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CANADIAN MECHANIC'S MAGAZINE AND PATENT OFFICE RECORD

Vol. 4. NOVEMBER, 1876. No. 11.

BUSINESS PROSPECTS FOR THE YEAR 1877.

ALTHOUGH there has been a great falling off in the past season in the building trade throughout the Dominion, the state of the labour market during the last month will not warrant the conclusion that this decrease in the building business has arisen, altogether, from the state of the money market and the general depression in mercantile affairs, but from an abnormal state of trade, in large cities, that has caused an immigration into them, from the country, of a great number of mechanics, and who are now the principal parties who are the sufferers from the present cessation to all speculative building operations. These men, and inferior mechanics and untrustworthy men, are those who are sure to suffer, and ever will be sufferers under such contingencies. It would be far better for the country mechanic to remain in his village, where he generally receives fair wages for his labour, than to allow himself to be enticed into large cities for the sake of a temporary increase in wages, and where he becomes exposed to its vices, pays a high rate for his board, and, perhaps, in the course of a few months, finds himself without employment and without a cent in his pocket to keep himself, or a family, should he have one, from enduring all the hardships of poverty, sufferings from cold, and, too often, heavy expenses arising from sickness, which, if he had remained contented in his proper sphere, would have been avoided.

As a rule, good workmen always obtain a fair rate of wages, no matter how depressed the building business may be; there is always a sufficient quantity of work in progress, which cannot be postponed, and for which skilled and steady hands are always in demand. The following prices, which we now quote, will show that business, during the past season, has not been so dull as generally believed. For example, we give about the average prices in the principal cities in the Dominion that artificers have been receiving in the following trades during the past summer.

Stone Masons and Bricklayers.

In these trades there has not been much difference in the rate of wages between this and last year; the rates having averaged about $2.25 for the former, and $2.50 for the latter. Building material, however, has averaged fully 20 per cent lower in price than last year, except in importations from England, which maintain much about the same figures as in former years. The prices of building materials and hardware from the United States are considerably lower.

Carpenters and Joiners.

During the past season the demand for *good* carpenters and joiners has, also, been pretty steady, and has fully kept pace with the supply—inferior workmen are always at a discount in slack times. The wages have averaged from $1.75 to $2.00 a day according to skill; there is, however, a visible flatness in the business as winter approaches.

Painters.

Of course what affects one branch of the building trade must affect another, but probably this branch has suffered more than any other; there are many proprietors of household property, who have this year dispensed with the usual painting and papering of their private dwellings and tenements, and we may here observe that the remarks as to skilled and steady men in the first mentioned trades, as always obtaining employment in slack times, do not apply so truthfully to the painters' trade. Few proprietors are capable of discriminating between good and bad painting, or the quality of materials used; and the public are frequently imposed upon by men, out of employment, offering to work cheaply; but, however low their wages may be, they are mere daubers themselves, giving bad work, and worse materials. At this season of the year the trade is a little brisker, as the men always follow the last of the workmen engaged in buildings. The wages have been fairly remunerative; plain hands have been paid $1.75 a day—better skilled and grainers $2.00 and over. Prospects for the coming spring are not very bright for the painters' trade.

PLUMBING.

This business, relying for the most part, like the painting business, on the construction of new and superior houses, is also not brisk, and it is not a class of work that can be carried on favorably out of doors in winter; the operations will be confined principally to repairs. We fear many large shops, this winter, will be obliged to work on half time, if not close up altogether. There are, however, some large contracts on hand by leading firms. Wages averaged, during summer, from $1.50 to $2.00 per day.

MECHANICAL ENGINEERS, &c.

Over this particular line (and one of the most important in the Dominion), there still hangs a heavy cloud—the iron trade is very dull in all branches, and there is a general economising all over. The supply of labour is far in excess of the demand, and the outlook is anything but cheering, as capitalists will not invest in, nor will banks advance upon, any line of speculative business, to which this class appertains, until the country has become thoroughly purged of its men of straw.

Recent articles which have appeared in the United States papers, we are glad to find speak more hopefully of a return of business to a normal state after the election of the next President, and, in fact, the wheels of trade are already beginning to move. With a steady reaction in the United States, will come the influx of its wave across the borders; many of the artificers who have flocked back to their native country will again wend. their way back to their old workshops in the States and thus relieve us, to some extent, of a great evil, viz., having a surplus of operatives. The coming winter, however, will be one of the hardest experienced in Canada for many years past, and now is the time that those who can afford to put their buildings in repair, should take advantage of the present low prices of materials and rate of wages, and thus, not only benefit themselves, but confer a great boon upon the unemployed mechanics who, this coming winter, will find it hard wherewith to provide food and raiment for their wives and children.

THE PATENT OFFICE REPORT.

AMONG the abundant crop of Parliamentary papers always marking the close of the session is one which, though it falls short (says *The Times*) of what it might be made, yet serves a useful purpose in illustrating the rate of advance in industrial science. The Patent Office Report, which will be in the hands of the members of Parliament in a few days, shows the usual steady increase in the number of applicants for patents during the year with which it deals. In 1875 there were no less than 4561 applicants, or 69 more than in 1874. The growth, however, is smaller than that of the year before, for 1874 exceeded 1873 by 198. The lessened increase may, perhaps, be fairly attributed to the somewhat depressed state of many industries. Certainly such figures as these are evidence of a great deal of inventive ingenuity; but at the same time a severe comment on the average value of the inventions is afforded by the fact that only 28 per cent. survive their third year, and only 10 per cent. seventh. The number of absolutely worthless inventions may also be guessed from the fact that 1173, or more than a quarter of the applications in 1875, are already dead, never having got beyond their six months of provisional protection. From so extensive a business considerable revenue might naturally be expected, and such is, in practice, the result. During the year a profit was earned of £110,950, after payment of all costs and charges, including the not inconsiderable sums of £24,000 for paper and printing, £18,000 for salaries and office expenses, &c. This comfortable income, too, seems very steady, for last year it amounted to £110,618. Since the establishment of the office is on its present footing in 1851, it has produced over a million of money, the exact sum being £1,229,772. Numerous have been the appeals to the Treasury to devote a portion at least of this large sum to purposes of science and industry; but successive Chancellors of the Exchequer have persistently refused to listen to such proposals, however tempting. Perhaps, now that a Science Museum seems likely to be established, its claims may meet with more attention.

Beyond these statistics, however, there is nothing new in the report, and, indeed, on comparing it with that for last year, it is evident that the same identical form has been adopted, with the alteration of the necessary figures. The greater portion of the report is occupied with a reprint of an application made to the Treasury eighteen years ago by the then Commissioners of Patents for a new office. There is also a plan of an appropriate site for such an office in the middle of what is now one of the Embankment Gardens. The reproduction of this year after year shows a certain poverty of invention on the part of the Commissioners, or, perhaps, rather on that of the clerk whose duty it is to prepare the report, while its adoption year after year—it has appeared almost continuously since 1859—by successive Chancellors and law officers shows much unanimity of feeling as regards the want of the office under their control. It would, however, appear that the Treasury pays but small regard to the requests even of functionaries so exhalted.

Yet it is not for want of material that the Patent Office Commissioners fall back on the literary efforts of nearly twenty years back. An account of the recent alterations in the arrangements of the office would certainly be useful to inventors, and there have been quite changes enough to make some such notice almost necessary. This is the case, even though our patent system escaped the radical changes proposed by the Bills brought in during the past and the preceding sessions. It should, however, be stated that the report only professes to deal with 1875, while it is in the present year that the alterations now being made were first commenced.

The work connected with the granting and registering the grants of patent occupies but a small department of the office, and is, of course, of a very simple character. It is in the production of its publications that the principal energies of the Patent Office are absorbed, for in the amount of these and the regularity of their appearance the office can vie with any of our publishing firms, except the very largest.

When the Act of 1852 was passed—the Act which abolished chaff waxes, clerks of the hanaper and their kindred—it contained a provision that all specifications of patents, past and future, should be printed for the public information. For this purpose the then Lord Chancellor, Lord St. Leonards, appointed Mr. Woodcroft, one of the principal patent agents, as superintendent of specifications, an office which shortly after merged in that of clerk to the commissioners, on Mr. Woodcroft being appointed to the latter post. The work of deciphering and printing the older documents was one of some difficulty, but it was successfully accomplished in spite of remonstrances of a few of the ancient keepers of the treasures, who saw in the publication of their record something little better than sacrilege. At the same time the work of printing and issuing the current specifications went on *pari passu*, and in a very few years the arrears were worked off. Since then every specification has been printed as soon as the six months expired during which the invention is kept secret. The number of these in now 95,791, of which 14,369 were filed before 1852. Previous to the passing of the Act, there had been no indices to the contents of the vast mass of specifications hidden away in the Rolls Chapel, the "Petty Bag" Office, and the Enrolment Office. A set prepared by Mr. Woodcroft for his own use was purchased and printed by the Commissioners, and it was determined to carry this on annually. This has been done, but in a considerably improved style, for the earlier indices were made from the titles only of the specifications, and these, in a very great number of instances, afford but little clue to the contents. New indices to the "old law" specifications have often been asked for and often promised, but they yet remain to be made. As an instance of the incomplete nature of those there are, it may be mentioned that an American a year or two ago discovered a description of a sewing machine at least fifty years older than the earliest previously known. This was given in the specification for shoemaking. The latter indices are more complete, and the principal requirement about them now is that they shall be amalgamated into volumes of ten years or so, to lessen the labour of a search through so many separate yearly volumes. An alteration in their form adopted a few years back has caused a little confusion, but, perhaps, has some slight counterbalancing advantages.

Another set of publications hardly less important to intending patentees than the indices, is the series of classified abridgments

of specifications. These are published in cheap, handy volumes, and give a brief analysis of the contents of all specifications relating to a certain subject. The weak point about these is that in every class there are numerous omissions, the imperfections of the indices being repeated in them. The fact that these publications are thus not wholly trustworthy causes very large sums to be spent in employing agents to search through the volumes of specifications themselves—a tedious undertaking, but the only way of ascertaining with a certainty the novelty of any invention.

