-cloth.

Charles Tourville, Montreal. — Hand-made boots and shoes.

Miss A. Bernard, Three Rivers.—Ornamental bark work.

George Hagar, Montreal.—Clothes mangle, carriage jack, counter scales.

R. Mitchell, & Co., Montreal.—Specimens of brass work.

A. Robertson, & Co., Montreal.—Samples of tweeds and cloths.

J. C. McLaren, Montreal.—Copper rivetted leather hose, flexible branch pipe, single and double leather belting.

Taschereau, Onslow, & Ryan, Quebec.—Hemp and manilla ropes, and lines.

F. Shaw, & Bros., Montreal.—Sole leather.

Ellison, & Co., Quebec.—Photographic views of Quebec and vicinity, and photographic views of public buildings.

Philip Whitty, Quebec.—Solid eye mining picks.

J. & R. Irwin, Montreal.—One set of single light harness.

Joseph Barbeau, Quebec.—Two pairs of hand-made fancy boots.

Canada Glass Co., Montreal.—135 samples of glass bottles, vials, flasks, &c., manufactured at the Company's Works, Hudson on the Ottawa river.

S. T. Willet, Chambly.—White and scarlet, plain and twilled flannels.

Fisher & Blouin, Quebec. — One set of single light harness.

P. & J. Dunn, Montreal.—Samples of machine made horse-shoe nails.

Reed & Childs, Montreal.—Boot seaming, crimping, and treeing machines, finished and rough lasts.

Narcise Valois, Montreal. — Harness and buff leather, waxed calf-skins and sheep-skins.

P. Dugal, Quebec.—Carriage, apron, and top cover leather.

Henderson & Son, Montreal.—Clay smoking pipes, variety of patterns.

Thomas Jenking, Montreal.—Collection of brush makers' work.

Nelson, Wood, & Co., Montreal.—Corn brooms and dusters.

Paul Ceredo, Montreal.—A coal and gravel sifting machine.

C. W. Williams, & Co., Montreal.—Family sewing machine, commercial sample.

Eadon, & Co., Quebec.—Washing machine, mangle, tubs, pails, &c.

E. Perry, & Co., Montreal.—Trunks and valises.

Parkyn & Brodie, Montreal.—One barrel of flour.

Frothingham & Workman, Montreal.—Collection of boring bits and augers.

Alex. Buntin, & Co., Montreal.—Collection of printing, writing, and packing papers.

Livernois, & Co., Quebec.—Plain and coloured photographs.

Pollock & Calvert, Montreal.—Passe partout picture frames.

A. W. Ogilvie, & Co., Montreal.—One barrel each of flour, pot and pearl barley.

Cox & Murphy, Montreal.—A meter for measuring liquors.

W. Scott, & Co., Montreal.—A frame of oil-painting illustrative of the timber trade of Canada, painted by Kreighoff.

Charles Dion, Montreal.—A domestic fire alarm.

Winning, Hill, & Ware, Montreal.—Samples of 15 different kinds of syrups and bitters.

Roy & Bedard, Quebec.—One side-board.

Wm. Notman, Montreal.—Hunting, landscape, and skating photographs, cabinet portraits, carte de visite, &c.

Alex. Henderson, Montreal.—67 photographs of Canadian scenery and public buildings in Montreal.

Desmarias, & Co., Montreal.—One frame of carte de visite.

R. Millard, & Co., Montreal.—Railroad chairs, and spikes, and machine-made nuts.

C. Smeaton, Quebec. — Photographs of winter scenes.

James Ruthven, Montreal.—Collection of ruling pens.

J. Redpath, & Son, Montreal.—Samples of refined Sugars.

James Shearer, Montreal.—Samples of machine-made moldings, architraves, skirtings, &c., window blind, shutters, and doors.
Prowse, Bros., Montreal.—One refrigerator.
Cyrille Duquet, Quebec.—One scarf pin made of Canadian gold and pearl.
Robert Reid, Montreal.—Four relievo medallions of the seasons.
Lymans, Clare, & Co., Montreal.—Pot and pearl ashes.
Wills & Mooney, Montreal.—Samples of machine-made horse shoe nails.
F. Gross, Montreal.—Surgical appliance for contraction of the knee and extension of the leg.
O. L. & R. S. Clarke, Cote S. Paul.—Five strings of sleigh bells.
John Millar, Montreal.—One cask extract of hemlock bark.
James Thomson, Montreal.—A table inlaid with the woods of Canada.
John Spence, Montreal. — One Stained glass window.
Canada Starch Company, Montreal.—Samples of starch.
Canada Iron Mining and Manufacturing Company, Montreal.—Samples of pig iron from the Hull Mines.
John H. Stoaks, Lacolle.—Model of a railroad car self-acting coupling and buffer.
——. Bourasa, Montreal.—A cartoon drawing, subject, Apotheosis of Columbus.
Moise Iron Company, Montreal.—Samples of Moise River iron sand, iron made from the sand, and steel made from the iron.
Grand Trunk R. R. Co., Montreal.—A model of a railroad sleeping car.

RECENT PUBLICATIONS.

American.

American Horticultural Annual, 1867. A Year-Book of Horticultural Progress for the Gardener, Fruit-Grower, and Florist. Illustrated. 12mo. pp. 152. N. Y.; O. Judd & Co. Paper—50 cts.

Bridgeman. The American Gardener's Assistant. In Three parts. Containing complete Practical Directions for Cultivation of Vegetables, Flowers, Fruit-Trees, and Grape Vines. By Thomas Bridgeman. New edition, revised, enlarged, and illustrated by G. Edwards Todd. 12mo. pp. 152, 211, 166. N. Y.; W. Wood & Co. Cl.—$2 50.

Burgh. The Slide Valve Practically Considered, By N. P. Burgh. 16mo. pp. 95. Phila.; H. C. Baird. Cl.—$2.

Gazetteer of Manufacturers and Manufacturing Towns of the United States, containing a full and comprehensive Review of the Extent and Condition of the Manufacturing Interests and Resources of the United States, etc. etc 1866, 4to. pp. 172. N. Y.; J. M. Bradstreet & Son. Cl.—$5. (By subscription.)

Henderson. Gardening for Profit; a Guide to the Successful Cultivation of the Market and Family Garden. By Peter Henderson. 12mo. pp. 243. N. Y.; O. Judd & Co. Cl.—$1 50.

Husmann. The Cultivation of the Native Grape, and Manufacture of American Wine. By George Husmann. 12mo. pp. 192. N. Y.; G. E. & F. W. Woodward. Cl.—$7 50.

Hyde. Treatment and Uses of Peat and Peaty Material. Designed expressly for the Instruction of Farmers and Owners of Peat Lands. By J. Burrows Hyde, C. E. 24mo. pp. 81. N. Y.; Bailliere Bros. Flex. Cl.—60 cts.

Jacques
The House: A Manual of Rural Architecture; or, How to build Country Houses and Out-Buildings. With Numerous Original Plans. By D. H. Jacques. Revised Edition. 12mo. pp. 176. N. Y.; George E. & F. W. Woodward. Cl.—$1 50.
The Garden: a Manual of Practical Horticulture; or, How to Cultivate Vegetables, Fruits, and Flowers, etc. etc. By D. H. Jacques. Revised Edition. 12mo. pp. 166. N. Y.; George E. & F. W. Woodward. Cl.—$1.

Johnson. Peat and its Uses, as Fertilizer and Fuel, By Samuel Johnson, A. M. Fully Illustrated, 12mo. pp. 168, N. Y.; O. Judd & Co. Cl.—$1 50.

Law. Copyright and Patent Laws of the United States, 1790 to 1866. With Notes of Judicial Decisions Thereunder, and Forms and Indexes. By Stephen D. Law. 12mo. pp. 264. N. Y.; The Author, and Baker, Voorhis & Co. Half shp.—$2 50.

Mackellar. The American Printer: a Manual of Typography, containing Complete Instructions for Beginners, as well as Practical Directions for Managing all Departments of a Printing-Office. With several Useful Tables, etc. etc. By Thomas Mackellar. 12mo. pp. 336. Phila.; R. H. Johnston & Co. Cl.—$1 50.

Monzert. The Independant Liquorist; or, The Art of Manufacturing and Preparing all kinds of Cordials, Syrups, Bitters, Wines, etc. etc. By L. Monzert. Complete in One Volume. 12mo. pp. xvii. 193. N. Y.; J. F. Trow & Co. Prs. Cl.—$3.

Munson. The Complete Phonographer; being an Inductive Exposition of Phonography. with its Application to all Branches of Reporting, etc Intended as a School Book. By James E. Munson. 12mo. pp. 236. R. H. Johnston & Co. Cl.—$2.

Proteaux. Practical Guide for the Manufacture of Paper and Boards. By A. Proteaux. With Additions by L. S. Le Normand. Translated by H. Paine, M.D. With a Chapter on the Manufacture of Paper from wood in the United States, By Henry T. Brown. Illustrated by six Plates. 8vo. pp. 285. Phila.; H. C. Baird. Cl.—$5.

Samson. Elements of Art Criticism, Comprising a Treatise on the Principles of Man's Nature as addressed by Art, together with a Historic Survey of the Methods of Art Execution in the Departments of Drawing, Sculpture, Architecture, Painting, Landscape, Gardening, and the Decorative Arts. Designed as a Text-Book, for Schools and Colleges, and as a Handbook for Amateurs and Artists. By G. W. Samson, D.D, Cr. 8vo. pp. 840. Phila.; J. B. Lippincott & Co. Cl.—$4.

Sharples. Chemical Tables. By Stephen P. Sharples, S.B. 12mo. pp. 192. Cambridge; Sever & Francis. C.l—$2 25.

Saunders. Domestic Poultry; being a Practical Treatise on the Preferable Breeds of Barn-Yard Poultry, with instructions for breeding and fattening, etc. By Simon M. Saunders. New and enlarged Edition. Very fully illustrated. 12mo. pp. 129. N. Y.; O. Judd & Co. Paper.—40 cts.

Watson. The Modern Practice of American Machinists and Engineers. Including the Construction, Application, and use of Drills, Lathe Tools, Cutters for Boring Cylinders and Hollow Work, generally, etc. etc. Together with workshop management, economy of manufacture, the Steam-engine, Boilers, Gears, Belting, etc. By Egbert P. Watson. With 86 Engravings. 12mo. pp. 276. Phila.; H. C. Baird. Cl.—$2 50.

Transactions of Societies.

OTTAWA MECHANICS' INSTITUTE

The annual meeting of this Institution was held on the 6th of March. From the report it appears that the Institute is in a very satisfactory position. By the way, it is more fortunate than any of its sister Institutes, in receiving an annual legislative grant of $300.

The Directors, at the close of its fourteenth year of existence, report that for the first time in several years it is entirely free of debt.

"This pleasing result is mainly due to the indefatigable exertions of the Managing Committee, who, feeling the necessity of a vigorous effort to wipe off the debt, amounting to upwards of two hundred dollars, which has for some years been pressing upon the institution, and the desirability of leaving it to their successors in office in sound financial condition, determined to test the liberality of their fellow citizens by soliciting subscriptions towards paying off the outstanding liabilities. The generosity of the responses to this appeal exceeded the most sanguine expectations of its promoters, resulting, as it did, in the collection of no less a sum than $210 75."

The number of ordinary members appear to have been increased since the beginning of the *Institute* year, from 290 to 438—or a total increase of 140 members and other subscribers. This has arisen to a great extent, no doubt, from the large addition of government employees to the city population. The receipts of the year were:—

Cash on hand	$ 3 44
Members' subscriptions	591 25
Rent of Hall	189 54
Legislative grant	300 00
From concert	241 41
Paper, &c., sold	53 15
Special Donations	210 75
	$1,589 54

The expenditure :—

For papers and periodicals	$ 205 58
Gas, rent, fuel, &c	751 76
Expenses of Concert	150 18
Printing and postage	90 61
Insurance	14 00
Books and binding, &c	46 50
Salary of custodian	315 18
	1,573 81
Balance in hand	$ 15 73
Available assets	$ 131 73
Liabilities	105 70
Apparent surplus	$ 26 03

Two hundred and forty-one visitors have been introduced during the year; 26 newspapers and magazines have been supplied to the Reading-Room by purchase, and 12 as donations. The Library contains about 2,000 volumes of books, about 100 of which had been re-bound during the year, and 100 added by purchase. The number of issues of books during the year was 2936.

The directors close their report by bearing testimony to the zeal and efficiency of the custodian of the Institute, Mr. J. B. Steacey.

We have received no list of names of the office-bearers elect.

HAMILTON MECHANICS' INSTITUTE.

The annual meeting of this Institute was held on Friday, the 22nd of February, 1867. The President, Thos. McIlwraith, Esq., briefly stated the objects of the meeting. The minutes of previous annual meeting having been confirmed, the Secretary read the report of the directors for the past year, from which we learn that the number of members on the 1st of February, 1866, was 431; elected during the year, 136—total 567; retired during the year, 120; remain in good standing on the books, 447.

The receipts and expenditures for the past year were as follows:—

RECEIPTS.