Another objection to these is that they have not, as yet, been carried down beyond 1866. In that year a rule was made that every applicant for a patent should send in with his specification an abridgment of its contents, and these abridgments were published, first in quarterly volumes, afterwads in weekly numbers. Unluckily, it turned out, as might have been expected, that the inventor is the last man to describe briefly and concisely his own invention, and, therefore, these abridgments were of very little use. They are, consequently, now to be discontinued, and the publication will cease with end of the present year. At first it was proposed to continue them and have them prepared by a competent staff; but this idea has, perhaps not very wisely, been abandoned.

To complete the list of publications, it must be added that a journal is published twice a week, giving lists of applications, grants, &c., with other information useful or interesting to intending patentees.

Such is the work of the publishing department of the Patent Office. It has been steadily increasing since the establishment of the office, as continual efforts have been made to assist inventors in obtaining the information necessary to enable them to protect their ideas. The work is now to be slightly lessened by the cessation of the weekly abridgments and the index accompanying them, which was brought down in each number to the date of its publication from the commencement of the year. The stoppage of this will be a decided loss to those engaged in searching for anticipations of their inventions. For the future it is intended to issue the specifications themselves in volumes of about fifty each, with a separate short index to each volume. The usual drawings, also, instead of being published in exact facsimile, are in future to be reduced by photo-lithography. A few such numbers have been issued, but from their appearance it is doubtful whether this plan can be carried out without great inconvenience.

Besides the publishing department, there is a part of the office devoted to a library, which, by the efforts of Mr. Woodcroft and Mr. Prossor, the library clerk, has been brought to a really high standard of excellence. It is specially rich in works illustrating the early history of invention, and is also well supplied with scientific works, foreign as well as English. It is also free to all comers, and, indeed, claims the distinction of being the first absolutely free library opened in London. The Patent Office Museum at South Kensington has been less successful. Possessed of a number of valuable relics, it is encumbered with too many models of incomplete or useless inventions, most of them quite valueless for either historical or educational purposes.

Within the past eighteen months the Patent Office has had added to it the office for registering designs, and that for the registration of trade-marks. The former office was merely transferred from the Board of Trade, but the last named is a new creation entirely.

A RAILWAY IN CHINA.

(See page 324.)

The Celestial Empire has at length become the scene of railway operations, and, although only on a small scale at present, it leads to the hope that the present may prove the precursor of many lines. The question has been agitated for some years past, the Chinese proving very difficult to be persuaded of the advantages of the railway system. We afford illustrations on page 324 of two engines constructed by Messrs. Ransomes and Rapier, Engineers, Ipswich, England, and respectively named the "Celestial Empire" and "Flowery Land." The type of engine was determined on more to suit the local circumstances than good hauling power. The length of wheel base is 7 ft. 6 in., and the wheels, 2 ft. 3 in. in diameter, are six in number, all coupled and fitted with brakes. The cylinders are 8 in. diameter by 10 in. stroke. The barrel of the boiler is 2 ft. diameter, the tubes being 1¾ in. diameter and 6 ft. long. The total heating surface is 150 square feet, and the grate area 4 square feet, the weight in working order being 9 tons. The water is carried in side tanks. The boiler and frame are throughout of Low Moor iron, and the boiler is constructed for a working pressure of 200 lbs., but it is intended to be used only up to 120 lbs. This excess of strength of the boiler is to meet any contingencies that may arise at the hands of the Chinese firemen. The railway is fitted with double water-supply tanks at each end of the line, so as to allow the water in all cases one day to settle. In order to fully cover the liability of being short of clean water, the water tanks of the engines are made large enough to run two double trips.

The opening on the 30th ult. was highly successful, the Chinese taking readily to what in official quarters was looked upon as an innovation. They were conveyed up and down the line, free of charge, all the day following the opening, and on Monday week the line was opened for regular working. Six trains are run daily each way, and recent telegrams state that they are all crowded with passengers, and that the cash receipts are highly satisfactory. So far, then, the line appears to be a success, and as the anticipated interference on the part of the authorities has not been manifested, it is to be hoped that the Shanghae line will prove to be the first instalment of a vast system of Chinese railways. Whether regarded from a military or a commercial point of view, there can be no question that railways would prove of immense benefit to that vast and densely populated country.

EIGHT-HORSE POWER COMBINED THRASHING MACHINE.

(See page 325.)

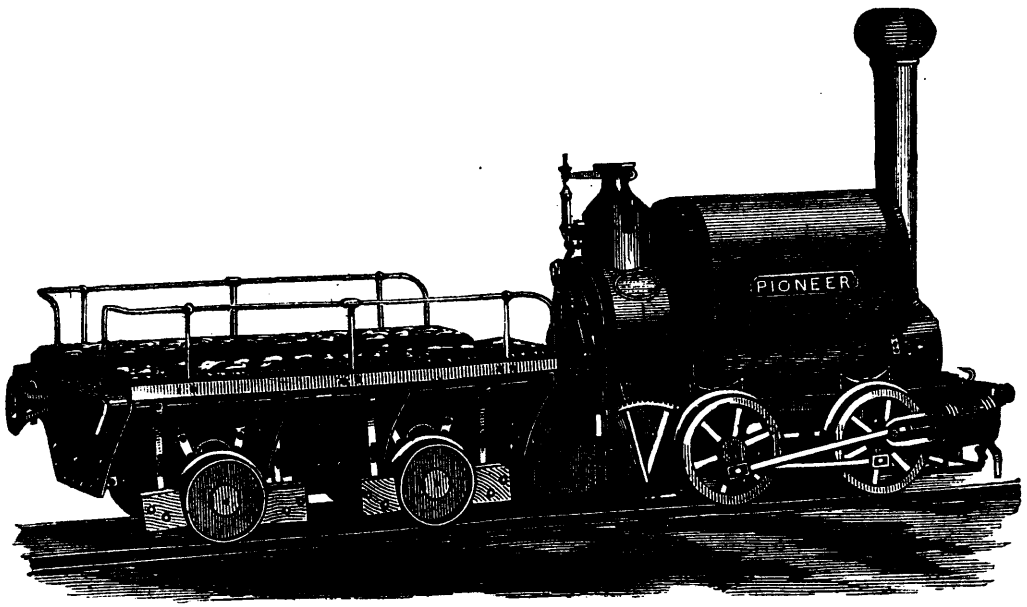
On page 325, we illustrate one of the various sized thrashing machines exhibited by Messrs. Nalder at the Royal Agricultural Society's Show at Birmingham this week. On referring to the engraving, it will be seen the bagging of the chaff is effected in a very easy and simple manner—in fact, nothing is added to the ordinary machine but the sliding frame having two bags hung on it, one being filled, and this, when full, is pushed out, the empty one taking its place. Hooks and eyes being on each bag, the man in charge has only to hook them together and put the bag up into a cart, or empty it into a barn as required. By taking this frame and bags away the chaff falls on the ground as usual and in its proper place. The corn is delivered into sacks at the hind part of the machine, and we find Messrs. Nalder were one of the first to adopt this now universal system, having made their first thrashing machine on this plan. The cavings are delivered under the middle of the machine, leaving the front part entirely free for nothing but the straw, which certainly appears the best arrangement, as, if the shaker at all fail in shaking all the corn out, it can be collected and again passed through the machine; but when desired, by a simple arrangement the caving can be delivered in front of the front travelling wheel, or not, at pleasure. This is in some cases desirable, as when the machine is fixed in a small barn with corn on both sides, so as to leave even hardly room to let the belts run free. This has only been added this season.

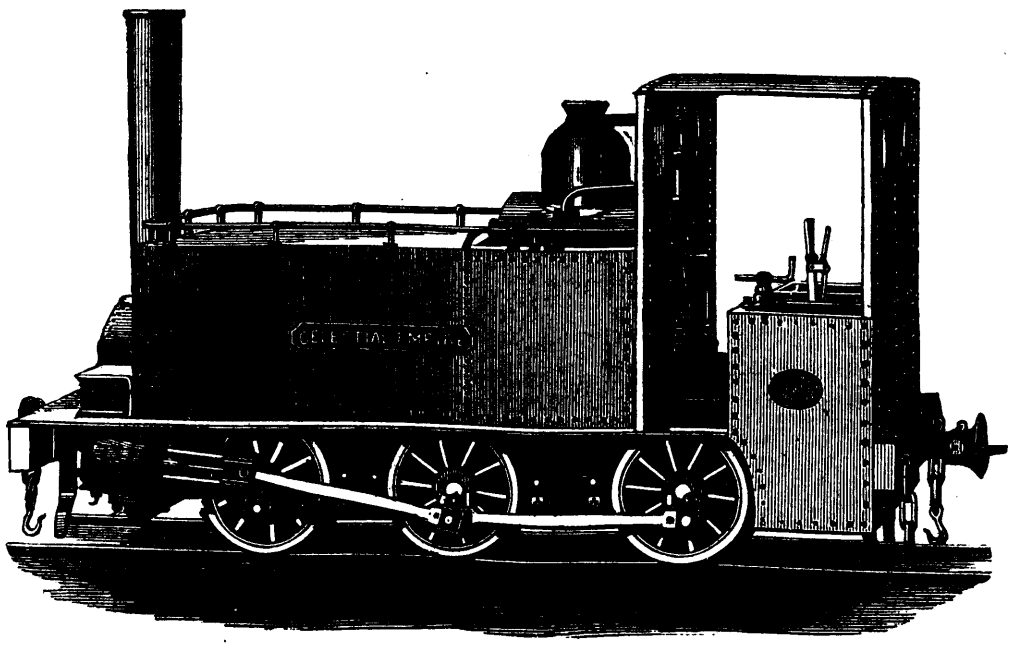
A very simple system is adopted of using the machine as a single blast, either with or without horner; as a double blast, also either with or without horner; or as a finishing machine proper. All the small brasses are the same pattern and size, thus interchangeable, and fitted with special adjusting slips, so that, as a brass wears, all that is necessary is to break a thickness off. These machines are made from 2½-horse-power, to 10-horse-power, divided into three classes, and making in all thirty different sizes manufactured by the Messrs. Nalder.

Messrs. Nalder & Nalder have introduced a very neat arrangement for lifting the drum to the top of the machine for balancing or repairs, without having to draw the spindle or take off the pulleys. This is done by taking out part of the panel of the machine where the drum is fixed, and using two of the castings as a pair of strips to balance the drum on. The great importance of having the drums of thrashing machines well balanced is such as to require no remark. Figs. 1 and 3 of the engraving show the drum, spindle, and pulleys lifted out of their ordinary place, and laid on the balancing strips B, B. Fig. 2 shows the drum in its ordinary position, the panel filled up; and the strips, being used as part of the panel, cannot be lost.

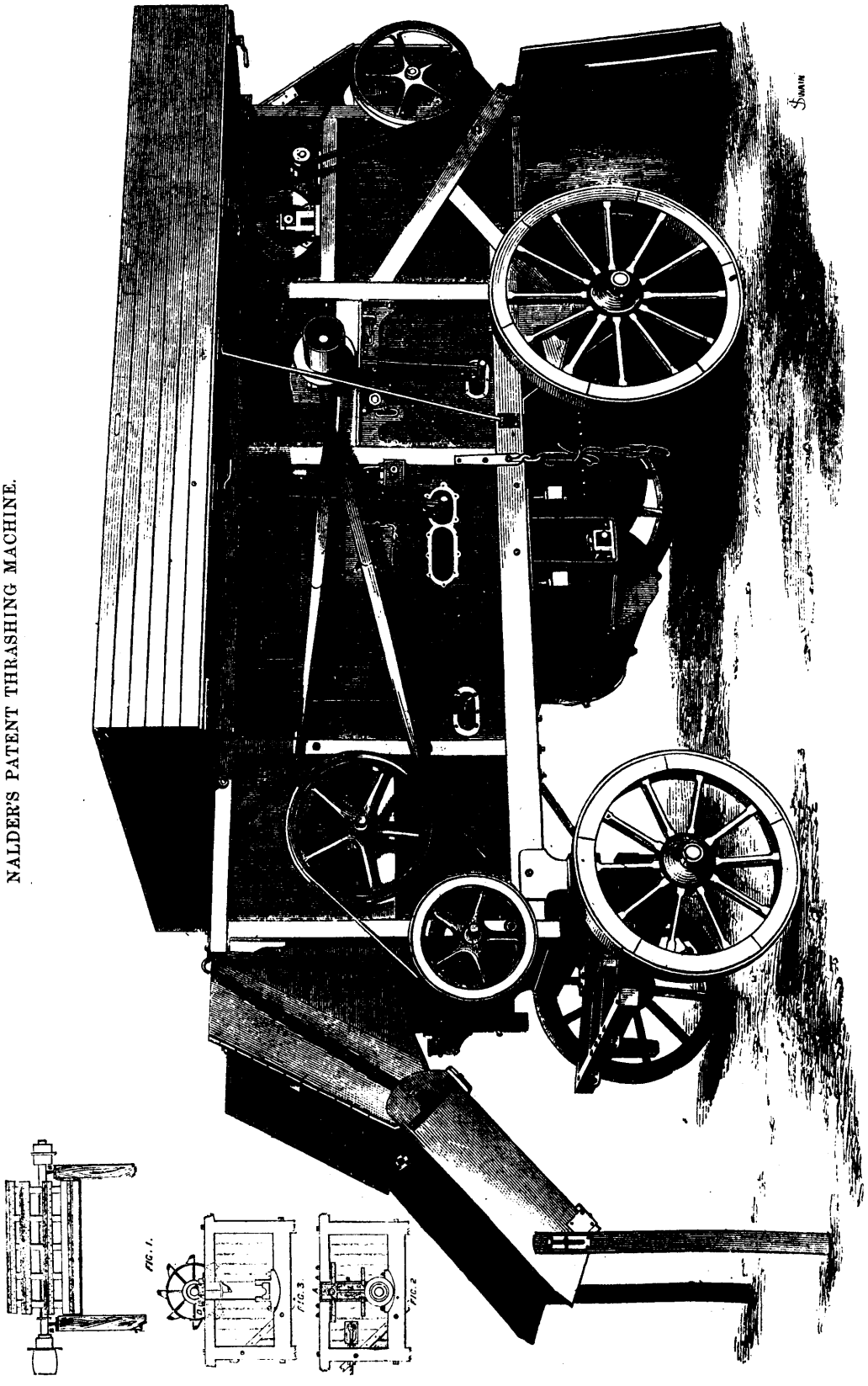
Messrs. Nalder have this year also introduced a simple method of delivering the cavings either behind the front travelling wheels or in front of them at pleasure, as sometimes it is difficult in small barns to get at the side of the machine even for oiling; but they recommend behind as the proper place, so that any corn not taken out by the shakers falls through the straw rack, and can again be put through the machine. They also dwell on the fact that, after having taken so much care to part with the machine, the corn, chaff, cavings, and straw, they should each be deposited in places so as not to be again easily mixed.—*The Engineer.*

LOCOMOTIVES FOR THE FIRST CHINESE RAILWAY.





NALDER'S PATENT THRASHING MACHINE.



RAILWAY BRAKES.

The following letter, which well describes the actual state of things, is written by "Traveller" to *The Times*.

English and American railways present, at one point, a marked and, to an Englishman, a humiliating contrast. We have failed to establish any proper control over running trains. The Americans have established a control which is almost perfect. After 50 years' experience we still employ for stopping our trains the rude and ineffective methods which were in use at the very dawn of railway travelling. The Americans employ a mechanism which bears to ours about the same relation which the breech-loading rifle bears to the flint-lock and smooth-bore, or to the bow and arrow of the past.

When the driver of an English train sees danger before him, he shuts off steam. His fireman begins in haste to turn a lever. The guard, warned of impending peril, makes his way as quickly as possible to a similar lever at another part of the train. In 10 to 15 seconds the combined efforts of fireman and guard have applied the brake to 14 wheels—probably one-fourth of the number present in the train. Meanwhile, the space which intervenes between the rushing train and the obstacle which threatens its destruction has diminished with fearful rapidity. An English train running at full speed cannot be brought to a stand under 1100 or 1200 yards, and that is seldom afforded in cases of accident. Ordinarily, the feeble nature of our brakes is cut short by a shattering collision, and the death or injury of many of the passengers.

In presence of similer danger the American driver touches slightly a little handle which stands up before him. In less than two seconds every wheel in the train is grasped by a powerful brake, and before the train has traversed a distance greater than one-and-a-half times its own length it is brought to a stand. A train running even at our high English speed is stopped easily in 15 seconds, and within 600 feet of the point where danger was discovered.

Many accidents occur with us from waggons breaking away upon inclines and running back uncontrolled. The American brake renders such accidents impossible. The separation of one portion of the train from the rest causes, without any human agency, the instant application of a brake to every wheel in both sections. Last week an accident of this class occurred on the Midland line. The American brake would have had the whole train at a stand within a few seconds of the separation. As it was, the driver held on his way ignorant that any thing was wrong, and his disjoined waggons followed him on a down grade. When at length he stopped they struck him with great violence. Just as the collision occurred the Scotch express—which on the Midland is fitted with an American brake—rushed past at full speed. One of the carriages struck the projecting *débris* of the wreck. That contact put the brakes on to the whole express train almost before the driver was aware of the accident.

The American conductor has power to apply the brakes from any car of the train without waiting for the concurrence of the driver. The same privilege is extended to the passengers, but few of them are aware of it, and it is never availed of. The conductor applies the brake without requiring steam to be turned off. So powerful is this brake that the stoppage of the train is not perceptibly delayed even by the impelling force of the steam. I conversed recently with many drivers and conductors of the American trains upon the subject of brakes. Their testimony was unanimous and most emphatic. Not one of them would consent to take charge of a train which was not fitted with a continuous air brake. It was curious to hear a rugged engine driver in the wilds of Kansas or Nebraska declare that he would not expose himself to the risks which the supineness or parsimony of railway directors still lays upon the whole English people.

It costs $138 (about £25) to fit one of the large American cars with the air-brake. But I am assured that it saves its cost annually by the prevention of accidents. Railway travelling has been much less dangerous in America within the last few years. Americans claim that notwithstanding inferiority of roadway and rolling stock, they now travel more safely than we do; and they assert that this is owing in no small degree to the use of an efficient brake. If railway directors think they practise economy by the use of the obsolete and dangerous hand-brake, they are surely not wise in their generation.

I may mention, that besides the air-brake, there is in use in America a vacuum-brake; but experience seems to have pronounced against this contrivance, which is now falling into disuse.

The air-brake has been generally used in America for about four years. During these years how many lives have been lost on English railways because the driver was not furnished with means to stop his train in time to avoid collision? How many English homes are yet to be desolated before our railway directors will consent to surround with proper defence the precious lives intrusted to their care?—*Iron*.

Rust Cement for Water and Steam Pipes.—The *Engineer* says the following is a rust cement for water and steam pipes:—Make a stiff paste with two parts sal-ammoniac, thirty-five parts iron borings, one part sulphur, and water, and drive into the joint with a chisel; or, to two parts sal-ammoniac and one part flowers of sulphur, add sixty parts of iron chips, and mix the whole with water to which one-sixth part vinegar or a little sulphuric acid is added. Another cement is made by mixing 100 parts of bright iron filings or chips or borings with one part powered sal-ammoniac, and moistening with urine; when thus prepared, force it into the joint. It will prove serviceable under the action of fire. All the above parts are by weight.

Pin Factories in the United States.—The old, though perhaps bootless, question,—"Where do all the pins go to?" is recalled by the statement in an American paper that there are now eight pin factories in the United States, which make 47,000,000 pins daily. In addition to these, the importation of pins reachess 25,000,000 daily. As these are sold, it is safe to say that 72,000,000 pins are lost daily, or 50,000 every minute!

Proposed Modification in Asphalte Road Pavement.—Admirable as is asphalte as a road material in point of smoothness and cleanliness, it has, as it has been hitherto laid down, the great disadvantage of being exceedingly slippery, and therefore dangerous, at certain seasons. It is said that there is now a fair prospect of this difficulty being overcome, the Val-de-Travers Company having recently introduced slabs of their asphalte, upon the surface of which are studs of chilled iron. These studs are starlike in shape, and are distant about 3 in. from each other. It is claimed that these give absolute security against slipping, and that consequently the slabs are specially useful within, and at the sides of, tramway rails. They can, it is stated, be laid down at the same cost as granite sets.