	$ cts.
To Balance from last year	11 70
" Subscriptions to 1st February, 1867	1036 41
" Hall Rent	1143 06
" Donations	645 00
" Paper Sales	113 23
" Reunions	108 64
" Show Cards	23 00
" Rent	130 00
" Book Sales	106 97
" Gore Bank, &c	5 56
	$3323 72

EXPENDITURE.

			$ cts.
By Cash	paid for	Insurance	50 00
"	"	Magazines	42 16
"	"	Newspapers	115 05
"	"	Building Repairs, &c	370 84
"	"	Gas Account	341 50
"	"	Salaries	679 44
"	"	Cleaning Hall and Room	80 63
"	"	Mortgage to Canada Life Company	1100 00
"	"	Fuel	125 64
"	"	Postage	70 93
"	"	Printing	51 24
"	"	Books and Bindings	91 65
"	"	Reunion Expenses	54 38
"	"	Art Exhibition	1 00
"	On hand		149 26
			$3323 72

The number of volumes added to the Library during the year has been 125; number at date of last report, 2977—total 3102. Sold during the year, 1073; number of volumes now in the Library, 2029. The number of volumes issued during the year was 5929, or an average daily issue of over 19 volumes. The News Room is supplied with 105 Canadian and Foreign publications, of which 61 are furnished gratuitusly, and 44 are purchased by the Institute.

The Directors report on the position of the Institute:—

"Ever since the erection of the Mechanics' Hall building, the Institute has labored under the burden of a heavy debt due to the Canada Life Assurance Company. Some years ago an arrangement was entered into, by which it was agreed that $800 per annum should be taken in liquidation of both principal and interest. At the time the arrangement was made the Institute was in receipt of an annual grant from the Great Western Railway Company, and the Hall was rented much more frequently than it has been for the last two or three years. Owing, however, to the withdrawal of the Great Western Railway grant, the falling off in the rent of the Hall, and the payment of a number of floating debts, the payments to the Canada Life Assurance Company became considerably in arrears, notwithstanding the efforts of former Boards of Directors to increase the revenue. And the permanent income became insufficient to meet the expenditure.

"The Directors on assuming office, resolved to make an appeal to the citizens of Hamilton for aid to enable them to pay off the arrears, and to take steps to make the revenue sufficient to cover the expenditure. An appeal to the people of Hamilton was accordingly made, which the Directors are happy to say was liberally responded to, and a sum was raised sufficient to pay off the arrears to the Canada Life Assurance Company. * * * The permanent income is now amply sufficient to meet the expenditure, including the payment of $900 to the Canada Life Assurance Company.

"The state of the Library has engaged the earnest attention of the Directors. A great many books of little value which filled the shelves, but were never taken out, had been sold, and a number of new popular and standard works have been purchased, which will be put in circulation as soon as a new catalogue can be made out."

The Directors again bear testimony to the zeal and attention of the Superintendent, Mr. Rutherford, to his duties

The following gentlemen were elected Office-bearers for the year: *President*—Thomas McIlwraith, Esq. *Vice-President* — Judge Logie. *Directors*—Messrs. W. H. Glassco, J. W. Ferguson, Kenny Fitzpatrick, William Brown, William Turnbull, John W. Murton, Wm. Haskins, Geo. Rutherford, Wm. Young.

ANNUAL EXHIBITION OF THE TORONTO MECHANICS' INSTITUTE.

The seventh Exhibition of this Institution is now being held. Its character is somewhat similar to those of previous years, varying only in detail. In looking over the various articles in the rooms, we notice but very few shewn at the previous Exhibitions, probably not more than one dozen articles in all. The display in the Fine Arts is very good, comprising some 90 oil paintings, amongst which we notice a contribution of eleven specimens from Mr. A. J. Pell, of Montreal. There are also 133 water colour paintings, 39 pencil drawings, 4 crayons, 12 architectural drawings, 30 photographs, 19 engravings, 6 pen-and-ink sketches, 50 chromo-lithographs, and 7 paintings on glass. Besides these the *ornamental* drawing class in connection with the Institute contributes some 44 specimens, and the mechanical and architectural class 18 specimens.

In Natural History there are three collections of fossils and minerals, 370 specimens of birds, quadrupeds and fishes, and 13 reptiles, (some 70 of them being sent by Mr. Poole, of Ingersoll)—the birds varying from the tiny warbler to the heron, swan and bald-eagle, the quadrupeds from the smallest squirrel to the Canadian bear. Besides these, there are 7 cases of insects, a collection of Canadian woods, and 58 specimens of sea-weed, botanical specimens, &c. On the centre tables are some 69 statuettes in marble, bronze, parian, and plaster; 5 wood-carvings, 73 specimens of antique and modern potteryand glassware, 76 contributions of ladies' work, 17 of scientific apparatus, 19 of foreign and home manufactures, (including two small steam engines in operation,) and 130 contributions of ancient and modern curiosities, coins, &c., &c., the whole comprising a most interesting and instructive collection. The Exhibition opened on Wednesday, the 20th of March, and is to be closed on Tuesday, the 2nd of April, instant. We trust the enterprise will be as successful, financially, as the former exhibitions in connection with this institution. We cannot close this notice more appropriately than by copying a sentence or two from an article in the Toronto *Leader*, in reference to the exhibition of 1866:—

"If regarded simply as a means for increasing the revenue of a useful public Institute, which is now carrying a debt of $18,000, it is highly satisfactory and suggestive. Mechanics' Institutes are never supported on a large scale by the mere subscriptions of their members, and have generally to appeal to the benevolence of the wealthy for pecuniary aids. But this system induces a spirit of dependence and patronage adverse and prejudicial to the spirit of self-reliance and personal effort that distinguishes this age and forms so large an element of its progress; and when Mechanics' and similar Institutes can derive revenues from enterprises that contribute to public amusement and instruction, they are in the safest and healthiest condition. The exhibitors in this instance are assisting the Institute and serving the public better by lending their articles of interest and beauty, than by gifts of money."

Selected Articles.

KNOWLEDGE BY THE FIRESIDE.

(From the *Maine Farmer.*)

No. 6.—Crystallography Continued.

Peculiar circumstances are necessary to form large crystals. In great cavities in the earth, where soluble substance is perfectly quiet, very large crystals will be found. At Zinken in Germany, a cavity was opened from which five hundred tons of crystals of quartz were obtained, the largest of which weighed eight hundred pounds. Crystals of felspar have been found in this State weighing well nigh one hundred pounds. A crystal of beryl was found in Acworth, N. H., a few years since, that weighed five tons. These crystals are found in a coarse granite, which appeared to have been formed from sedimentary matter settling down beneath the waters of the ocean containing the peculiar elements necessary to form these crystals. Crystals of the same substance assume a different shape from peculiar circumstances under which they are formed. A solution of salt water will form a cube, but if a little boracic acid be added to the solution, the crystals will have their angles all truncated. Hence, the crystals from any particular locality of minerals will have a peculiar character by which they will be recognized. We recently saw some crystals of quartz from Colorado. They had a peculiar shape, that of having one crystal formed upon another, at different times. We have seen crystals of calcite from the town of Freeport in this State, which were six sided prisms. On the summit of each crystal there was an enlargement like the head of a nail of a flattened crystal. This variety is called from its peculiar appearance, nail-headed spar.

Sometimes crystals assume a curved surface. Ice is sometimes so formed in a loose clay soil in autumn. Crystals of gypsum are so formed in the Mammoth Cave in Kentucky, sometimes forming very beautiful shapes. The surface of the diamond is frequently convex instead of a plane surface.

All metals assume a crystalline form. Iron, the most abundant metal, though submitted to the operations of the workman, are, nevertheless, crystalline. Iron owes its toughness to a fibrous crystalline form, while a granular form of crystallization renders it brittle. When the smith hardens a piece of steel, he only changes the crystalline structure.

A weak form of crystallization sometimes takes place in clay and sand united, so as to assume a circular or globular shape. The forms are frequently seen in clay beds in this State. Sometimes rocks assume a columnar form, as the basalt in the Giant's Causeway, and in the trap rocks in Maine. The stratification of rocks is due to the same cause. They break up into joints, forming blocks, columns and sheets. Thus we see that crystallization plays an important part in the structure of our globe. Without it all would be confusion. We could not distinguish common salt from the most virulent poison.

No. 7.—The Ox Tribe.

Perhaps no tribe of animals is more important to man than that of the ox, whether we regard him as an article of food, his hide for leather or for the labor which he is capable of performing for man, They have been found in some form or other as natives in every continent except South America and Australia.

The ox is found in a fossil state in the more recent geological formations. Three or four species have been discovered in North America in this condition. Two species are now known to naturalists on this continent. The Buffalo and the Musk ox. The buffalo formerly ranged over the whole of the North American Continent, but since the settlement of the country by Europeans, it has been confined to the base of the Rocky Mountain System, and in a few years in all probability will become extinct, unless protected by special legislation. The musk ox lives on the northern shores of our continent. It is said that but a single specimen is preserved in Europe and none in the cabinets of this country. This is rather singular.

It appears that both the horse and the ox were more abundant on the American continent in a former geological period than at present, as the fossil remains of at, least, two species of the horse have been discovered in both North and South America. When America was first discovered, no species of the horse was known, but when introduced from Europe it increased with the greatest rapidity, so that now it is exceedingly abundant in the south-west part of this continent and in South America, where they run wild in immense herds.

The fossil remains of the buffalo abound at the Big Bone Lick in Kentucky along with the remains of the mastodon. They evidently resort to that spot in search of salt. In all these remains, as well as that of the buffalo, the horns turn downward, and are not so long as those of the European species. One extinct species appears to have been larger than the buffalo. It is probable that they had qualities inferior to those of the European ox and not fitted for the wants of man, and so gave way to a higher development. The musk ox is remarkable for having a long fleece with which to protect himself in the cold climate west of Hudson's Bay.

Among the more prominent of the ox tribe was the Urus which existed in Europe. Cæsar describes him as being but little inferior in size to the elephant. It is said to have existed in Switzerland as late as the sixteenth century when it became extinct. The Auroch, or European Bison appears to have been abundant in Europe, but it is now extinct except in the forests of Lithuania where they are protected by the Emperor of Russia.

The origin of the present race of the domestic ox is not known. They have assumed different varieties by attention given to breeding, so that their original form is lost. The value of the ox to the farmer is recognized in all countries where the horse cannot be employed with advantage. They have been found capable of large growth. An ox weighing two thousand pounds is by no means rare among cattle breeders. After having performed their allotted amount of labor, unlike the horse, they are still held at a high value as an article of food.

No. 8.—The Horn Pout.

[Only of local interest in *Maine*—a fish found in its ponds and streams.—Ed. Journal.]

No. 9.—A Knowledge of Self.

Perhaps there is still as much need of the advice of the ancient sage who uttered the well known bit of advice, "Know thyself." We design in this number to call the attention of our readers to the matter of general health, a subject of vast importance to the great majority of our citizens in a climate so changeable as ours.

When an epidemic breaks out in a community, there is generally much excitement, but such epidemics are generally not so fatal as those more insidious diseases that creep into the system unawares till they have secured their victim in their relentless grasp. Amongst those which sweep away many people in Maine at this season of the year is what is known as lung fever. If our citizens generally would be as guarded in their person against this disease as they would be if the small pox prevailed in our midst, we should have a much smaller number of deaths in this State from this disease. Young children and old people are peculiarly exposed to this disease. Children whose feet are only half warm enough, and who have at the same time a full ruddy face, are apt to be seized at this season of the year. Now we believe in warm clothing and plenty of it. As long as ladies persist in wearing eight or more thicknesses of clothing round the waist, and only a pair of thin woollen or even cotton stockings, and a pair of thin fashionable shoes, so long must husbands and parents expect to hear constant complaints of colds and coughs and pains in the sides. We are so accustomed to this state of things that we hardly deign to think of it in its true light. Many a person would be frightened could they see how they but too often are exposing themselves.

But there is another still more fruitful source of disease. We refer to the indifference which most persons give to the condition of the stomach, liver and bowels. If these are obstructed, disease is pretty sure to follow. In the spring of the year, which is near at hand, we shall find a great many persons affected in this manner. They have a dull headache. Their eyes are sore, they feel dull and stupid. Look into their eyes and the white of the eye will be tinged with yellow. Ask them if their stomach and bowels are regular and they will reply in the affirmative, when the truth is they are suffering from severe costiveness, while the liver is out of order and the bile is pouring itself into the blood which causes all this headache, sore eyes and yellow eyes and skin. This condition of things is brought about by the kind of diet many families are compelled to use during the spring months. Salt pork and salt beef are their staple articles of food, and they serve to bring on these difficulties. Many persons of a naturally billious temperament are more so by drinking coffee. We do not make a tirade against these articles. We only speak of them as existing facts. Now to remedy this state of things it is necessary to keep all the functions of the animal economy in regular order so that no organ shall be obstructed in the regular performance of its duties. When this is the case it is seldom that a person will suffer from those things which we have just enumerated.

There is one fact connected with this condition of things which it may be well to notice, which is, that the sufferer rarely ever feels a willingness to make use of any remedies till he is absolutely compelled to do so. It is a wretched habit to be all time dosing up with this and that nostrum. Such persons are always ailing, and making everybody they see feel as though they were sick. The old rule to keep the head cool, the feet warm and the system open, is still one of the best of prescriptions. By a little more attention to these things we should save many a doctor's bill. It is this condition which we have just described that renders so many persons low spirited at this season of the year. Unhappy themselves, they render everybody else so. Their food does not digest, and they feel as though the whole world is against them. It is astonishing how one's feelings are affected by their physical condition. Some persons boast that they never take medicine. Such persons do not need it. The internal organs are in good plight, just as nature designed they should be. But many persons are not so. Some organ is not strong enough to perform its requisite duty, and medicine must then be called in to assist nature.

It is not within our province to prescribe for persons afflicted with such troubles as we have here described. We must leave this for a family physician. We close as we commenced—Know thyself.

A NATURALIST'S HOME.

"There is no place like England for a rich man to live in exactly as he pleases. It is the appropriate exercising ground for the hobbies of all mankind. You may join an Agapemone, or you may live alone in dirt and squalor, and call yourself a Hermit. The whim of the late Charles Waterton, naturalist, was a very innocent one, namely, to make his home a city of refuge for all persecuted birds, a sanctuary inviolate from net and snare and gun; and he effected his humane purpose. An intimate associate and fervent admirer of his, one Dr. Richard Hobson, has given to the world an account of this ornithological asylum; and it is certainly very curious. The name of the place was Walton Hall, near Wakefield; and it seems to have been peculiarly well adapted for the purpose to which it was put. It was situated on an island, approachable only by an iron footbridge, and having no other dwellings in its immediate neighborhood. The lake in which it stood gave the means of harboring waterfowl of all kinds, while the "packing" of carrion crows in the park exhibits a proof of the protection afforded by even the mainland portion of the estate; it was sufficiently extensive to allow of portions being devoted to absolute seclusion, for those birds which are naturally disposed to avoid the haunts of man. "Two thirds of the lake, with its adjacent wood and pasture land, were kept free from all intrusion whatever for six successive months every year; even visitors at the house, of whatever rank, being 'warned off' those portions set apart for natural history purposes. Even the marsh occupied by the herons was forbidden ground throughout the whole breeding season, unless in case of accident to a young heron by falling from its nest; in which case aid was afforded with all the promptitude exhibited by the fire-escape conductors for the safety of human life."

The surroundings of the mansion itself were quaint and exceptional, exhibiting the eccentric character of their proprietor. Item, a magnificent sun dial—constructed, however, by a common mason in the neighborhood—composed of twenty individual dials, ten of which, whenever the sun shone, and whatever its altitude, were faithful timekeepers. On these dials were engraved the names of cities in all parts of the globe, placed in accordance with their different degrees of longitude, so that the solar time of each could be simultaneously ascertained. Near this sun dial was a subterraneous passage leading to two boat houses, entirely concealed under the island, furnished with arched roofs lined with zinc plate, and arrangements for slinging the boats out of water when they required painting or repair.

Four sycamores with roosting branches for peahens, and a fifth, whose decayed trunk was always occupied by jackdaws, screened the house from the north winds. Close to the cast iron bridge was a ruin, on the top of whose gable, at the foot of a stone cross twenty-four feet above the lake, a wild duck built her nest, and hatched her young for years. A great yew fence enclosed this ruin on one side, so that within its barrier birds might find a secure place for building their nests and incubation. For the special encouragement and protection of the starling and jackdaw, there was erected within this fence a thirteen feet high stone and mortar built tower, pierced with about sixty nesting berths. To each berth, there was an aperture of about five inches square. A few, near the top, were set apart for the jackdaw and the white owl. The remaining number were each supplied at the entrance with a square loose stone, having one of its inferior angles cut away, so that the starling could enter, but the jackdaw and owl were excluded. The landlord of these convenient tenements only reserved to himself the privilege of inspection, which he could always effect by removing the loose stone.

The lake had an artificial underground sluice, which issuing out at a little distance into sight, furnished the means of cultivating a knowledge of the mysterious habits of the water rat; this stream then passed through one of the loveliest grottos in England. Near this place were two pheasantries, the central portion of each consisting of a clump of yew trees, while the whole mass was surrounded by an impenetrable holly fence; the stable yard was not far off; and hence the squire had infinite opportunities of establishing the important fact, as he considered it, that the game cock always claps his wings and crows, whereas the cock pheasant always crows and claps his wings. Mr. Waterton's interest in natural history was, however, by no means confined to the animal creation. He concerned himself greatly with the culture of trees (though by no means of land), and hailed any *lusus naturæ* that occurred in his grounds as other men welcome the birth of a son and heir. Walton Hall had at one time its own corn mill, and when that inconvenient necessity no longer existed, the millstone was laid by, and forgotten. The diameter of this circular stone measured five feet and a-half, while its depth averaged seven inches throughout, and its central hole had a diameter of eleven inches. By mere accident, some bird or squirrel had dropped the fruit of the filbert tree through this hole to the earth, and in 1812 the seedling was seen rising up through that unwonted channel. As its trunk gradually grew through this aperture and increased, its power to raise the ponderous mass of stone was speculated upon by many. Would the filbert tree die in the attempt? Would it burst the millstone? Or would it lift it? In the end, the little filbert tree lifted the millstone, and in 1863 wore it like a crinoline about its trunk, and Mr. Waterton used to sit upon it under the branching shade. This extraordinary combination it was the great naturalist's humor to liken to John Bull and the national debt.

In no tree fancier's grounds were there ever one tenth of the hollow trunks which were to be found at Walton Hall; the fact being, that the owner encouraged and fostered decay for the sake of his birds' paradise. These trees were protected by artificial roofs in order to keep their hollows dry, and fitted thus for the reception of any feathered couple inclined to marry and settle. Holes were also pierced in the stems, to afford ingress and egress; and one really would scarcely be surprised if they had been furnished with bells for "servants" and "visitors." In an ash tree trunk thus artificially prepared, and set apart for owls (the squire's favorite bird), an ox-eyed titmouse took the liberty of nesting, hatching and maturing her young. Mr. Waterton attached a door, hung on hinges, to exactly fit the opening in the trunk, having a hole in its inferior portion for the passage of the titmouse. The squire would daily visit his little tenant, and opening the door, delicately drew his hand over the back of the sitting bird, as though to assure it of his protection. But unfortunately, after the bird had flown, one year, a squirrel took possession of this eligible tenement, and although every vestige of the lining of its nest was carefully removed, no titmouse or any other bird ever occupied it again.

In May, 1862, the squire pointed out to the author no less than three bird's nests in one cavity —a jackdaw's with five eggs; a barn owl's with three young ones, close to which lay several dead mice and a half grown rat, as in a larder; and, eighteen inches above the owl's nest, a redstart's containing six eggs! Our author deduces from this circumstance, that in an unreclaimed state, birds, although of different species, are not disposed to quarrel; and the fact that near this "happy family" a pair of water hens hatched their eggs in a perfectly exposed nest, under the very eyes of two carrion crows who occupied the first floor of the same tree, an alder, without the least molestation, seems to confirm this view.

In this Garden of Eden, however, all sorts of anomalous things seem to have been done by birds. In a cleft branch of a fir tree, twenty-four feet from the ground, a peahen built her nest, through which piece of ambition, since falling is much easier than flying, she lost all her young ones. In the branch of an oak, twelve feet from the ground, a wild duck nested, and brought down all her brood in safety to their natural element. A pair of coots built their nest on the extreme end of a willow branch closely overhanging the water; but the weight of the materials, and especially of the birds themselves, depressed it so that their habitation rested on the very surface of the water, and its contents rose and fell with every ripple; and, finally, another pair of coots who had built their house on what they considered *terra firma*, found themselves altogether adrift one stormy morning, and continued so, veering with the fickle breeze for many days, until at last the eggs were hatched, and their young family became independent, and could shift for themselves. All these minutæ were carefully watched by the squire. An excellent telescope enabled him to perceive from his drawing room window the manœuvers of both land and water fowls. "You could carefully scrutinize their form, their color, their plumage, the color of their legs, the precise form and hue of their mandibles, and not unfrequently even the color of the iris of the eye: also their mode of walking, of swimming, and of resting. You could see the herons, the water hens, the coots, the Egyptian and the Canada geese, the carrion crows, the ringdoves (occasionally on their nests), the wild duck, teal, and widgeon." No less than eighty-nine descriptions of land bird, and thirty of water fowl, sojourned in the grounds or about the lake of Walton Hall. In winter when the lake was frozen, it was literally a fact that the ice could sometimes not be discerned, it was so crowded by the thousands of water fowl that huddled together upon it without sound or motion.

Mr. Waterton, it may be easily imagined, was himself no sportsman; but it was his custom to supply his own table on a fast day (he was a Roman Catholic) with fish shot by himself with a bow and arrow. Otherwise, he made war on no living creature, except the rat: the "Hanoverian" rat, as he designated him with bitterness: and even him he preferred to exile rather than destroy. On his return home from his famous wanderings in South America, he found the hall so infested with rats that nothing was safe from them. But having caught a fine specimen of the "Hanoverian" in a "harmless trap," he carefully smeared him over with tar, and let him depart. This astonished and highly-scented animal immediately scoured all the rat passages, and thus impregnated them with the odor of all others most offensive to his brethren, who fled by hundreds in the night across the narrow portion of the lake and were no more seen. Though very bigoted in religious matters, the squire was indeed a most tolerant and tender-hearted man. He built a shelter upon a certain part of the lake expressly for poor folks, who were permitted to fish whether for purposes of sale or for their own dinners; and notwithstanding that it was his custom to dress like a miser and a scarecrow, and to live like an ascetic, sleeping upon bare boards with a hollowed piece of wood for a pillow, and fasting much longer than was good for him, he was very charitable and open handed to others.

It must be confessed however, we gather from this volume that the great naturalist was, out of his profession, by no means a wise man, and certainly not a witty one. He loved jokes of a school boy sort, and indulged in sarcasms more practical than delicate. The two knockers of his front door were cast, from bell metal, in the similitude of human faces, the one representing mirth, and the other misery. The former was immovably fixed to the door, and seemed to grin with delight at your fruitless efforts to raise it; the latter appeared to suffer agonies from the blows inflicted on it. In the vestibule was a singularly conceived model of a nightmare, with a human face, grinning and showing the tusks of a wild boar, the hands of a man, Satanic horns, elephant's ears, bat's wings, one cloven foot, one eagle's talon, and with the tail of a serpent; beneath it was the following motto:—

ASSIDENS PRÆCORDIIS
PAVORE SOMNOS AUFERAM.

It was his humor, more than once, when between seventy and eighty years of age, to welcome the author, when he came to dinner, by hiding on all fours under the hall table, and pretending to be a dog. He made use of his wonderful taxidermic talents to represent many individuals who took a leading part in the Reformation by loathsome objects from the animal and vegetable creation, and completed the artistic group with a sprinkling of "composite" demons. He was seriously vexed, and behaved very rudely to a stranger under his own roof, who had profanely designated his favorite (stuffed) Bahia toad as "an ugly brute."

These and similar instances of bad taste we think Dr. Hobson might have left unrecorded with advantage. Still, there was much to like as well as to admire about the great Naturalist. No museum of natural history elsewhere could compare with the beauty and finish of the specimens, prepared by the 'squire's own hand with wonderful skill and patience, which adorned the inside of Walton Hall. "Not even living nature," says our author, "could surpass the representations there displayed." In attitude, you had life itself; in plumage, the lustrous beauty that death could not dim; "in anatomy, every local prominence, every depression, every curve, nay, the slightest elevation or depression of each feather." The great staircase glowed with tropical splendour. At the top of it was the vertical cayman mentioned in the Wanderings, on which the squire mounted in Essiquibo, and the huge snake with which he contended in single combat. Doubts have been thrown on both these feats, but Dr. Hobson relates instances of presence of mind and courage shown by the squire in his presence, quite as marvelous as these. Wishing to make experiment as to whether his Woorali poison, obtained in 1812 from the Macoushi Indians, was more efficacious than the bite of the rattlesnake, he got an American showman to bring him twenty-four of these dangerous reptiles, and took them out of their cases, one by one, with his own hand, while the Yankee fled from the room in terror, accompanied by very many members of the Faculty, who had assembled to witness the operation. In his old age, he alone could be found to enter the cage of the Borneo ourang-outang at the Zoological Gardens, in order minutely to inspect the palm of his hand during life, and also the teeth. It was with difficulty he obtained permission to run this hazard, the keepers insisting upon it that the beast would "make short work of him." However, nothing daunted, the squire entered the palisaded enclosure. "The meeting of these two celebrities was clearly a case of love at first sight, as the strangers embraced most affectionately, kissed one another many times, to the great amusement of the spectators. The squire's investigations were freely permitted, and his fingers allowed to enter his jaws; his apeship then claimed a similar privilege, which was corteously granted after which the orang-outang began an elaborate search of the squire's head."

The strength and activity of Waterton were equal to his physicial courage, notwithstanding that he was wont to indulge in venesection to a dangerous extent, always performing that operation himself, even to the subsequent bandaging. At eighty-one, the supleness of his limbs was marvellous; and at seventy-seven years of age our author was witness to his scratching the back part of his head with the toe of his foot! Death, however, claimed his rights at last in the squire's eighty-third year.