IMPROVED PANEL PLANER.

(See page 264.)

We have often called the attention of our readers to the tendency in our times to perfect all products of industry, and to ease and cheapen the labor. One of the principal results of this tendency is the construction of machines serving special purposes, and we have often had occasion to describe such.

Our present illustration is another instance of this kind; it represents an improved planer, especially constructed for the planing of very thin lumber of either hard or soft woods. It is especially desirable in a door, cabinet, or furniture manufactory, and for planing cedar for the manufacture of segar-boxes it is unsurpassed, leaving the surface of the lumber perfectly smooth and even, no matter whether the wood is straight or cross-grained.

It will work lumber from 4 inches down to ¼ inch thick and 4 inches long with perfect safety, thereby making it one of the most desirable machines ever offered to the public, and any parties desiring to buy a cheap first-class machine will do well to examine this one before purchasing elsewhere, as they are warranted to be superior to any other machine of this kind in the market.

The manner of gearing it is entirely different from any other machine of its kind, and is so arranged as to allow changes from thick to thin without altering the relative positions of the gears a particle, and producing a strong even feed. It also possesses a novel and practical friction feed, being controlled by a lever, which, by slight changes of position, will produce a range of feed varying from 20 to 40 feet per minute, at the will of the operator, who is enabled to change from fast to slow, or *vice versa*, when a portion of the stick may be cross-grained, without the intervention of cones or belts, only one belt being required. A movement of the lever past the center-stop produces a reverse feed for backing out the stick when desired. The cut does not show the pressure-bars which are applied to this machine for holding the stuff while being acted upon by the cutter.

The machine is made at the favorably known works of the S. A. Woods Machine Co., of Boston and New York, who have earned a high reputation for the excellence of their products.—*Manufacturer and Builder*.

THORNE AND DE HAVEN'S PORTABLE DRILL AT THE PHILADELPHIA EXHIBITION.

Among the exhibits of machine tools at the Philadelphia Exhibition, are four sizes of portable drills, manufactured by Messers. Thorne, De Haven, and Co., of Philadelphia, and especially designed for use upon pieces of work of irregular form, or which from their size cannot be readily adjusted under a stationary drilling machine. Figs. 1, 2 show a side view and plan of the largest machine exhibited. It is mounted on a short cast-iron standard with a cruciform base, the latter being provided with slots through which bolts pass for securing the drill to work. The post *a* carrying the drill is held either in the vertical bearing in the bace, or, for horizontal work, it is placed in the horizontal bearing marked *b*. The radial arm *c* is held in position in the post by the bolt and plate *d*, the drill being traversed to and fro by means of the screw *e*, and rotated by a worm and tangent wheel. The end of the arm is furnished with a socket which carries the drill frame, and it can be turned round, so as to bring the cone pulley in a line with the driving belt.

As will be seen from the drawing the drill is driven by gearing, either direct from the cone or through a system of back gearing, shown in section on the drawing. The automatic feed is obtained from a small pulley on the main cone pulley shaft, a strap passing from the former to a small pulley above which drives a worm and rotates a nut, through which the screw spindle *f* passes. The worm is hinged at *g*, and can be turned out of gear by turning a small eccentric at *h*, and the feed can then be worked by the handwheel *i*. In the smaller machines, as in Fig. 6, the back gear is omitted, and the drill is driven direct through the bevel pinion on the cone pulley shaft. In one form also, the bearing in the end of the arm, instead of being cylindrical, is made spherical, and the drill is mounted on a spherical boss, held in the bearing by a collar; when this latter is in position, the frame can only be rotated in a horizontal plane, and the spindle is kept square with the base, but if the collar is removed the frame can be set at any angle desired. This modification finds many useful appliances in drilling irregular forms, such as sternposts, &c.

The mode of driving this drill is very ingenious, and is shown in the illustration, Figs. 3, 4, 5. The counter-shaft is driven by a strap passing through the eye *j*, and which is shifted to the fast pulley when the cord *k* is pulled and held in position, the weight *l* always tending to throw the strap to the loose pulley. On the other end of the counter-shaft is a grooved pulley *m*, over which the cord passes which actuates the drill. Below this grooved pulley is a frame *n*, supporting a swing hammer *o*, the centre of which is hollow as shown in the section. In this swing hanger are two idle pulleys *p*, so placed that the delivering edge of one of them is always in line with the receiving edge of the grooved pulley. The cord passes under the pulley *p*, over the grooved pulley, through the hole in the hanger *n*, and then hangs down, being kept tight by a weighted pulley *q*; it then passes around pulley p^1, and over the cone on the drill. The weighted pulley is used, so that as the drill is moved to varying distances from the counter-shaft, there may be an extra length of driving cord available. If more is required, additoinal lengths can be added by hook-and-eye connections.

The arrangement and finish of these drills are excellent, and they are very largely employed in American workshops. Messrs. Davis, Hathorn, Campbell, and Davey, of Leeds, are now introducing them into this country.—*Engineering.*

HIGH PRESSURE VALVE.

About two years ago we illustrated a new form of valve which had then just been brought out by Messrs. T. H. P. Denis and Co., of Chelmsford. Recently Messrs. Denis have introduced some improvements in the construction of these valves, and the annexed engravings show the modified arrangements now adopted as exhibited by them at the Show of the Royal Agricultural Society at Birmingham.

As will be seen by the views given, the arrangement consists of two disc valves which, as they are pushed down and brought opposite to the openings they cover, are at the same time made to rotate, and are thus forced apart and closed up against their seats by the action of the screw at the back of each valve. In the old arrangement the edges of the valves geared into racks formed at the side of the valve case, the rotating movement thus going on during the whole descent of the valves in the act of closing. Now, however, all the cogs are on the rims of the disc, and all the cogs on the interior of the casing except one on each side. This makes the interior more simple, and the valves cannot now be put together improperly if taken apart by an inexperienced person. The threads of the screws on the valves are also of a much coarser pitch than formerly, and thus the forcing apart of the disc takes place more quickly, it being effected just at the end of the downward movement. When the valve is closed, also, there is with the present arrangement no tendency for it to stick fast. Another result of the forcing apart of the disc being effected at the end of their closing movement is that they are never far removed from their seats, and in fact almost touch the latter during their downward movement, so that they are able to clear any dirt off the faces. The coarse-threaded screws also enable the disc to wear much longer than before. Altogether the arrangement is a neat and good one.

JAPANESE CARPENTERS' TOOLS.

(See page 329.)

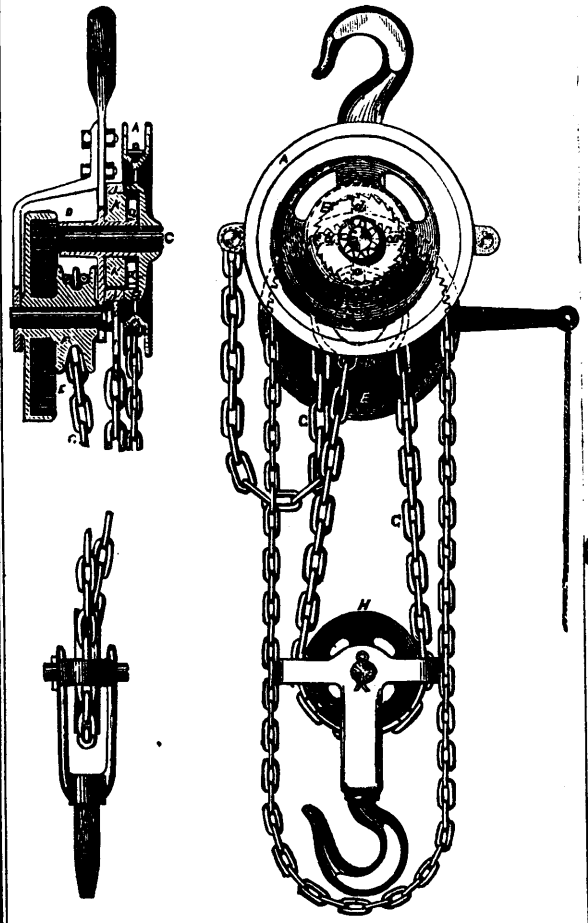
At the Philadelphia Exhibition can be seen a Japanese house built with wood sent from Japan, and put up on the spot by Japanese workmen. Both the house and its erection have attracted considerable attention, and the present is therefore a fitting time to give our readers some idea of the tools used by Japanese workmen, as they are described in reports of the Exhibition at Philadelphia, and in the report of Dr. Exner on the Austro-Hungarian Expedition to Eastern Asia.

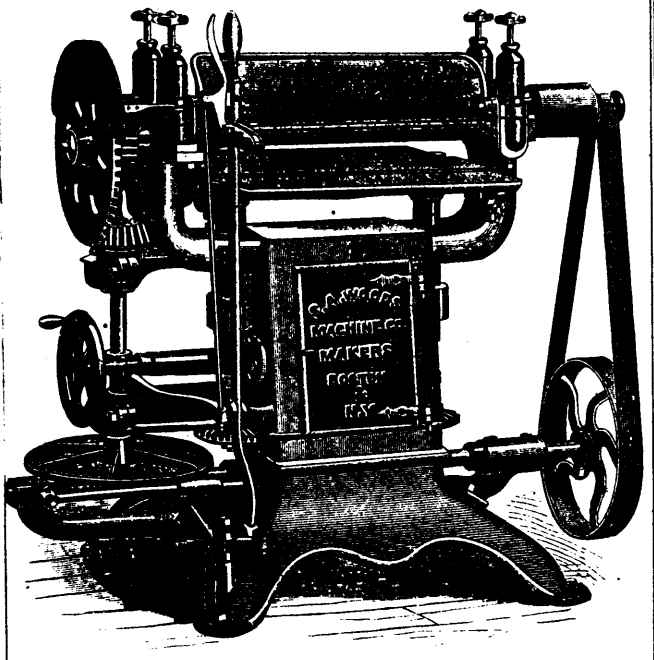
A Japanese carpenter makes a cut with his saw, or a shave with his plane, not by pushing the tool from him, but by drawing it towards him. The stock of the plane (*A*) is made of a wood resembling ash or hornbeam, the plane irons are in great part, sometimes wholly, of steel. The broad surface of the plane iron (which is single) has a slight convergence inwards and downwards. It is kept in place merely by its accurate fitting and the pressure on its sides; it has a less pitch than is usual with English planes, on account of the different way in which it is used. The common pitch for bench planes for soft wood is 45 deg.; "York pitch," for mahogany, wainscot oak, and hard or stringy wood, is 50 deg., and the pitch may be increased under certain circumstances to as much as 60 deg. (half pitch). The Japanese pitch, on the other hand, for their draw planes, is 40 deg. *B* is a chisel with cylindrical handle, protected against wear by an iron collar at the top; the cutting edges are brought a little forward at each end, to make clean wore in cutting corners. The bradawl, *C*, is a pointed piece of steel of triangular section, with a wooden handle; it is reported by Europeans who have used it that a greater number of small holes can be made with it in a given time than with the ordinary bradawl. String used in marking straight lines is coloured by means of the apparatus *D*. One end of the string is fastened to the winding cylinder, and the other to a peg, shown at the right hand of the figure. The string is wound up just as a fishing line is, and on being drawn out again by the peg it passes with a slight pressure over, steeped in wet clay or chalk, or (according to Dr. Exner) a bag filled with Indian ink.

The Japanese saw, like the Japanese plane, is drawn towards the workman, not driven from him. It is weaker in build than the European, as it has a smaller strain to endure. Exner states, as the result of experiment, that the Japanese saw requires twice as much time as the frame saw, and three times the number of strokes, to do the same amount of work. There is, however, a counterbalance of advantage in favour of the quality of the work, which is stated to be excellent. According to the "American Manufacturer and Builder," double saws, such as that shown at *F*, have long since been patented and made in the United States, but have had no success. They have been in use in Japan for a very considerable period. The instrument shown at *G* is a combination of rule, straight-edge and square. One side of the rule divides the Japanese inch into sixths, the other into fifths. The adze, *H*, serves for levelling horizontal surfaces; the handle is made of bent ash; the head, shown separately, combines lightness with strength. *J* is a water-level, identical in principle, though not in detail, with its European congener.

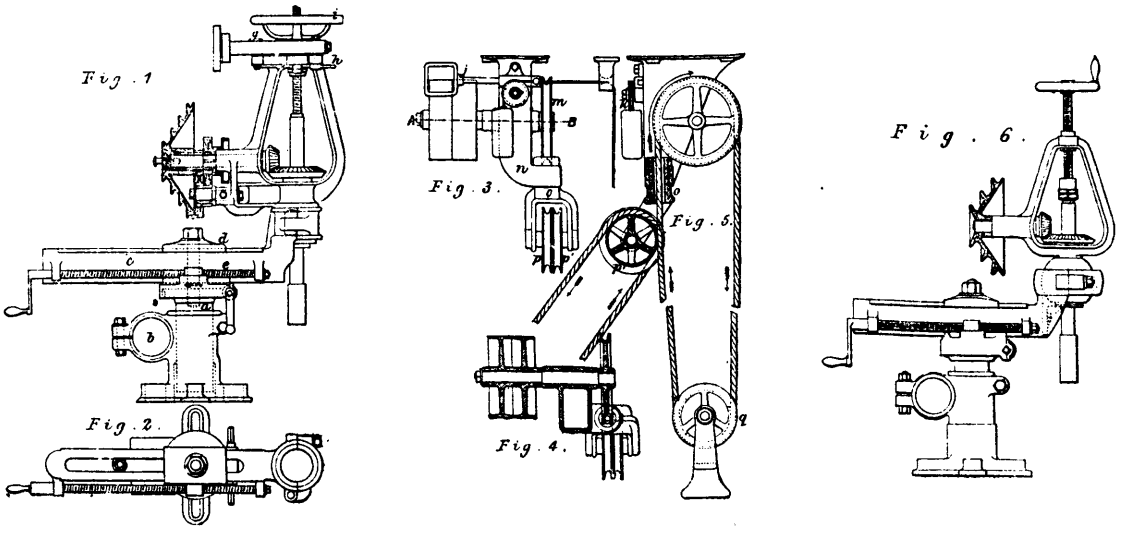
Some idea to what vast extent farming is carried on in California and some other Western States may be formed from the following item in one of our exchanges:—"Ploughing in unbroken furrows six miles long can be seen in Fargo, California. The teams start in the morning and make one trip across an entire township and back before dinner, and the same in the afternoon, making 24 miles travel every day." It would seem that the steam plough ought to find a place in such a region.

CHERRY'S PATENT "BLOCK."



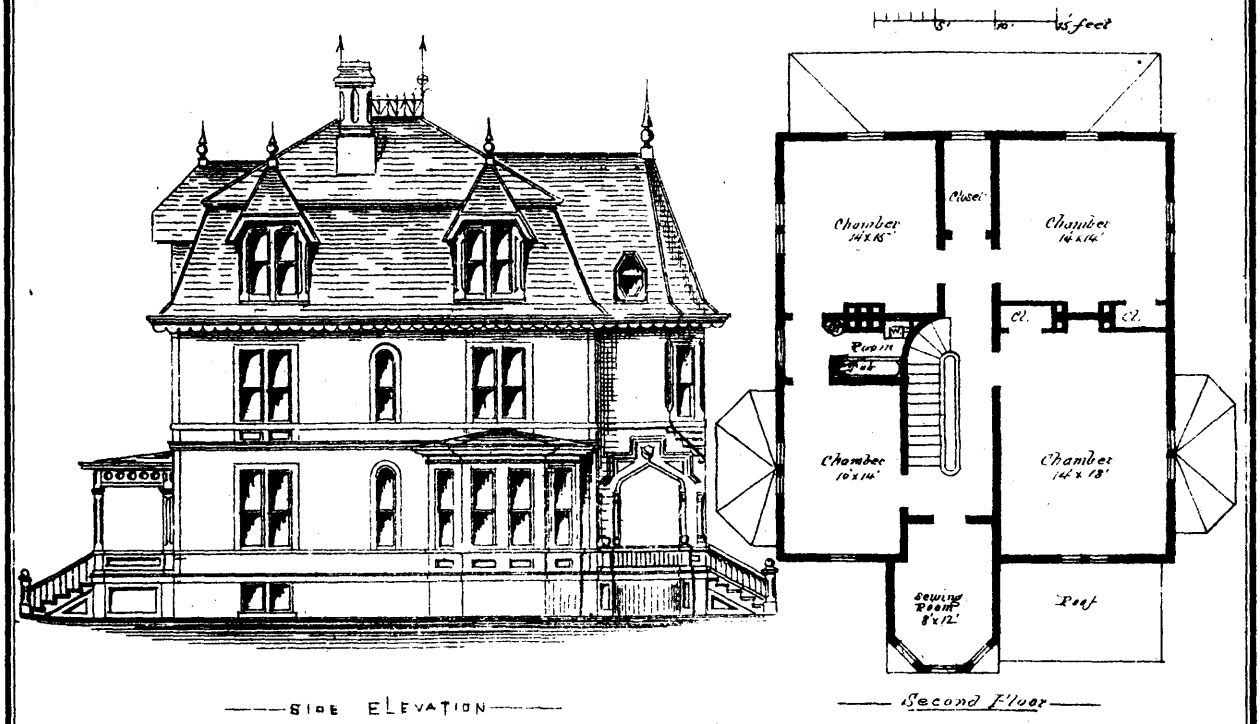


IMPROVED PANEL-PLANING MACHINE.



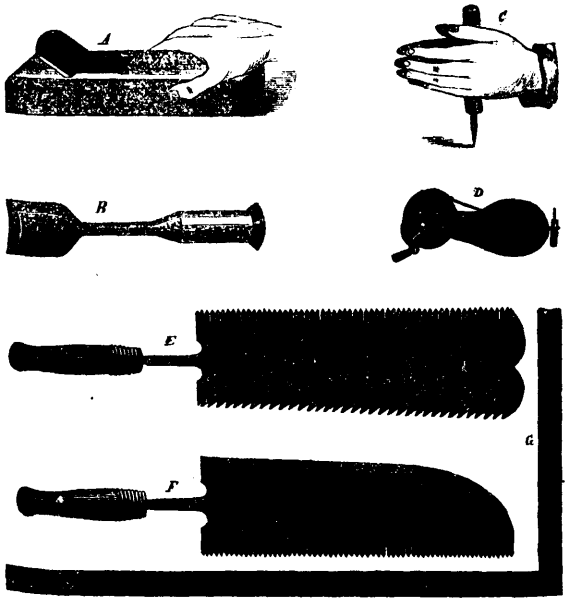
THORNE AND DE HAVEN'S PORTABLE DRILL.

ARCHITECTURAL DESIGN.—From Atwood's Modern American Homesteads.

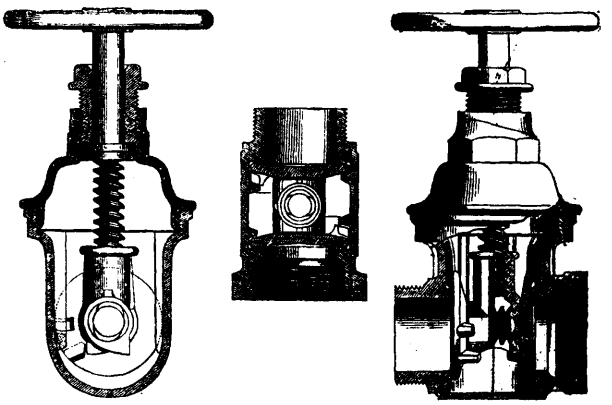


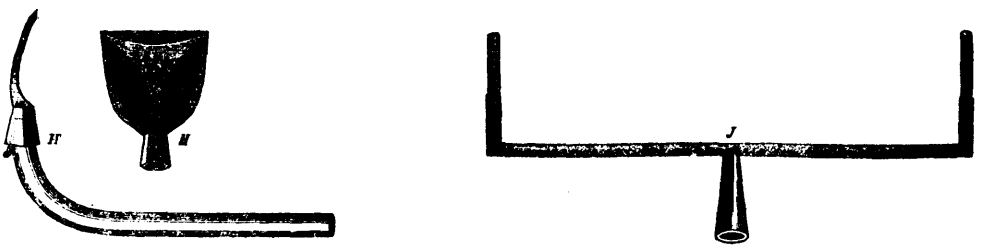
Side Elevation

Second Floor



HIGH-PRESSURE VALVE.