Charles Waterton lies buried in a secluded part of his own beautiful domain, at the foot of a little cross with this inscription written by himself,—

Orate
Pro anima Caroli Waterton,
Viatoris:
Cujus jam fessa,
Juxta hanc crucem
Hic sepeliuntur ossa.

Even those iron limbs of his grew weary and he died.—*Chambers Journal.*

PETROLEUM FUEL.

We have been informed that Mr Richardson has resumed, or is about to resume, his experiments at Woolwich Dockyard on the use of petroleum as fuel for sea and land boilers. So far as we can make out, all the former series of experiments, eminently satisfactory though they were, have with our authorities gone for nothing. They have a splendid coal-testing apparatus at Woolwich, the property of the nation; and therefore do not want anything newfangled, or that will do away with the use of that pet apparatus. It may be remembered that the rope-making machinery, the envy of the world, and the property of the lately deceased Mr. Cotton, was purchased by the then Government for the manufacture of hawsers, &c.; and yet, though the finest ropes in the world had been spun from it, as soon as it got into Government hands it was pronounced worthless, under the advice of interested parties condemned, broken up, and sold for old iron! Luckily for Mr. Richardson, he lives in 1867, and no cold water thrown on his excellent plan can put out his light, especially when he promises economy, cleanliness, and every possible advantage to a commercial public in the use of his furnace and general method. The new series of experiments are to be at Mr. Richardson's own expense—of course he will now be able to give every publicity to the various results obtained.

Originally it was found very satisfactory to burn the new fuel through a porous floor or permanent wick, but the great difficulty was to get rid of the smoke; it choked the boiler tubes, and so arrested evaporation, rendering frequent cleansing necessary. A superheated steam blast was turned in over the flame, with a certain amount of success, but still the smoke poured from the chimney in blinding quantity. Mr. S. J. Mackie, we have been told suggested the application of the superheated steam beneath the furnace floor. The suggestion was at once adopted, the necessary alteration in the furnace was made, and the result was a triumph. After a little while, it was found that, by taps regulating the supply of oil and of steam, combustion could be rendered absolutely perfect. The experiments showed that there was in the materials used a great difference in heating power—the Torbane-hill "once run" oil beating all competitors. Eighteen and a half pounds of water were evaporated per pound of this oil in the defective apparatus, as against 9½ lbs. of water per pound of best coal in the Woolwich coal-testing apparatus—the finest in the world. With a properly built furnace Mr. Richardson would have evaporated 21 lb. of water. Of what immense importance this result must prove to the new naval fleet—the *Monitors* and "castellated" ships of light draught that are to be built—no one can give a proper estimate. If rock oil will raise three times the amount of steam that coal can do per pound consumed then—if as much oil as coal can be burnt per square foot of grate—an oil-bearing vessel can carry three times as much fuel as a coal burning one, or, in other words, a war ship can remain under steam three times as long as a coal-burning one.

Turning to the merchant service, we know that on the length of the voyage depend the dimensions of the steamer to carry sufficient coal for the journey. The *Great Eastern* was to have run to India; it was found that this could only be accomplished by a vessel carrying 10,000 tons of coal. Out of 3,500 tons burden the *Persia* devotes 1,400 to her fuel! Reduce these figures by two-thirds, and you make the journey to India practible, and enhance the profits of the American voyage very considerably. This, of course, is not all. We have steamed over the Atlantic in all weathers and have been filled with the most profound pity for the poor stokers and cinder-heavers. Half-burnt and half-drowned, we have seen them come on deck and nearly faint there from their terrible duties. With petroleum all this is done away with, consequently there is to be added to the saving in money the wages and "boarding" of stokers and heavers; there is also the saving of their berth-room.

Mr. Richardson has, in a manner, the field open to him; but we advise him to adopt a different course to what he is now doing—first of all to take himself clear away from Woolwich and appeal to those who supply his fuel to afford him every facility for demonstrating the great value of his invention and experiments. A small company, with a few thousand pounds capital, would perhaps be better; we leave both proposals for Mr. Richardson's consideration, confidant that with his assistance we need not fear for our coal supply, with petroleum coming from, or ready for use at, nearly every port of importance in the world.—*English Mechanic.*

Machinery and Manufactures.

Boiler-making.

It is of very little use preaching how a boiler ought to be made, unless we are prepared to show how a good boiler can be made in practice. We have selected Mr. D. Adamson's boiler-works at Newton Moor, near Manchester, as one of the best examples of their kind for the purpose of placing the present state of boiler-making practice, and the next progressive steps which are likely to be taken in the manufacture of boilers, before our readers. Mr. Adamson has been led to boiler making as a specialty by his well-known patent for flanged seams, and his experienee having been collected by the manufacture of nearly one thousand boilers, he is now considered one of the first authorities on boiler-making in this country. The main principles arrived at in the Newton Moor works are the following;—To test every plate used as to its tenacity and ductility, to use no single row of rivets for longitudinally seams, and to apply double-riveted welts to steel plates, and to weld up all longitudinal seams of iron plates used in the construction of internal flues. To drill all rivet-holes, without exception, after the plates are bent and put together in their proper position, so as to assure perfect accuracy of fit for the rivets. To expose no double thickness of plates nor any rivet-heads to the direct action of the flame, and to give considerable elasticity to the entire structure for expansion and contraction with alterations of temperature. To test every boiler with water to a pressure exceeding the working pressure, not in direct proportion to the latter, but to an extent which will insure a sufficient margin for safety without going to extreme test-loads. To prolong the hydraulic test with variations of pressure for a considerable length of time, during which all leakage is carefully observed and repaired. And, finally, to limit the strain of the extreme test-load to seven tons per square inch on iron, and to thirteen tons per square inch on steel.

The materials used for making boilers at the Newton Moor works are boiler-plates of the well known brands of iron, and, in preference to these, Bessemer steel plates made at the Bolton forge, or at Messrs. Cammel & Co.'s works. Each plate is ordered from the mill fully two inches longer and wider than wanted for the boiler, so as to give a margin of one inch at each side, which is cut off by a shearing machine, and is made use of for testing the quality of the plate. This plan has the advantage of removing the rough ends of the plates, and at the same time avoiding the use of those portions which are always most likely to contain flaws, impurities, or irregularities for forming the rivet seams of the boiler. The strips removed by the shears, which strips are justly considered to be inferior portions of the plate, are, as we have said, used for testing the quality. Each strip is beat cold by hammering, and is expected to stand doubling up until the ends nearly touch each other without showing any cracks or fractures, and all plates which fail under this test are rejected. As a rule, the Bessemer steel plates stand more than this, allowing of being doubled up quite close without the slightest signs of fracture. This is due to the precaution of ordering the softest kinds of Bessemer steel plates only, which are never expected to exceed a tensile strength of 38 tons on the square inch, all steel beyond that tenacity having been found too brittle for boiler-making. With boiler-plates, particularly with those of steel, the process of annealing is of the utmost importance. Mr. Adamson has found, by direct experiments, that a plate rolled very hot, and a " black rolled " plate, will expand at such different rates when heated as to strain the rivet seams; and when tested at the same temperature, the rates of elongation vary so much that two such plates when joined will never take the strain equally. The process of annealing is, therefore, carried on at the works, and is combined with that of bending the plates. There is, of course, no art in annealing plates, all that is required being care to let them cool as slowly and gradually as possible. After the process of bending, the plates are fitted together by means of a few temporary bolts, which pass through holes previously punched through them. The diameter of these holes is much less than that of the rivet holes, in order that they may be drilled out to their proper size for riveting after they have served their temporary purpose.

The plates are next put under a drilling frame having six headstocks, with horizontal drills all placed radially, and so arranged as to be adjustable to the diameter of each shell. The holes are drilled with great speed and accuracy, six at a time, and through both superposed plates at the same time. The plates being drilled together, never change their relative position, and each rivet is thereby made an absolute mechanical fit. A still more complete machine, having twelve drill headstocks, is now in course of construction at the Newton Moor works, for their own use; and Mr. Adamson has kindly promised us drawings of this interesting tool for publication. The holes in the flanges and angle irons are drilled in a similar manner by plain vertical drilling machines, all holes being parallel to each other in those parts of a boiler. Riveting is effected by machinery, wherever the shape and position of the parts will allow of the application of the machine. Mr. Adamson considers a machine-riveted seam superior to any one made by hand, particularly when steel rivets are used, as with hand riveting, the numerous blows of the hammer cause that degree of brittleness called " hammer-hardening. " The machine used for riveting at Newton Moor are of Mr. Adamson's own design. They act by raising an adjustable weight through a series of compound levers, this weight actuating the riveting die by its sudden descent. This principle insures the exertion of an exact pressure upon each rivet, and this pressure, while it can be adjusted to each kind of work, cannot be altered by the workmen tampering in any way with the action of the machine. For riveting the flanged seams of internal flues a very ingenious arrangement is made use of for withdrawing the back holder by a cam after each stroke, so as to allow another rivet-head to pass underneath, and replacing the holder in its position when wanted for holding the rivet-head fast while the other is being formed in the manner just described. The longitudinal seams of iron flues are welded up, and the flanges are then bent over a kind of anvil having the corresponding form, by careful hammering at a bare red heat. Steel plates are never welded at Newton Moor, Mr. Adamson considering a weld in steel insufficient in strength to rely upon it for the same strains to which solid steel is considered safe in his boilers. The steel flues have a strip of steel riveted over their longitudinal seam, and this is placed in such a position in the flue as to be but comparatively little acted upon by the flame. The flues are generally made ⅜ inch thick in iron and ¼ inch in steel, the difference in resisting power for different pressures being adjusted by the distance and relative number of the flanged seams. Some of the finest boilers now made by Messrs. Adamson & Co. consist of a steel shell with wrought iron flues and end plates. The shell and flues are strengthened at their ends with angle-iron rings turned on their faces, same as all the flanges and rings forming the seams. The manholes are welded up from plates, flanged out to a shape from the solid, and riveted with drilled holes. At the front ends of the wrought-iron flues, where the grate is situated, it is preferred to substitute steel, which is less liable to blister under the direct action of the flame. The boilers are put together with all joints turned and faced in the lathe, with the most rigorous exclusion of all drifts or similar appliances which could cause a strain upon plates or rivets when the boiler is completed. The boiler is then filled with water, and a stand containing two pressure gauges side by side, and independent of each other, is screwed upon the manhole. Water is then slowly pumped into the boiler to a pressure which will cause leakage at any seam or rivet imperfectly closed, and a number of workmen are constantly watching and repairing these leaks. As the pressure is slowly raised, new leaks show themselves, and are repaired in their turn, until a strain considerably above the working pressure is arrived at, and such a freedom from leakage obtained that the prossure gauges will remain almost stationary for several minutes when the pumps are shut off. The pressure is then quickly removed, and after a short time put on again to see if sudden changes will cause any fresh leakage, which would have to be repaired by calking. The final test is carried to a pressure some 50 lbs. or 60. lbs above the working pressure of the boiler, and does not bear a strict proportion to the latter. A boiler intended to work at 100 lbs. pressure, for instance, is tested to 150 lbs. pressure, while a boiler for 160 lbs. working pressure is tested only to 220 lbs. This seems much more reasonable than the practice of testing to the double working pressure, or any other proportionate rate of the working pressure, which makes the test too light at low, and unreasonably excessive for high, working pressures.

The introduction of steel for boiler construction, of which Mr. Adamson has been one of the earliest advocates, is gaining ground very rapidly The proportion of steel to iron used at the Newton Moor works has been gradually increasing until the scale has been now turned in favor of the former, and there can be no doubt that steel boilers will come into almost universal use as the safest and most economical in practice. The chief desiderata are now tubular steel plates rolled out of the solid, and seamless rings of angle steel. Designs for a mill for rolling both these articles are now under Mr. Adamson's consideration. Mr. Adamson also intends to plane all straight ends of his boiler plates, so as to improve their appearance and to insure a greater facility and regularity in calking their seams.—*Engineering.*

Metal Shavings.

There is a remarkable degree of uniformity and regularity in the shape and structure of all shavings removed by cutting tools from metallic surfaces. This regularity indicates strict laws of nature, capable of scientific investigation and a most promising field for research almost untouched as yet by physical science. To the mechanical engineer the nature of shavings is an important element of empirical knowledge and an object of constant attention. "To judge of the capabilities of a workman, I do not look at the work, but the shavings he makes." These are the words of an eminent engineer, which will meet with approval in many a workshop. But it is not only the skill of the workman, and the quality of the cutting-tool, it is also the nature of the material operated upon which can be judged by the character of the shavings with more certainty and readiness than by any other test. It is a general practice with steel makers or iron-workers to exhibit continuous shavings of very great length as proofs of the uniformity and malleability of their materials. Mr. Bessemer, at the International Exhibition of 1862, produced very long shavings from turned steel shafting. Mr. Anderson, of Woolwich, exhibited a shaving from a wrought-iron gun supposed to be the longest ever made in one continuous piece. In the Enfield factory the continuity of the shavings from gun-barrels is considered a proof of the solidity of their welds. On the other hand, cracks and flaws can be detected from the shavings. In the repairing shops of the Cologne-Minden railway, in Germany, for instance, in testing the soundness of axles after their having passed over a certain mileage, the process followed is to turn the parts running in the bearings with a very sharp tool, removing an extremely thin shaving only. This shaving is carefully observed. Its continuity is an indication of perfect soundness, and the smallest crack in the axle, even if not perceptible under the microscope, will cause the shaving to split up longitudinally when turned off. In planing armor-plates, the shavings are the best proofs of the malleability of the iron and of the powerful machines in use. At the Atlas Works, in Sheffield, there are shavings from their armor-plates 6 inches wide taken off the whole length of a plate in one continuous piece.