JAPANESE TOOLS.

THE PULSOMETER.

(See page 332.)

The pulsometer is a most ingeniously modified improvement upon Thomas Savery's ancient fire-engine, patented in 1698. In his case the cylinders were large in diameter, and alternately cooled by outside application or internal jets of cold water. The condensation thus effected produced a vacuum in the cylinder under operation, thereby became filled with water by atmospheric pressure. The steam was then re-admitted upon the surface of the water, which was thus ejected into the rising main. These intermittent admissions of steam and of internal or external condensing water had to be effected by hand, as there was no mechanical motion from which to obtain the opening and closing of the valves.

In the pulsometer this weighty objection to such an arrangement has been skilfully overcome. The peculiar flask-like shape of the working cylinders enables the steam to drive out the water without agitation and with the minimum of condensing surface until momentum has been set up. At the moment when the water has descended as low as the orifice which leads to the discharge, the steam passes through with the water, and ascending instantaneously condenses. A vacuum is thus so rapidly formed in the chamber lately filled with steam, that the steam passes through the admission valve with excessive rapidity. This admission valve is a small ball which continually oscillates upon a sharp edge between two alternative seats. When fully resting in one, it is never raised more than from 1-32 to ⅛ above its alternative seat, and thus is easily drawn over upon the open seating by any accelleration in the passage of the steam. These changes become so rapid, and are completed so instantaneously that in the smaller sizes the alternative opening and closing of the steam valve sounds as rapid as a pulse: hence the name applied to the pump.

The principal drawback to Captain Savery's engine was that the height of lift was directly proportioned to the pressure per square inch of the steam (about 2 feet to every pound), and that owing to the imperfection of boiler-making in those days, the limit of practical pressure was soon reached, and often exceeded with disastrous effects. The principle, of course, still governs the pulsometer; but on the one hand, the requirements for pumps of low lift, up to 60 or 70 feet, have most enormously increased since Captain Savery's time; and on the other hand also, high-pressures, even 300 lb. per square inch, are now safely carried as working pressures upon multitubular boilers.

The questi on of the economical use of steam is an important one, as effecting all steam-pumps; put in a very large proportion of cases the expenditure of a few more hundred-weights of coal in a week, where the gross amount is but small, is but a minor matter of consideration compared with simplicity, practical ease of working, and cheapness of first cost.

The strongest claim the pulsometer has of being a really practical improvement over Captain Savery's engine, and upon this rests the possibility of its being admitted at all into the market, consists in the fact that the greatest ingenuity has been employed, and careful precautions taken against this wasteful condensation. The form of the flask-chambers are specially designed for this purpose, and small drifting air-valves are used in the upper parts of the chambers, so that a considerable quantity of air is taken in with each suction-stroke. There is no doubt that this air will act as a non-conducting medium between the steam and the water, whilst at the same time it is most useful in destroying the shock of the incoming column of water.

The accompanying engravings show the mechanical construction of the pulsometer, and also one mode of applying it to the raising of water. Fig. 1 is a vertical section of the apparatus taken through the centre of the water chamber. Fig. 2 is a corresponding vertical section taken at right angles to fig. 1. The body of the apparatus is divided internally into two chambers, A A, which are separated by a vertical partition cast in one with the outer part. The figure of the body is of a pear-shaped form tapering upwards to the neck, J. The vertical partition extends laterally on each side at the upper part, where it forms the elliptical air-chamber, B, which communicates with the suction. The arrangement of this part is modified, and the partition forms a diaphragm, one side of which communicates with the delivery and the other with the suction. The fluid to be raised flows upwards by the induction passage C, which opens out on either side into the chambers A A. These openings have fitted to them the valves E E. This portion of the arrangement is shown very clearly in the sectional fig. A discharge chamber common to both, leads to the discharge, D, best seen in fig. 2. This chamber is also provided with two valves, F F, according to the purpose to which the pump is being applied. The valves are controlled, as regards the degree of apertures, by the guards G G, and externally the openings at the lower part of the chamber are closed by the covers H A, which are accurately fitted to the openings by planed joints. With this arrangement access is readily had to the interior, when the valves or any other part may require attention. The upper end of the chamber A, is surmounted by a casting termed the neck, J, which is accurately fitted to the face of the chamber and bolted there. The two passages of the chamber A open into a steam-chamber in which the ball-valve L is fitted, and so as to be capable of oscillation between the duplex-valve seats formed at the junction. The cylinder and air chamber are furnished with air-cocks, that may be brought into use when required. The steam for working the pump is admitted through the pipe K, and passes down the side of the neck which is left open, according to the position of the ball-valve, L. In fig. 1 the valve is shown to the left and the steam is entering the right-hand portion of the chamber, as indicated by the descending arrows. Here the steam presses upon the small surface of water in the chamber, and consequently depresses the water but without any agitation, hence there is but a very slight condensation, and the water is driven through the discharge opening and valve into the rising main.

The ejection also of the water from the cylinder, or chamber, is so rapid that it has not time to cool materially the walls of the chamber before the steam is r-eadmitted. This is so much the case that the pulsometer chamber is always too warm to the touch, and is not cooled to the touch by the rise of the water into the chamber. At the same time a large portion of the work is performed by the vacuum from the condensation of the steam. This will give the pulsometer a considerable advantage over those pumps which do not condense their steam at all.

Nevertheless, with these advantages and disadvantages, we have reason to believe that the enconomical working of the pulsometer, though considerably inferior to expansive or condensing pumping engines, may, at least, be taken on a par with the numerous direct-acting non-expansive steam-pumps which have lately flooded the market.

The pulsometer has one or two distinct features of advantage, which as far as we know, no other pumping machine can claim. The first is that it is practically imperishable, as a whole, the main casting being subject to no wear at all. The valves and seatings, which are the only parts subject to wear and deterioration, are all most easily replaced, and are all in separate parts for that purpose. In this way a pulsometer may, after many years' wear, be entirely renewed as to its perishable parts, at an additional cost of about 15 per cent only.

Again the pulsometer requires no packing or lubricating, which of themselves certainly represent a continuous expense, and the requisite frequent attention for ordinary piston-working engines and pumps.

One form of valve much approved of for water are spherical metal ball valves working on circular seatings, with guards attached to the valve-box cover. A valve which proves very serviceable, and which is much liked, is a flat cast-iron disc working on turned hinges and on a circular seating of hickory or hard wood boiled in oil. The wood is fixed with the end grain exposed to wear, and the well known Hawkley's steps are an excellent example of the amount of wear end-wood arranged in that way will stand. The guard of the valve is on the cover, and a wooden plug is fitted into the valve crown to deaden the concussion in working. Another valve, known as "Terreauxs," is made of indiarubber, in which the orifices are crossed indiarubber lips. This valve is most valuable where foreign substances have to be passed through, but is rather apt eventually to split at the end of the lips.

A great advantage to the pulsometer is the absence of any rubbing or wearing surface, such as a piston barrel, for the pulsometer will pump almost anything short of brickbats, as, for instance, water full of sand, grit and chips, mud, sewage, gas-tar, molasses, water mixed with grain, and paper pulp. For pumping acids it may be made from special mixtures of metal which could not be used in pumps which had afterwards to be bored. It might also, as far as we can see, be made of either glass, or stoneware.

The illustration, fig. 3, shows the pulsometer in another speially unique adaptation, viz., as slung in chains for sinking a well or shaft. It is perfectly independent of all fixing, and can be at once put to work without descent into the well by turning on the steam cock at the surface.

The objects to which the pulsometer may be most advantageously applied are exceedingly numerous, but amongst others,

we may mention the pumping out of coffer dams, the formation of dry docks, and the elevation of sewage, in all of which a large quantity of liquid with a comparatively low lift, is required to be ejected.

In mills, factories and paper works its applications are obvious, together with its utility as a most powerful fire-engine. On board ship it is eminently suited for a bilge pump, for washing decks or as a circulating pump. Its success has been already most authentically and widely established in the United States, as may be seen from numerous testimonials, and we have no doubt that very shortly it will be as widely known and appreciated in our own country.—*Iron.*

CRAVEN'S SEMI-DRY BRICKMAKING MACHINE.

The old system of hand brickmaking, in which the mass of clay, saturated with water, is thrown with force into a sanded mould and then removed to the drying ground, has, for some years past been steadily declining, to be superseded by what is known as the semi-dry process, a mode of manufacture in which the clay is used in a state containing only sufficient moisture to cause the alluvial particles to adhere. The clay having been rendered into this state, it has been the object of successive manufacturers to submit, in the best and most effective manner, the slightly cohesive mass of clay to such an amount of pressure as will force the particles into a solid and uniformly coherent block. Unfortunately, a practical difficulty has, up to the present time, intervened at this point, it is this: the clay forced into the mould carries with it a certain quantity of air commingled with its particles, so that after the mass is subjected to the extreme compression which is exerted by the semi-dry brick machine, it is apt to show this great defect—that on the moulded brick being taken from the mould it subsequently splits, or there is produced a number of laminar cracks similar to the lamination of slate or a certain class of rocks. The machine shown in the accompanying illustration is the result of careful study to avoid the serious defect we have referred to. Our engraving shows a front elevation in perspective of the semi-dry brickmaking machine, it being the invention of Mr. Craven, of the firm of Bradley and Craven, of Wakefield. The machine consists of a substancial compact frame, the base-plate of which is bolted to the flooring. Rising from this plate are a pair of vertical side standards, extending laterally midway, so as to form a table and foundation-plate for the mould. The main driving shaft is fitted outside the machine, immediately below the table, its outer or free extremity being supported in a vertical bracket-bearing fixed parallel to one end-face of the main framing. This shaft carries the usual fast and loose pulleys and spur-wheel, which give motion to a pinion on a shaft extending across the centre of the machine. This shaft gives motion, by means of cranks, to a pair of strong vertical connecting rods, which traverse in guides formed in the standards of the framing. The connecting rods are united by a heavy transverse cross-head which is bolted thereto. At the centre of the crosshead there is a cylindrical opening, forming a guide, and corresponding to a similar aperture in the crosshead of the main framing above. The rod of a heavy ram or plunger passes through these guides, carrying at its upper extremity a large spherical weight, and at its lower end a plunger which compresses the clay in the mould on the descent of the ram. To enable the pressure on the brick to be of as long duration as possible during each operation, a peculiar catch arrangement is fixed on the transverse crosshead, which, when the connecting rods have delivered the ram at their top centre, hold it there until the mould is filled with clay, when the catches are released, and the sudden fall of the ball-weighted ram at once forces the air out of the clay, and then exerts a steady pressure upon it until the connecting rods, working to the bottom centre, bring the final grip to bear upon the brick. Simultaneously with the downward movement of the plunger, an upward compressive force is exerted on the clay by means of a similar plunger or piston, which forms the lower part of the mould, and is actuated by a snail-ram fitted on. By means of these several mechanical movements acting in combination, as we have described, it is stated that the bricks so produced are of greater density than has before been accomplished, and that manufacturers are enabled to make them cheaper than can be done by the ordinary wet-clay process, whilst the production of a single machine is not less than 7000 per diem. From what has been shown, we think that the introduction of such machines as these will largely increase the demand for the class of bricks.

TORPEDOES.

Mr. Whitehead, the inventor of the celebrated fish torpedo, has been in England for some days past with the object of inducing the Government to purchase some improved torpedoes, from which he anticipates great results. Each torpedo, we understand, costs the enormous sum of £400, but the purchase of fifty carries with it the subsequent right of manufacturing them. Austria, Sweden, and other countries have availed themselves of the terms offered, and for £20,000 have obtained possession of a projectile which is said to be not only far superior to anything of the kind yet invented, but which would cripple a fleet before it had time to come within effective range. Fortified, however, by the results which have been obtained from a new submarine engine or rocket recently tried at Woolwich, the English Government are understood to have declined the terms which Mr. Whitehead placed before them. By enlarging the size of the torpedo, increasing the power of the air cylinders, and adding to the length of the propellers, the authorities of Woolwich have produced an engine of war which is capable of attaining a speed through the water of close upon twenty knots. This is the identical speed which the improved Whitehead torpedo is said to possess, but, in addition to its extraordinary speed, the latter has the power of running in a straight line. It has been impossible to prevent the present fish topedoes diverging to the right or left, although in some instances a double screw working on the same shaft has been tried; and, besides this defect, their flight through the water is frequently accompanied by a vertical undulatory movement which enables their course to be followed. The new Whitehead torpedo, on the other hand, is guaranteed not to diverge more than a yard from a straight line within a distance of 2000 yards. The ordinary whiskers around the nozzle have been dispensed with in the improved torpedo, and in consequence the inventor asserts that it can make its way through the torpedo nettings without exploding, except by actual contact with the ship itself. Its length is 18 feet, or about 4 feet longer than those in common use.

THE STRENGTH OF BAND SAW BLADES.

(To the Editor of ENGINEERING.)

SIR,—The following is the result of a set of tests made on Reichle Brothers' testing machine at the Philadelphia Exhibition, of eight specimens of Perrin's band saw blades. Three of the samples had brazed joints made by Richards, London, and Kelley, of the Atlantic Works, Philadelphia.

Number.	Thickness.	Width.	Width nearest to $\frac{1}{16}$th.	Breaking Weight.	Strength per Square Inch.	
				lb.	lb.	
1	·0346	1·05	$\frac{17}{16}$	7600	209,193	
2	.0353	·620	$\frac{10}{16}$	4000	82,765	
3	·0365	·745	$\frac{12}{16}$	6000	220,649	
4	·0337	1.062	$\frac{17}{16}$	3000	83,823	Broke at the end of the joint.
5	·0310	·625	$\frac{10}{16}$	2230	111,090	Broke across centre of the joint.
6	·0310	·490	$\frac{8}{16}$	2000	131,660	Do
7	·0335	·280	$\frac{9}{32}$	2000	213,210	
8	·0310	·094	$\frac{3}{32}$	485	166,430	

From the above probably most men will prefer to draw their own conclusions; but inasmuch as the thicknessess are nearly the same, all the blades made from No. 19 gauge steel, varied only by the grinding and smoothing down the joints; to reduce the strength to the average for each $\frac{1}{16}$in. in width would place the matter in shape to render it more readily applicable, and in this form the strongest unjoined blade was 500 lb. for each $\frac{1}{16}$th, 323 lb. the weakest, and the average 446 lb. While through the joints the strongest was 250 lb. for each $\frac{1}{16}$th in width, the weakest 176 lb., and the average 206 lb. The fact that when a band saw blade is strained to 175 lb. for each one-sixteenth inche of its width it is being strained to about the limit of its endurance, may be knowledge of some value to the makers and users of band saws.

JOHN E. SWEET.

THE PULSOMETER.

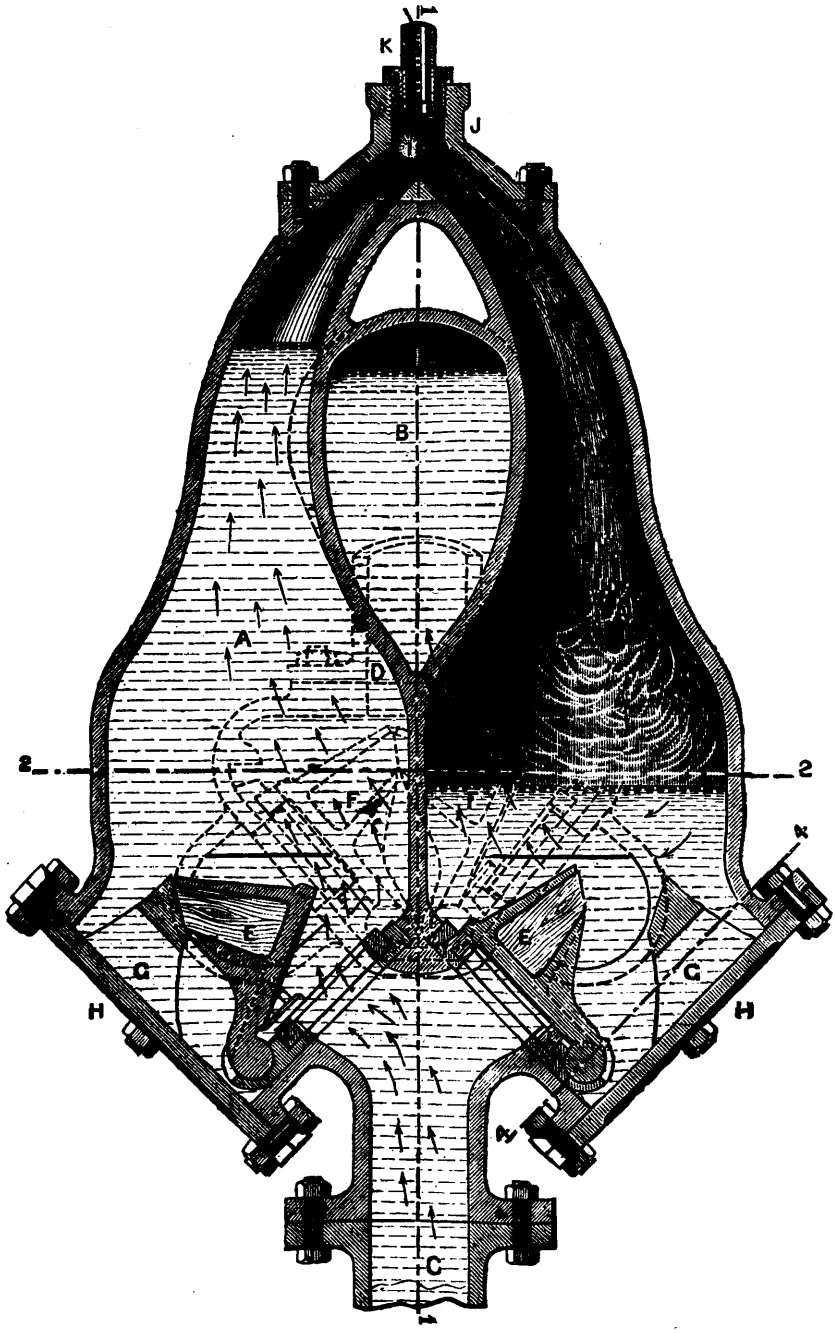


FIG. 1.

THE PULSOMETER.

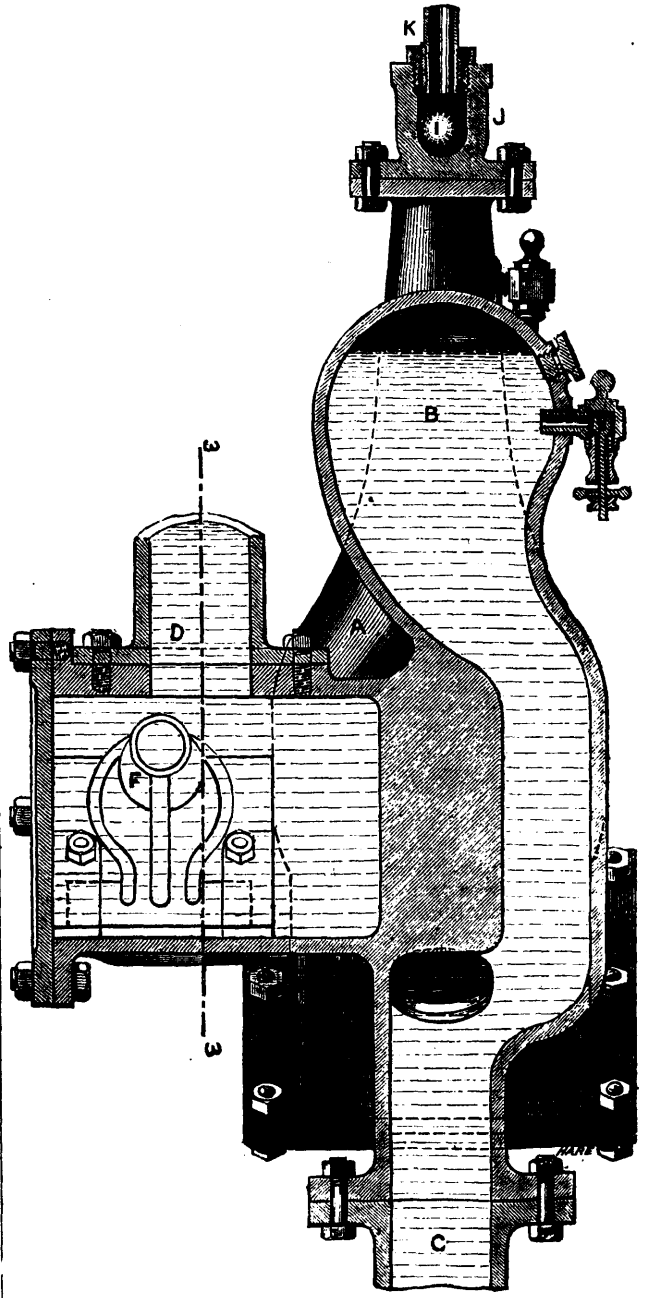


FIG. 2.