Cast iron gives shavings of very different character, according to the degree of its hardness. The cuttings from a chilled roll have the form of the thinnest needles, while soft gray iron will produce a curved cutting of some length. At Lowmoor Ironworks cast-iron guns have been turned with tools some 12 inches broad at the edge, removing thin shavings of equal width. These shavings are regularly curved up in coils of very small diameter, each continuous piece representing a surface more than half an inch long travelled over by the tool in removing it. The length of a shaving, if uncoiled, is much smaller than the length of surface from which it has been removed, owing to the crushing action of the tool upon the shaving. This action will be increased by the bluntness of the cutting edge, so that to a practiced eye even the state of the cutting tool will be clearly visible from the nature of the cuttings removed by it. The smallest shavings known are those removed by the scraping tool from planes of great precision. They are of microscopic smallness, and, from the limits of accuracy which their removal is capable of effecting, we must conclude that their thickness is less in fine scraping than the one-millionth part of an inch.—*Engineering.*

McKay's Life-Boat Disengaging Tackle.

A late number of the *American Artisan* contains a description of this invention for detaching a boat from her tackles, simultaneously at both ends, as she is lowered with a full complement of passengers into the water, "while the vessel is under speed or otherwise, by day or by night, under any circumstances, without peril to life."

The boat is constructed with rods running under the gunwale, "through thimbles or eye-bolts secured to the side of the boat; the forward and after ends of these rods pass through sockets secured to the stem and stern of the boat, for the purpose of receiving the links into which the tackles are hooked. The other ends of the rods are attached to a lever, which is pivoted amidships. To disengage the boat all that is necessary is to lift the lever, and the rods are drawn back out of sockets, liberating the links, and the boat descends evenly into the water.

"The arrangement is *positive* in its action; it cannot be operated wrong. The lever which operates it being seated in the throat of a knee on the top of the thwart, cannot be forced down; if lifted up it is sure to disengage the boat. The apparatus cannot be obstructed by ice, as it is placed in the upper part of the boat, under the gunwale. To prevent corrosion the rods and levers are galvanised, and the sockets and eye-bolts are made of composition.

"This apparatus has been approved by the United States Board of Supervising Inspectors, at their annual meeting held in Buffalo, N.Y., October, 1866, and after numerous trials by the local inspectors of steam vessels in Boston, and in presence of some of the most competent engineers, mechanics, and steamboat captains, it has been pronounced a most *sure, simple*, and effective arrangement.

"Donald McKay, the eminent ship-builder of Boston, in a letter to the proprietor of the apparatus, says:—'Having seen many, if not all the mechanical devices in use, both in this country and in Europe, for the purpose of detaching boats from their tackles, I do not hesitate to say that your *positive detacher* is the most certain, simple, and efficient apparatus for the purpose now in use. I consider the arrangement of the rods under the gunwale, to which the lever is attached for the purpose of drawing the rods from the sockets, a superior device to any of those operated in the centre of the boat, for the reason if it be in the *bottom* of the boat it is liable to be frozen up in water, and, if raised up, it takes up room in the centre of the boat, and would be liable to accidental disengagement; while yours, being arranged under the gunwale, is entirely protected from accident, and takes up no room."

The "Shoddy Devil" superseded.

The term "shoddy" has now been so long in use that it has acquired a secondary meaning (at least with our cousins the Yankees, for their mushroom millionaires). Here in England, the term indicates woolen rags torn and clawed into fibre, to be used over again by being spun with new wool and woven into common cloth, thus turning that to a profitable use which would have been otherwise entire waste. It is true that cloth made from shoddy cannot boast any great excellence as to strength and durability; but it is cheap, and will serve as a covering at a cheap rate to those who might otherwise be compelled to go in a state ill-protected from the cold. Shoddy, as hitherto made from woolen rags, has been but little removed, from a kind of fluffy, woolen dust, the length of the best fibre in it scarcely exceeding half an inch, the bulk being very much shorter and much of it absolute dust. This arose from the defectiveness of the "devil," as the shoddy machine is called. Certainly the usual machine is simple, but not very effective as to excellence of product.

The general principle and working of the machine is this:—The rags being cleaned and torn or cut into convenient-sized pieces, are placed on an endless band, which carries them to a pair of fluted rollers, by which they are seized and held tightly and gradually protruded on the other side, where a cylinder full of spikes revolves at a great speed, rapidly tearing or rasping the rags as they are pretruded into broken fibre. With some kinds of woolen rags, perhaps, very little better results can be obtained with any machine; but from all loosely woven fabrics, such as flannel and most woolen fabrics for ladies' wear, fibre of from two to three or even four inches might be obtained with a suitable machine, and such might be easily respun without the addition of any new wool, and this, in fact, is done by a newly-invented machine which we have had the pleasure of inspecting at rest and in action. This machine is equally applicable to the unraveling of silk rags, which the shoddy machine is not competent to do, nor indeed has it been accomplished by any other machine. We will give a general description of this machine, which we are only permitted at present to do, seeing that there are several particulars in its construction which are not yet secured to the inventor.

The new machine consists of a series of jointed brushes moving in *quasi*-elliptical guides, on which the rags are placed, being first cut into suitable pieces. On these brushes they are carried under a cylindrical brush, which turns at greater speed than the jointed brushes move, and thus keeps the rags straight; behind this brush there is a wooden cylinder armed with steel teeth, which catch the threads from the woof and remove them from the warp, and then deliver them on to a second cylindrical brush, which in its turn delivers them on the discharge roller, from which they fall, if it be silk, in large flakes, the warp remaining on the jointed brushes in long fleecy fibres, from which it is also removed as it comes round to the discharge point. The fibre obtained from silk rags is in every way equal to that from which ordinary spun-silk is made, and will doubtless be used for the same purposes, and for the warp of ordinary silk with thrown silk for the woof. In operating on mixed fabrics, whether woolen or silk, where the fibre of the material is not mixed and spun together, but where the commoner material is used for the warp and the better for the woof, this machine effectually separates the two materials, the woof being removed in fleecy flakes, while the warp remains attached to the jointed brushes. We saw several examples of this, where the fabrics were of cotton and silk, and cotton and woolen. In both cases the cotton warp was left perfectly intact, and the silk and wool were perfectly removed without in the least breaking the fibre.

The machine we saw in operation we understand will produce about 120 lbs. of silk from the rags in a day by the simple attendance of one boy or girl to feed it, and a one-horse steam engine will drive three of them. The silk rags, we were told, can be bought at present for about ½d. per pound; but about half of the weight is waste, being simply dirt or seams and other parts of old garments which cannot be used. This raises the price to a penny only. The charges that come against it are for assorting the rags, cutting into suitable sizes, washing, feeding the machines, and driving-power. Those charges are all comparatively light, seeing that no skilled labor is required. The profits must consequently be very great, when such a valuable product as raw silk is picked up as it were out of the very gutters; such rags having been considered till now as of no value. We were allowed to manipulate the machine ourselves, and, having placed some pieces of silk rag on the hinged brushes, we had the pleasure of seeing thrown out at the other end of the machine a large flake of fine fleecy silk, the fibres in which we found to be from two inches to six in length, agreeing in lengths with the various pieces of rag which we introduced, clearly shewing that the office that the machine performs is simply unraveling but not at all injuring the fibre. Its operations on woolen rags are equally successful, but we have laid more stress on the unraveling of silk, it being the more difficult of the two, and not having before been done. This machine is at present only exhibited privately for reasons before stated. We hope in time to be able to give a fuller account of it with drawings.—*Mechanics' Magazine.*

The Sidney Cheese Factory—The profits of the Trade.

The annual meeting of the stockholders of the "Front of Sidney Cheese Factory," was held on the 3rd January inst. The following is an abstracted statement of the summer's business which we commend to the careful perusal of the farmers of the country:—

Cost of factory, including building, vats, machinery, waggons for drawing milk, cans, &c., &c., $2,250. The number of cows from which milk was received was 220, and the quantity of milk received 581,371lbs., during 165 days. The amount of cheese made and sold was 59,498lbs., which realized $7,706.80. Expenses of manufacturing including making, drawing milk, boxes, freight, commission on sales, &c., $1,554.33, leaving a nett balance of $6,151.97, which was divided among 19 stockholders, each man receiving a cheque for his money. The factory commenced operations on the 10th of May, and closed on the 15th of November. No milk was received at the factory on Sunday, the milk obtained on Sunday was retained by the stockholders. We may here mention that the stockholders consist exclusively of those who furnish milk, each cow representing one share, so that every man furnishing milk has a proprietary interest in the factory. The success which has attended this factory has given the liveliest satisfaction to every stockholder, proving, as it does, that the manufacture of cheese not only pays, but is highly remunerative, and therefore cannot but be an incentive to others in different parts of the country to establish factories; it will render them to a certain extent independent of the grain market, and at the same time improve the land. The more advanced farmers have learned that it is time to adopt some system by which their lands can be reclaimed from the exhausted state to which the constant cropping has reduced them, and there is no more effectual way of doing this than by establishing dairies. Many have been under the impression that the selling of milk to, or of sending it to a factory was not as profitable as manufacturing butter and cheese themselves. Those who have supplied the Sidney factory have come to a different conclusion. The summer's business has convinced them that the most profitable use to which they can put their land is to stock it with cows, and supply milk to the cheese factory. The figures which we have given above show that each cow has netted, in cash, within a fraction of $28 to its owners from the 10th of May to the 15th of November and one day's milking besides. But if we had the exact time that milk was furnished from the cows, it would show an income of over $30 per cow, because in the figures given above we have made the calculation upon the assumption that milk was obtained from 220 cows for the whole time, when the fact is the full number of cows were not obtained until the middle of June. The best illustration we can give of the success and profitableness of cheese-making is one in connection with this same factory. A man in the spring borrowed money and bought cows, and sent the milk to the factory during the summer. This fall when the division was made, he received sufficient money as his share to pay for the cows, and to pay for his stock in the factory of $4 for each cow, thus giving him his stock on his farm and in the factory for the trouble of pasturing and milking during the summer. If this is not sufficiently profitable we know not what is.

The Hon. Robert Read has presented the company with the bonus of $100, which he offered a year ago for the establishment of the first cheese factory in the county.—*Belleville Intelligencer.*

Soluble Glass for Surgical Splints.

M. Velpeau has called the attention of scientific men to "anamo-inamovible" bandages made of soluble glass, to replace the starch, plaster-of-Paris and glue applications now used for bandaging fractures in England. The great advantage possessed by this glass is that it affords a firmer support, becoming quite hard in two or three hours, at the same time being readily removed by moisture. All these recommendations do not apply to the substances now in use, nor is their application as easy and neat as that of the soluble glass. It can be procured at a very moderate price from Mr. Rumney's Chemical Works, Manchester, and we hope that as fair a trial will be given to it in England as has already been done on the Continent. The discovery of this glass was made by Fuch, in Munich; he prepared it by fusing together sodic sulphate and charcoal and sand, or either potassic or sodic carbonate with sand. It is of extensive use in the arts for stereo-chromic painting, and protecting substances of all kinds that might be damaged by moisture, etc., from atmospheric action.—*Chemical News.*

Novelty in Tanning.

A tannery has been located at Rockford, Ill., in which is employed the patented process by exhausting the air from the vat. The tanning is said to be accomplished in twelve hours, and that of sheep skin in fifteen minutes. The weight of leather from a given weight of hides is ten per cent greater than by the ordinary process, and the cost of the works is but ten per cent that of the old. It is also claimed that the leather is better; but this point can only be determined by wear.

The French Pine Wool.

This curious novelty in manufacture, lately noticed among our patents, is said to be already in active manufacture and sale in Paris. As wadding it is recommended as adding to those usually demanded in that article highly medicinal qualities for catarrh, bronchitis, sore throat, rheumatism, etc. As mattress stuffing, it is but half the price of wool and hair, and better still, its resinous principles gets it the abhorrence of bugs. As flannel for all purposes, it peculiarly promotes the functions of the skin. The etherated pine oil prepared at the same time is highly praised as an application for incipient paralysis and apoplexy, recent burns, worms, fits, etc. etc.

Steel Fusee Watch-chains.

The manufacture of steel fusee watch-chains for the internal machinery of watches is and has been for nearly a hundred years a staple of Christ-church, Hants, England; young girls with small fingers and delicate touch being the manufacturers. Each chain is about eight inches in length, and contains upwards of 500 links, riveted together. It is not thicker than a horse-hair, and the separate links can but just be perceived with the naked eye. Modern invention has as yet discovered no substitute for this chain equal to it in slenderness, strength, and flexibility.

Malleable Cast-iron.

Few of our readers may be aware that screw-propellers, and we mention the propeller of the Danish iron-clad gunboat *Rolf Krake*, are cast of Mr. McHaffie's malleable cast-iron or steel, as made by Messrs. McHaffie, Forsyth & Miller, of Glasgow. This material, as made by the firm just named, is not the subject of a patent, but is made by a process known, we believe, only to the manufacturers. Of its merits, however, there can be no doubt. It is of great absolute strength, great toughness, and great hardness; and although necessarily much more expensive than iron, it is of less than one-half the cost of brass. Messrs. R. Napier & Sons have employed it for the mast-caps and scupper-pipes of the frigates they have constructed for the Turkish Government; and as these vessels were built under Admiralty superintendance, one of the mast-caps was carefully tested some time since, at Woolwich Yard, and with excellent results. Several ships in the India trade, as well as several of the English and French transatlantic steamers, have their hawse-pipes made of this material. They are of but one-half the weight of cast-iron hawse-pipes, and are far more durable. The toughness of this metal is remarkable. We have seen pinions cast of it, with their teeth hammered down closely to the solid boss, and yet without any apparent cracking of the metal.

Messrs. Shand, Mason & Co., have employed this material, cast at Glasgow from their own patterns, for the pumps of their lighter steam fire-engines, for which, as well as for many other purposes, it is admirably adapted.—*Engineering.*

The Band Saw for Iron.

Among the many samples of War Department ingenuity now ready for shipment in Woolwich Arsenal, for the Industrial Exhibition at Paris, is a work hitherto unattempted—namely, a device in iron cut by the circular or riband saw. The letters, although carved from a slab of solid iron one inch thick, are all correctly formed, and are of perfect uniformity throughout. The saw it appears, is the invention of M. Perrin, and was exposed at the Paris Exhibition of 1855, where it was purchased by Colonel Tulloh, then Superintendent of the Royal Carriage Department at Woolwich. Until very recently it has been used solely for the purposes for which it was designed — cutting and carving difficult and irregular curves in wood, &c., of which some specimens in mahogany, lignum vitæ, and other hard woods, are preserved in the pattern-room of the department. The tedious and laborious hand process, by means of the punch and chisel, being the only method hitherto used in carving the angle plates necessary in the construction of the wrought iron gun carriages, led to the attempt by Colonel Clerk to test the application of the circular saw for that purpose, and the result has proved highly successful. The device above-named consists of the words "Royal Carriage Department, 1867," which are surmounted with a crown and the letters "W. D."

The Largest Clock in the World.

The four dials of the clock of the English Parliament House are each twenty-two feet in diameter, and the largest in the world. Every half minute the point of the minute-hand moves nearly seven inches. The clock will go eight and a half days but it only strikes for seven and a half, so as to indicate by its silence any neglect in winding it up. The mere winding-up of the striking mechanism occupies two hours. The pendulum is fifteen feet long; the wheels are of cast-iron; the hour bell is eight feet high and nine feet in diameter, weighing nearly fifteen tons. The weight of the hammer alone exceeds four hundred pounds.

The First Smelting at the Hull Mine.

We heartily congratulate the Hull Mining Company on the entirely successful result of their first smelting operation. The yield of the first smelting yesterday was about two tons. We have seen a portion of it, and are satisfied that it is of a very superior quality, rather close in the grain and somewhat harder than for some purposes is quite desirable, but that objection will have been remedied before this paragraph meets the eye of the reader—another smelting having been made last night at 12 o'clock. The sample we have seen is superior to any iron that comes to this country from abroad. Being reduced from very rich ore, and by means of charcoal it bears resemblance to Swedish iron. Two smeltings will henceforth continue to be made every twenty-four hours. The whole business of the company is now in a flourishing condition. They are running down the ore at the rate of about sixty tons a day, their six huge kilns for making charcoal are in constant operation. All the machinery and other arrangements of the latest improvements are in good working order, and all the chief difficulties incident to a new beginning have happily been overcome.—*Ottawa Times.*

Mechanical Uses of Castor Oil.

It is not as universally known as it deserves to be, that castor oil is as useful in *the trades* as it is in medicine. It is much better to soften and redeem old leather than any other oil known. When boots and shoes are greased with it, the oil will not at all interfere with the polishing afterwards, as in the case with lard, olive, or any other oil. In Harrisburg, the old leather hose of some of the fire companies were greased with it, and found to become almost as soft and flexible as new leather. Leather belts for transmitting motion in machinery will usually last three or five years, according to the wear and tear they are exposed to; when greased with castor oil they will last ten years or more, as they always remain flexible and do not crack. Besides this advantage, castor oil prevents slipping, so that a belt three inches wide, impregnated with it, will be equal to a belt four and a half inches wide without castor oil. It is necessary, however, to wait twenty-four hours till the oil has disappeared from the surface and penetrated the leather, otherwise the freshly-greased surface will cause slipping. Another advantage of castor oil is that rats and vermin detest anything impregnated with castor oil and will not touch it.—*Pittsburg Gazette.*

Hand Boot-pegging Machine.

At a recent meeting of the American Institute, a Mr. Brown of the American Hand-pegging Machine Co., exhibited and explained a machine, by which he "stated that he could peg a large-sized boot in twenty-five seconds, and a pair of boots could be pegged with double rows of pegs in about two minutes. The machine was placed on the inverted bottom of the boot, and by turning the crank of the machine it drove and withdrew the awl, and after having advanced to make the next perforation in the preceding hole, a peg was inserted and driven. Strips of sole leather were pegged and given to the audience, who admired them for their beauty and the neatness of the workmanship. The patentee stated that the machine was protected by nine different patents."

Filling Copper, Bronze, and Brass Shells with Cast-iron.

A highly ingenious application of cast-iron to filling in thin molds of brass, copper, bronze, etc., has recently been brought out by Mr. Atkin, of the firm of Messrs. Winfield & Co., Birmingham, England. The very high temperature of molten cast-iron would cause the destruction of any thin mold of copper, brass, or bronze were the cast-iron poured into the mold in the open air; but by immersing the thin mold in water, so that it shall be surrounded by the water, and then pouring in the cast-iron, the latter, in heating the metal of the mold, merely conveys heat to the outer film, which is immediately imparted to the water, and thus the mold is kept from being damaged or even tarnished. This process of filling-in a mere shell of a more expensive metal with cast-iron is eminently suited for the preparation of weights for ordinary beams or for gas lustres, for giving solidity to electrotypes of figures or statuettes, for stair rails, metal bedsteads, door handles, etc., and, indeed, wherever iron can be employed, and which, by this process, can be coated with a thin covering of a more costly metal, and thus acquire the appearance of being solid brass, bronze, or copper.—*London Artizan.*

Useful Receipts.

Cement for Ivory, Mother-of-Pearl, etc.

Dissolve one part of isinglass and two of white glue in thirty of water; strain and evaporate to six parts. Add one-thirtieth part of gum mastic, dissolved in half of one part of alcohol, and one part of white zinc. When required for use, warm and shake up.

In-explosive Gunpowder.

Neumeyer's process for making inexplosive gunpowder, mentioned at page 48, is as follows:—75 parts nitre, 6·25 sulphur, and 18·75 charcoal, (the latter prepared from birch wood in a closed retort, soaked in soda lye and dried upon canvas strainers) are mixed in a moist state, and granulated in the ordinary way. English war powder consists of 75 parts nitre, 10 sulphur and 15 charcoal. Sporting powder, 77 nitre, 9 sulphur and 14 charcoal.

Some doubts are entertained as to the value of this powder; an Englishman has submitted it to microscopic examination, and finds that it differs from ordinary gunpowder, in being a coarse instead of an intimate mixture of the same materials. The ordinary powder, having been macerated to a thin paste, appeared as a uniform grayish mass, the particles of charcoal and sulphur being indistinguishable; whereas the Neumeyer powder under the same conditions appeared to consist of roughly intermingled grains of charcoal and sulphur. The ingredients being thus imperfectly mixed, a slow rate of combustion is the result; but in confinement, the gases liberated by this slow combustion becomes explosive. It seems evident that this result cannot approach in force or quickness the explosion of good gunpowder. An experiment reported with a shot gun, if true, confirms the apparent worthlessness of the invention; a charge of shot at thirty yards hardly reached the plate, and the few that struck it were hardly flattened at all. Thorough tests will no doubt soon be made, to ascertain its real value.

Preservation of Eggs.

Le Betier (a Parisian paper) recommends the following method for the preservation of eggs:—Dissolve four ounces of beeswax in eight ounces of warm olive oil, in this put the tip of the finger and anoint the egg all around. The oil will immediately be absorbed by the shell, and the pores filled up with wax. If kept in a cool place, the eggs after two years will be as good as if fresh laid."

Cement to fasten Iron in Stone.

A German professor has found out a cement for fastening iron in stone which in forty-eight hours becomes nearly as hard as the stone itself. This consists of six parts of Portland cement, one part nicely-powdered lime, burnt but not slacked, two parts of sand, and one part of slacked lime. This, when well mixed and reduced to one mass of cement with the necessary quantity of water, is put in the crevices or openings of the stone and the iron, both being previously damped, and after forty-eight hours the iron will be found thoroughly and lastingly fastened in the stone.

Cheap Paint.

An exchange says the cheapest paint, properly so called, is made by mixing ochre or fine sifted clay with crude petroleum. We have seen a coating of this paint that had stood six years and appeared to be about as good as when applied. The cost was about one-third that of common paint. The best and cheapest application of all is that of crude petroleum, without any mixture, the oil used alone penetrating deep into the wood and rendering it permanently durable.

Soluble Blue.

Dr. Brucke obtains soluble Prussian blue by preparing a solution of 217 parts of yellow prussiate of potash and one of sesquichloride or tersulphate of iron made of 72 parts of protosulphate, or its equivalent of metallic iron, mixing each solution before they are brought together, with twice its volume of cold saturated solution of glaubersalts. The iron liquor is then added to the prussiate, keeping them well stirred, the precipitate is washed by decantation, until the washings come off blue. It is then transferred to a strainer, and afterwards dried and pressed between paper.

Practical Memoranda.

Japanese Alloys.

Japanese alloys:—*shakdo*— copper and one of ten per cent. of gold. After articles are made of this metal and polished, they are boiled in a solution of sulphate of copper, alum, and diacetate of copper (verdigris), by which they receive a beautiful bluish-black color. Copper with 30 to 50 per cent. of silver has a rich gray color. Brass consisting of 10 parts copper and 5 of zinc. Bell metal, first quality, copper 10 parts, tin and iron 5, zinc 1·5. Second quality, copper 10, tin 2·5, lead 1·33, zinc ·5. Third quality, copper 10, tin 3, lead 2, iron ·5, zinc 1. Fourth quality, copper 10, tin 2, lead 2. In forming bell-metals the copper is first melted and the other metals are added in the order stated.

Magnetism in Iron.

At a white heat all magnetism disappears; it is still sensible in iron when heated to a dark red glow.

Obtaining Oxygen.

M. Sessier de Mothsey offers a simple and cheap apparatus for obtaining oxygen from the atmosphere, a tube containing a solution of permanganate of potash or soda and a jet of steam at a certain temperature. Heating the solution to a proper degree, a current of air speedily saturates it with oxygen, the nitrogen escaping; when the jet of steam is thrown in, displaces the oxygen and expels it from the solution. Being heavier than the atmosphere, the oxygen is collected in the tube nearly pure. The operation may be continued indefinitely. The apparatus will be exhibited on a large scale at the Paris Exposition.

Solution of Rosins for Varnishes.

Calcutta copal and its congeners, as well as amber, are found, after heating in a closed vessels to 350° to 400° cent. (660° to 750° Fah.) to have acquired the property of dissolving when cool, in hydrocarbon or vegetable oils, without loss, and producing new and very fine varnishes. The combined influence of heat and pressure is the cause of the novel properties, the later rising as high as twenty atmospheres.

Velocities.

The velocity of a ship is from 8 to 14 miles an hour; of a race-horse, from 20 to 30 miles; of a bird, from 50 to 60 miles; of the clouds, in a violent hurricane, 80 to 100 miles; of sound 823 miles; of a cannon ball, as found by experiment, from 600 to 1,000 miles; of the earth round the sun, 68,000 miles, or more than a hundred times quicker than a cannon ball; of light, about 800,000,000 miles—passing from the sun to the earth, 95,000,000 miles, in about eight minutes—or a million times swifter than a cannon ball; while the exceeding velocity of the thoughts of the human mind is beyond all possible estimate.

Curing Green Hides.

A great many butchers, wool dealers, &c., are purchasers of the hides off the beef in the country towns and we often get from them inquiries as to the proper and most profitable method of curing the hide and preparing it for the market. A great many butchers do not use proper care in this branch, and the consequence is that the hides will not pass city inspection, owing entirely to the ignorance or carelessness of the person who prepared them for the market. The proper way to salt hides is to lay them out flat, flesh side up, and form a nearly square bed, say 12 x 15 feet, folding in the edges so as make them as nearly solid as possible. Split the ear in the cords that run up the ear in each one so as to make them lay out flat. Sprinkle the hide with two or three shovels full of coarse salt, as the size may require—say for a 60 to 80 pound hide, from 10 to 15 pounds of salt. At any rate cover the hide well, as it need not be wasted; then let them lie in this from 15 to 20 days, after which take them up, shake the salt out, and use it again.—*Shoe and Leather Reporter.*

Beton Agglomere.

M. Coignet's *beton Agglomere* is a mixture of sand and hydraulic lime thoroughly worked together by machinery, and in its then plastic state moulded into any desired form. It has been extensively employed in and about Paris for several years past, and we believe that one of the station-houses on the St. Germain's line of railway is entirely formed of it, the whole building being a monolith. About twenty miles of the sewers in Paris have been made of it, and it is largely employed for building works and ornaments. Mr. Bazalgette and Mr. Grant, of the Main Drainage Works, are now experimenting with it, with a view to its use here, and the architect of St. Thomas's Hospital has given directions to make a few arches of it.—*London Paper.*

"Drying" Linseed Oil.

A quick process for getting drying linseed oil is given by Dr. Dullo. He boils the raw oil for two hours with binoxyd of manganese and hydrochloric acid, and so gets a rapidly-drying oil in very much less time than by the processes generally employed.

Removing Ammonia from Gas.

Mr. Bowditch states that clay removes ammonia from gas as perfectly as acids and metallic salts do. It has also a remarkable power of acting upon certain sulphureted compounds in gas, so as to render them removable. The foul clay is worth 21s. per ton as manure, and costs the companies very little.—*Mechanics' Magazine.*

Every Man his own Measure-maker.

The *American Artisan*, copies from an Eastern paper, the following rules, by which every one who can saw and nail boards, can make his own measures:—

A barrel contains 10,752 cubic inches. A box 24 inches long by 16 inches wide and 28 inches deep—that is, on the inside—will hold just a barrel.

Half-barrel. Make a box for this, 24 inches by 16, and 14 inches deep. This will contain 5,376 cubic inches, or just half a barrel.

A bushel contains 2,150 4-10 cubic inches. A bushel box will be 16 inches by 16 8-10 inches square, and 8 inches deep.

Half-bushel. A box twelve inches long by 11 1-10 inches wide and 8 inches deep, will hold half a bushel.

Peck. A box 8 inches by 8 4-10 inches square, and 8 inches deep, contains a peck.

Half-peck. A box 8 by 8 inches square, and 4 1-10 inches deep, or 268 cubic inches.

Half-gallon. In this there are 134 4-10 cubic inches. A box 7 by 4 inches and 4 8-10 inches deep contains just that quantity.

Quart. A box 4 by 4 inches square, and 4 2-10 inches deep.

To preserve Polish on Steel or iron.

Pure parriffine is a good preservative for the polished surface of iron and steel. The paraffine should be warmed, rubbed on, and then wiped off with a woolen rag. It will not change the color, whether bright or blue, and will protect the surface better than any varnish.

Statistical Information.

London Milk Supply.

The monthly supply of milk from the country into London is 508,000 gallons. The western counties contribute 140,000 gallons; the eastern counties transmit 125,000 gallons; the northern counties 95,000; Hants and Berks, 55,000; and from other districts the daily supply is augmented by 18,500 gallons. Kent and Sussex are the lowest contributing counties; and at the present daily averages 6,604,000 gallons of milk are annually brought from the country to London; and this is increased by metropolitan dairymen to an extent of another third, and is retailed out to about 260,000 customers. The aggregate supply of milk consigned to London is the produce of 20,000 cows in the country. The wholesale prices charged are at an average of 2s. per barn gallon (eight quarts); and the value of milk brought to London for consumption represents a sum of £660,400 per annum.

United States Patent Department.

The Report of the Commissioner of Patents for the United States, for the year 1866, furnishes the following statistics :—

Number of applications for patents during the year	15,269
Number of patents issued, including re-issues and designs	9,450
Number of caveats filed	2,723
Number of applications for extensions of patents	67
Number of patents extended	58
Number of patents expired	1,042

Of the patents granted there were :—

To the citizens of the United States	9,210
To subjects of Great Britain	127
To subjects of French Empire	48
To subjects of other foreign governments...	65

NO. II—MONEY RECEIVED DURING THE YEAR.

On applications for patents, re-issues, etc.	$460,798 20
For copies and recording assignments, etc.	34,867 18
Total amount	$495,665 38
Total expenditures	361,724 28
Surplus receipts for year	$133,941 10

Applications and caveats filed, and patents issued, for thirty years, ending December, 1866 :—

Year.	Applications Filed.	Caveats Filed.	Patents Issued.
1837	—	—	435
1838	—	—	420
1839	—	—	425
1840	765	228	473
1841	847	312	495
1842	761	291	517
1843	819	315	531
1844	1,045	380	502
1845	1,246	452	502
1846	1,272	448	619
1847	1,531	553	572
1848	1,628	607	660
1849	1,955	595	1,070
1850	2,193	602	995
1851	1,228	760	869
1852	2,639	996	1,020
1853	2,673	901	958
1854	3,324	868	1,902
1855	4,435	906	2,024
1856	4,960	1,024	1,502
1857	4,771	1,010	2,910
1858	5,364	943	3,710
1859	6,225	1,097	4,538
1860	7,653	1,084	4,819
1861	4,643	700	3,340
1862	5,038	824	3,521
1863	6,014	787	4,170
1864	6,972	1,063	5,020
1865	10,664	1,063	6,616
1866	15,269	2,723	9,450

The Commissioner, reporting on the want of room for the proper transaction of the business of the Department, says of the Library :—" The library of this office has vastly grown in importance within the last few years. It is not only needed and used as an absolute necessity by the examiners in the performance of their duties, but it is now so much consulted by inventors and those engaged in their interests, by whose money the office has been built up, and who exclusively sustain it, that the want of room and books is now signally felt. It is not an uncommon thing for persons to come from distant parts of the United States to consult books which can only be found here. A careful examination of the catalogues of other libraries shows that the Patent Office collection is now one of the best technical libraries in the world, if not the very best. The high price of gold and the limited means of the office during the war prevented the purchase of many volumes which are much needed. Gold has very much depreciated, and the means of the office are now ample, and there are needed many volumes of necessary works to complete series heretofore kept up, which must soon be purchased or be hereafter bought at a much greater cost, if they can be procured on any terms, and there is really no room for any additional volumes, if such were now on hand. The works consulted in this library are, very many of them, of large size, and require corresponding space for their examination. It often happens that every table in the room now occupied by the library is more than covered with volumes for examination, and this, too, in places which should not be open to the public at large."

New York and Canada.

There is no part of this Continent superior to Western Canada as an agricultural country. This is abundantly borne out by statistics. These prove not only our Western lands to be unexcelled in fertility, but that our system of husbandry is of the most satisfactory kind. We have no later Canadian statistics than those of the census of 1861, but even these—and we have made great progress since that time—compare favourably with any of the adjoining American States. Take New York for example. That State is regarded as one of the best agricultural districts in the Union, and as regards climate occupies pretty much the same position as the Western Provinces. Its latest agricultural statistics are for the year 1864—three years after ours were taken—and yet in many particulars we completely take the lead. The fo lowing are the principal agricultural returns of each country—these of Canada, it should be remembered, being for the year 1861, and those of New York for 1864 :—

	C. W.	N. Y.
Population	1,396,091	4,554,204
Acres of improved lands..	6,051,619	14,828,216
Acres unimproved	7,303,288	10,412,534
Cash value of farms	$295,162,315	$923,881,381
Value of implements	$ 11,280,347	$ 21,184,824
Acres of fall wheat	434,729	406,591
Bushels do	7,537,651	5,432,282
Acre spring wheat	951,634	104,996
Bushels do	17,082,774	
Acres of barley	118,940	189,035

Bushels do	2,821,962	3,075,170
Acres of rye	70,376	233,219
Bushels do	973,181	2,575,438
Acres peas....................	460,595	46,491
Bushels do	9,601,396	580,827
Acres oats......................	678,337	1,109,565
Bushels do	21,220,874	19,052,833
Acres corn	79,918	632,235
Bushels do	2,256,290	17,983,888
Acres potatoes................	137,266	235,073
Bushels do	15,325,920	23,237,762
Acres turnips	73,409	8,124
Bushels do	18,206,950	1,282,388

The contrast between New York State and Canada, as afforded by these statistics, is very favorable to us. With far less population, less improved land, and less value of implements, our farmers turn out far more fall wheat, spring wheat, peas, oats, turnips, &c. Of Indian corn, rye, and potatoes, the New Yorkers rather take the lead, and they are also set down as doing so in barley in the above table. But the barley crop has had an immense increase in Upper Canada since 1861, and we have little doubt that our next census will show that we now raise more barley than New York does. As to quality, it is freely admitted by the Americans themselves that we raise the best barley to be had on the Continent. The higher price paid for our barley fully attests this fact.

One of the most gratifying features of the above comparison, is the fact that our lands yield more per acre than those of New York State. Of fall wheat New York sowed within some 28,000 acres of the breadth sown in Canada, but we reaped over 2,000,000 bushels more than they did. The average quantity of oats raised by us in 1861, was fully more than 31 bushels per acre—but New York only averaged 17 bushels per acre! As will be seen by reference to the table, New York reaped 19,053,198 bushels of oats from 1,109,565 acres sown, whilst our Western farmers, from 678,337 acres, took off no less than 21,220,874 bushels! This fact, of itself, speaks volumes for the fertility of Canadian soil. The small quantity of turnips raised in New York appears singular—our returns being 18,206,950 bushels as against 1,282,388. Taking the returns all in all, they indicate pretty clearly that our farmers have nothing to envy in the Empire State, and that either as regards excellent soil or good farming, we can compare favourably with our neighbours.—*Trade Review.*

Photography.

A new Actinic Light.

A new light for photographic purposes has been proposed by Mr. Sayers. It is composed as follows:—Nitrate of potash in powder, and well dried, 24 grammes; flour of sulphur, 7 grammes; red sulpheret of arsenic, 7 grammes. These three ingredients, being well ground together, the mixture on being ignited will yield a most powerful photogenic light; but 200 grammes of the compound are necessary to make the light last half a minute. The cost of the mixture is not more than 80 centimes per kilogramme, which would last two minutes and a half, while light from magnesium wire costs about 1s. per minute.

Production of Natural Colors by Photography.

M. Neipce de St. Victor has recently communicated to the French Académie des Sciences the results of his latest researches, having for their object to obtain and fix the colors of nature by means of photography. His paper is full of very important, new and interesting facts, proving that the fixation of natural colors on the photographic tablet as a practicable and available result, which for a long time has been considered as a dream, is not perhaps so far from being fully realized—not as a mere scientific experiment, but as the completion of the splendid discovery of photography.

The process of M. Niepce de St. Victor may be shortly described as follows:—The silver plate must first be chlorurised, and then dipped into a bath containing fifty centigrammes of an alcoholic solution of soda for every 100 grammes of water, to which a small quantity of chloride of sodium is then added. The temperature of the bath is raised to about sixty degrees centigrade, and then the plate is only left in for a few seconds, the liquid being stirred all the time. The plate being taken out, it is rinsed in water and then warmed until it acquires a bluish-violet hue, which is probably produced by the reduction of a small quantity of chloride of silver. The plate is now coated with a varnish composed of dextrine and chloride of lead. In this way all the colors of the original, including white or black of more or less intensity, are reproduced, according as the plate has been prepared, and as the blacks of the copy are either dull or brilliant. The reduction of the chloride should not be too great, because otherwise nothing but pure black or pure white could be obtained; and in order to avoid this inconvenience a little chloride of sodium is added to the soda bath. A few drops of ammonia will produce the same effect. By this process a colored drawing, representing a French guardsman, was reproduced by M. Niepce, with the exception of one of the black gaiters, which he had cut and replaced with white paper. The black hat and the other gaiter produced a strong impression on the plate, while the white gaiter was perfectly reproduced in white. Much more intense blacks may be obtained by previously reducing the stratum of chloride of silver by the action of light; but then all the other colors lose the brilliancy in proportion.

This production of black and white is a considerable step in heliochomy. It is a most curious and interesting fact, for it would prove that black is not entirely the absence of light, but is a color of itself, producing its own effects, as well as the other colors. This was illustrated by the experiment made at the suggestion of M. Chevreul, the celebrated member of the Académie des Sciences whose known researches on the contrast and effect of colors are so instructive and interesting. Accordingly, M. Neipce tried to represent on his plate the black produced by the absence of light in a hollow tube. But the hole produced no effect, or rather it was negative, which is not the case when the black of natural objects, represented in a colored picture reflects its own tints, or, if we may say so, its own rays—endowed it would appear, like all others, with chemical action, for the apparent reason that the hole could not reflect any rays, and its blackness is the result only of the absence of all rays. The same thing may be said of the white, but less extraordinarily; for the white being the result of the rays united, it may be more easily understood that the chemical action of the white would be the compound result of the various rays of which it is composed, and that result is the same as that which gives us the sensation of white. Certainly the reproduction of black and white by M. Niepce de St. Victor is a most extraordinary fact unfolded by his beautiful discovery, and perhaps more surprising than the reproduction of all the colors themselves.

It is not possible at present to foresee all the consequences of the researches of M. Neipce de St. Victor. It may be the seed that in the field of science will, by proper cultivation, grow into a gigantic tree, from which time will probably reap the most nutritious and wonderful fruits.—*British Journal of Photography.*

Nitrate of Silver.

Photographers who lose large quantities of nitrate of silver should allow all the excess of silver acetic acid and other matters from the plates undergoing development to run into stone jars containing fragments of zinc. By this means the metallic silver may be collected, digested with dilute sulphuric acid, washed and dried in the oven, and thus by a little pains quite a large saving may result.

Marking Linen by Photographs.

Since the process of photographing upon silk and linen has been perfected in France, many persons have their portraits upon their linen, instead of their names or initials. They are not injured by washing.

A New Modification of Photography.

It has been suggested that the interior and exterior parts of complex objects, such as an instrument or a bodily organ, may be represented in their actual positions, by first photographing the exterior part, and before the image has been strongly impressed, substituting upon the camera the inner part. The latter will appear in the picture as behind or inclosed in a transparent image of the former.

Submarine Photography.

M. Bazin has obtained clear submarine photograms at a depth of 300 feet, in his diving studio, by means of the electric light thrown through water-tight lens windows upon the objects to be photographed. The value of this invention in submarine surveying is obvious.

Old Collodion.

Humphrey's Journal says that old collodion may be rejuvenated and made useful in the following manner: "Add alcohol and ether in equal parts, or a mixture of one-third alcohol and two-thirds ether is still better—until the collodion flows easily and is thin enough to coat the plate without streaks; furthermore, to each quart of collodion add sixty grains of bromide of cadmium, and put the mixture, after frequent shaking, in a cool dark place. This collodion probably will become colorless and work as well perhaps as the best new collodion that can be made."

Miscellaneous.

Nevada Salt Mines.

The salt mines of Nevada are among the wonders of our mineral territory. A single bed covers 50, 000 acres with solid rock salt, 95 per cent fine, and deeper than any shaft has yet been sunk. The accumulation continues without intermission, from the salt water which wells up, overspreads the surface and evaporates, leaving a snowy spread of fine salt, of which 2,000,000 bushels are gathered annually.

Nutrition of the Teeth.

Dr. Henry S. Chase, in the *Medical Investigator*, estimates that a mother and child under eighteen months, together require for the nutrition of the dental and osseous systems, 55 grains per day of phosphate of lime for the former, and 27 grains for the latter. These 87 grains, he says, are contained in 10 ounces of cheese, in 31 ounces of peas, in 35 ounces of fresh mutton, beef or unbolted wheat flour, or in *one hundred and seventy five* ounces (nearly 11 pounds) of fine flour, such as we commonly use—enough to make a dozen loaves of baker's bread of the largest size. Think of a woman eating a dozen of those loaves daily to sustain the osseous system! It is consoling that bread is a minor item in the diet of most persons. Want of backbone or any other bone at all would result from a diet of fine wheaten bread, if these calculations are not at fault somewhere. Living on "bread and butter" of this sort is too common, however, among the women and children of America. There is a fatal "facility" about it. We must have a new "staff of life" with more bone in it, and equally handy.

Subterranean City Railways.

The London tunnel railway, with its enormous cost, from peculiar local conditions, of five and a half millions of dollars per mile, has paid from the start, five per cent in 1863, six and a half per cent in 1864, and seven per cent in 1865, which are considered very large returns for money invested in England. Over twenty millions of passengers were conveyed by it in 1866.

The *Scientific American*, of the 9th Feb., contains a full page illustration of the plans proposed for an Arcade Railway under Broadway, N. Y. and other portions of the city. Estimated Expense $2,000, 000 per mile. The project is to excavate the entire width of the street, and twenty five feet in depth; the lower ten feet for sewers, vaults, &c., the subterranean street to have at least four tracks, the two outer ones for trains to run at five miles an hour, for way passengers; the inside line fifteen miles per hour. The upper street to be supported by iron colonnades. The sub-street to be lighted by areas near the side walk in the main street.

Making Trees Imbibe Colour.

Newest among what Mr. Tennyson calls the "fairy gifts of science," we notice an invention of Mr. Hyett to make trees imbibe colour while growing. The results were exhibited lately at the *conversazione* of the Cirencester Royal Agricultural College, in the form of beautiful sections and planchettes of wood, stained with various hues. Metallic salts are introduced in the substance of the growing tree, apparently caried up by the sap, and forced into the fibre and cells of the stem. So we can make our forests play the part of their own stainers and grainers, and cut down a pine already prepared to imitate expensive walnut or exotic mahogany. There is only one thing left to desire—that, after being thus stained, the wood could be induced to grow into the forms of tables, chairs and wardrobes. Nor shall we despair of such a result, since the Americans have long talked of a machine into which you put raw cotton at one end, and by-and-by there emerges at the other a calico shirt, hemmed, starched, ironed, with the buttons all on, and neatly marked.—*London Telegraph.*

Perchloride of Lead.

M. Nikles, professor of chemistry at Nancy, recently announced to the Academy of Sciences that he had succeeded in obtaining perchloride of lead, a curious substance derived from the only compound of lead and chloride, and which now must be called protochloride. The latter is obtained directly by subjecting lead to the influence of chlorine by the application of heat, or else by treating litharge with hydro-chloric acid. It crystallizes in needles, is volatile and cannot be decomposed by heat. M. Nikles has obtained the new compound by exposing the protochloride to the action of a current of chlorine in a solution of lime. The perchloride thus obtained is a yellow liquid emitting a strong smell of chlorine, and is a powerful agent for communicating that element to other substances. It will dissolve gold, and produces, with aniline and the analogous compounds, those beautiful colors for which those substances are so remarkable. With morphine, it yields a color similar to that of the horizon at sunrise; and with brucine, a rich cherry-red. Now, brucine and strychnine, both vegetable bases extracted from nux vomica, are very difficult to distinguish from each other, and here perchloride of lead steps in as a useful agent; for it so happens that it does not produce red with strychnine, as it does with brucine, and may therefore be used to distinguish one substance from the other. It serves the same purpose with regard to morphine and the other alkaloids of opium; it will likewise detect bicarbonate of lime in potable water by producing a yellow tint, and help to distinguish salts of lead from those of bismuth since it precipitates the former from their solutions and not the latter. It will carbonize cane-sugar and not glucose, and blacken aniline without producing any effect either on fecula, starch, or dextrine. Like other perchlorides, it combines with ether to form a very caustic compound, which attacks both gold and platinum, besides other metals.—*Mechanics' Magazine.*

Talkers and Writers.

To *talk* well and to *write* well are quite distinct accomplishments, although they are sometimes found united to a high degree in the same individual; often, however, it is quite otherwise. Poor Goldsmith occurs as a familiar example. The observations he let fall in company with his literary colleagues were so notoriously flat and pointless as to provoke the remark that he "wrote like an angel, and talked like poor Poll." Other great talkers, famous wits, have written so little that their reputation rests on bon-mots and anecdotes recorded by others. But even when a great talker is also a great writer, it is rarely through his own "remains" that we appreciate his conversational abilities; we owe that privilege to the bands of camp-followers who pick clean the bones of deceased celebrities. Johnson's reputation, in this respect, owes more to Boswell than it did to himself. The unreported talker shares the fate of the singer; after his departure from the scene, his fame remains a matter of faith and tradition, which people believe in because their fathers have told them so, but the proof of which is for ever silenced.

A new explosive compound.

A new explosive compound which may be susceptible of some practical applications has been described by Mr. Peter Griess. It is a salt named by the author "nitrate of diazobenzol," which is prepared by passing nitrous acid through a solution of aniline in four times its volume of alcohol. The gas is passed through this solution until the addition of ether to a small portion causes the copious precipitation of white acicular crystals. When this point is reached the whole of the reddish-brown liquor is mixed with ether; the crystals are then allowed to subside, and separated as far as possible from the mother liquor. They are then taken up with cold dilute alcohol, and re-precipitated by the addition of ether, when they are obtained as long white needles. When obtained, they must be treated with the greatest care. They must be dried in the air or over sulphuric acid. Heated even below 100 deg. Centigrade they explode with tremendous violence, far surpassing that of fulminating silver. The destructive action of the explosion is extreme. Iron plates several inches in thickness were found smashed to atoms when something more than fifteen grains of the substance was exploded upon them. Friction, pressure, and concussion also cause the explosion. The smallest particles accidentally dropped upon the floor of a room, when dry, exploded when trod upon, emitting flashes of light. It may be well to repeat the author's caution that the manipulation of such a substance necessitates the greatest precaution.—*Mechanics' Magazine.*

The largest room in the world.

The *American Artisan* says the largest room in the world under a single roof, and unbroken by pillars or other obstructions, is at St. Petersburg, Russia. It is six hundred and fifty feet in length, and one hundred and fifty feet in breadth. By daylight it is used for military displays, and a battalion can conveniently manœuvre in it. In the evening it is often converted into a vast ball-room, when it is warmed by sixteen prodigious stoves, and twenty thousand wax tapers are required to light it properly. The roof of this great structure is a single arch of iron, the bars on which it rests weighing twelve million eight hundred and thirty thousand pounds.

Liquid Steam Fuel.

In pursuing his experiments with a view to substitute petroleum for coal in the generation of steam, Mr. C. J. Richardson has discovered an even cheaper compound that the least saleable mineral oils. He finds that coal-tar, creosote, naphthaline, and other similar products may all be burned in the same way as he proposed to burn the crude oils; a compound with which he has obtained excellent results being formed of coal-tar, two parts; creosote, three parts; and one or two parts of heavy shale oil. We are informed that Mr. Richardson will have his petroleum boiler at work again in Woolwich Dock in the course of a week or two, when all who are interested in the matter can inspect its practical working.—*Mechanics' Magazine.*

Crystallization of Glycerine.

The Chemical News says:—About five tons of glycerine were recently imported from Germany by an English firm, in casks containing about 8 cwt. each. When they left the factory, the contents of the casks were in their usual state of viscid fluidity; but on arriving in London they were found to have solidified to a mass of crystals, so hard that it required a hammer and chisel to break it up. A large block of this solid glycerine, weighing several hundred weight, suspended in a somewhat warm room took two or three days to liquefy. Some of the crystals were as large as a small pea. They were brilliant and highly refracting, and so hard as to grate between the teeth. The original glycerine was pale brown; the crystals nearly white; the liquid drained from among them dark brown, and the liquid obtained by fusing the crystals as pure as possible from the mother liquid, was clear and nearly colorless, slightly more viscid than usual, and deficient in none of the qualities of pure glycerin. With the temperature reduced to zero for several hours, this liquid remained unchanged, except in becoming slightly more viscid. The cause of the crystallization is conjectured to have been the vibration of the railway journey, accompanied by intense cold, and enabling the particles to arrange themselves in a regular form, in analogy with the crystallization of wrought iron under the influence of vibration, and that of platinum salts by the aid of a stirring rod. Experiments were to be tried upon glycerin at a low temperature with agitation to determine the truth of this theory.

A Model "Black Country."

A correspondent of *Punch* says of one of the great iron founderies in France:—"I will tell you what I saw in that great French factory. I saw a town of 25,000 inhabitants, wholly built and owned by miners and ironworkers themselves, who buy their land in fee simple from their employers as they require it for building. I saw 10,000 of these people, some few of them women, who do light out door work, go daily to their duties, and 4000 of their children go daily to their schools. I saw drawings and attended historical and scientific examinations in the higher classes of these schools which would have done credit to Rugby and Eton, and heard, with a longing wish that it were so in England, how none are allowed to leave the school for the workshop till they could read and write well and do some arithmetic; and I heard, with no little surprise, that several of the higher boys have passed up into the school of Government Engineers in France. I saw the château of the proprietors standing in the very midst of this town of workmen, and within it, assembled round the venerable founder of this great industry, a little society principally composed of the officials of the place, which in refinement and intellect would have done honour to any capital in Europe. I saw all this, Sir, but I did not see a policeman or a soldier. I believe there were in the place (of course not near the areas) three of the former, but none of the latter; and finally, during ten day's stay, I did not see a drunken man, though I once heard one. This is no community of hammermen in Utopia—no black country of Cloud-land—but an actual translation of Bilston, Tipton, or Dudley, out of the vernacular of our Black Country, into French. This happy valley is called Le Creusot, situated in the department of Saône-et-Loire. The proprietors are not angels, but plain men, trading under the designation of 'Schneider et Compagnie,' and the head of the firm is M. A. Schneider, Vice-President of the National Assembly. Will some great firm, or cluster of firms, in our Black Country go and do likewise?"

Test for Acids.

M. Schonbein has furnished a test for acid so sensitive that it shows the presence of carbonic acid in distilled water that has merely been breathed upon. It is obtained by treating cyanine blue with soda; dissolving one part of the product in 100 parts alcohol, and adding twice its volume of water to the solution. The cyanine blue is formed by acting on iodine of amyl with lepidine. The fluid used for acids is adapted to alkaline by merely reddening it with an acid.

Nitro-glycerine Explosion.

A brass lamp which had been filled with kerosene out of a can that previously contained nitro-glycerine exploded with the noise of a cannon on board the ship *Sycamore*, at San Francisco, last month, and killed one man and shattered the cabin into kindling wood.

Saluces estimated the temperature of fired gunpowder at about 4,300 degrees, Fahr.