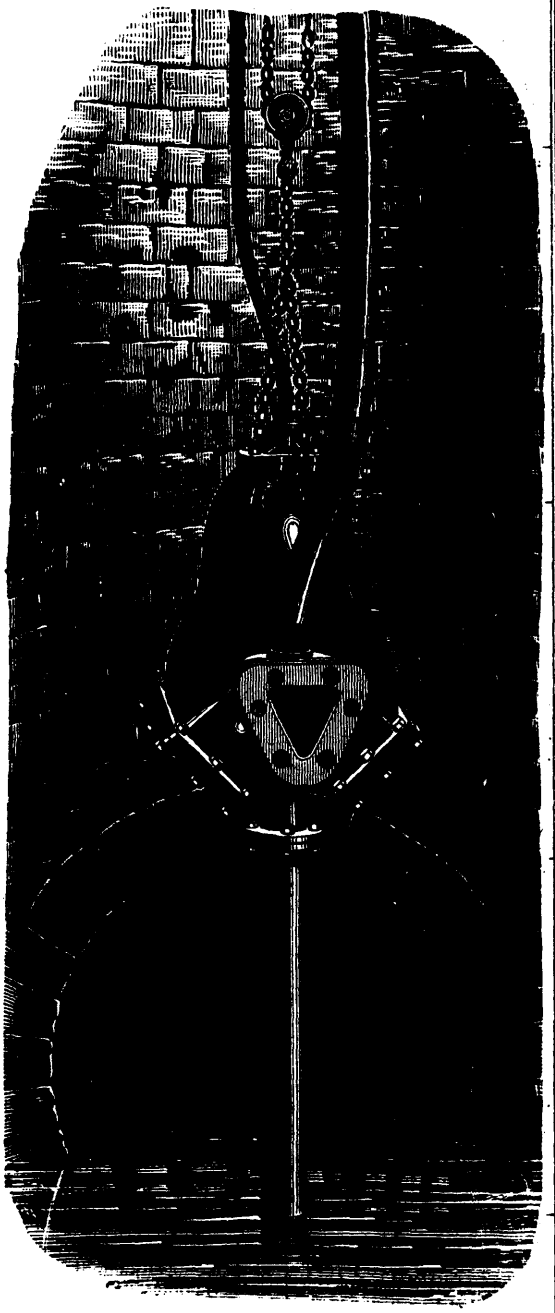


FIG. 3.

WEIMER'S HOT BLAST STOVE.

DESIGNED AND CONSTRUCTED AT THE WEIMER MACHINE WORKS, LEBANON, PA., U.S.A.

(See page 336.)

THE engraving represents one of Mr. Weimer's suspended pipe hot blast stoves, the most important feature of which is the suspending of the pipe from the roof of the stove, and the absence of the usual bed-pipes or mains.

The pipes are U-spaped, with the upper ends turned outwards and flanged. The cross section of the pipe is a parallelogram with semicircular ends, the internal dimensions being 4 in. by 13 in. and external 6¼ in. by 14¼ in., except at the curve of the U, where the metal has been increased to 1½ in. in thickness, the excess tapering gradually until the uniform thickness of 1⅛ in. is met about 3 in. from the bottom of the pipe; this additional thickness of metal is given to compensate for the action of the impinging gases and the more rapid oxidation of this part of the pipe. The flanges are planed to a true surface and secured to each other with key bolts; the pipes are cast from 12 ft. to 20 ft. long as may be preferred, and have collars formed on their upper end immediately below the flanges for the purpose of giving support to the roof, which is made of brick cut to fit between the pipe. The inlet main rests on the top end wall of the stove and is provided with an inlet branch and three pipe branches; three rows of U pipe (three to a row) convey the air to be heated from the inlet main through the first heating chamber to the transfer main, resting on the opposite side of the stove, where it is transferred to a similar lot of pipe, which convey it through chamber No. 2 to the outlet main. Each stove has two independent combustion chambers communicating each with its separate pipe chamber for the purpose of enabling the attendant to throw as much gas, and consequently heat, into the "cold" side of the stove as may be desirable, and to check a too great accumulation on the hot side. Each pipe is suspended by means of two key bolts to a 15 in. wrought-iron beam, three of which traverse the top of the stove resting on wall plates. Four draught chimneys on the corner of the stove control the action of the upper pipe chambers, while the usual gas valve regulates the flow of gas to the combustion chamber. The following advantages are claimed for this stove: perfect control of both gas and pipe heating chambers, great durability of the heating pipe with no warping or toppling over, so destructive to the standing pipe stove, the great facility of repair, and economic first cost of construction. The joints are all planed and placed outside the heating chamber.

KNOTT'S TUBE SCRAPER.

(See page 336.)

The accompanying sketch illustrates a neat and useful tool for cleaning and scraping the tubes of marine boilers, and consists of two or more flat tongues, welded together at one end to form a junction piece, to which a suitable handle is screwed; the other ends are sprung out, and turned severally at right angles upward from their outer surfaces; the projecting faces are cut to a shape that, when pressed together, they shall form a circle of a diameter less than that of the tube. A dovetailed slip is cut in each face, and a toothed guard piece passed through, one end being riveted to the body of the scraper, the other dropping over and forming an incline plane to each scraper; these, on being pressed into the tube, close the scrapers to the diameter of the tube, and, should the scrapers be pushed beyond the extremity of the tube, the inner inclines that are riveted to the tongues perform a like duty when the tool is being withdrawn. These tube cleaners assume various forms. They are made by Messrs. Ross & Co., Queen street, Newcastle-on-Tyne.

SEWAGE AT TROWBRIDGE.—M. Fulda, a French chemist, has been experimenting with the sewage at Trowbridge. The sewage flows into a tank in which an agitator is worked by a small steam engine to keep chemicals in operation. The contents flow off at a two-inch fall into another tank, where the solid portions of the sewage are rapidly precipitated to the bottom, and the effluent water runs into another tank, where further precipitation takes place, and the water flows thence clear and bright into the river. The expense of the whole apparatus is at the rate of 2*l* for every million gallons of sewage, the residium forming a portable manure. M. Fulda's system is in operation at the cloth mills of Messrs, Pratt and Sons, at the Bromley Union Workhouse, and other places. The cost of a plant to work his process M. Fulda estimates at 320*l*.

THE AUTOMATIC UMBRELLA RUNNER.

(See page 336.)

THE accompanying engraving serves to illustrate one of the neat little domestic inventions for which Americans are so famous. It is intended to dispense altogether with the present wire spring stop employed to keep umbrellas up or down. An umbrella being fitted with it, it is only necessary to push the runner to raise or to pull the runner to lower ribs. It has been patented by a Dr. Higgins, of New York, and is only introduced into this country by Messrs. Sangster.

The construction of the runner is as follows:—The inner tube A has fixed to its upper end the stretchers *s*, as in ordinary cases, and is substantially like the runner usually used, except that it is longer, and has cut through it a slot *a*, intended to receive the spring *c*, fitted in the stick C, and which keeps the umbrella closed or expanded. Over the tube A is an outer tube P, which is somewhat shorter than A, and slides up and down upon it, and is swelled or expanded at or about its middle, as shown, sufficiently to allow the spring *c* to be fully expanded, or thrown out when such swelled part is over either of the springs, at which time the outer tube also entirely conceals the spring. The action is as follows:—When the umbrella is shut, and it is desired to open or raise it, it is not necessary to press with the thumb or finger the spring *c* down through the slot *a* and into the spring recess in the stick, as has been done in ordinary umbrellas to allow the runner tube to be pushed up, but the outer tube P is moved upward and upon the tube A until its upper end comes in contact with the stretcher rim s^1. The first upward movement of the outer tube P brings the inclined surface or face *b* of its swelled portion against the spring *c*, and presses the spring into the stick, so that the tube A can pass over it as if the spring was forced in by the thumb or finger, and then the further upward movement of the outer tube carries the inner slotted tube along with it over the spring, and thus raises or opens the umbrella, as in ordinary cases. A continued movement in the same direction of the two tubes of the runner in the manner described thus performs the two offices of first pressing in the holding spring, and then carrying up the inner tube, which expands the umbrella. When the umbrella is fully expanded the slot a^1 in the tube A is brought over the upper spring of the stick, and the spring passes into the slot and holds the umbrella open. When it is desired to close the umbrella a similar movement of the runner tubes takes place, but in an opposite direction.

FLORAL CULTURE.

(See page 337.)

CLIANTHUS. — Nat. Ord. Leguminosæ. *Linn.* — *Diadelphia Decandria.* This splendid plant, which has hitherto been considered as very difficult to cultivate, has, upon further acquaintance with its habits, proved quite the contrary. Sown in the open air on a dry, warm sunny border in May, it has grown luxuriantly and bloomed profusely all summer with ordinary treatment. It requires but little watering.

CLIANTHUS DAMPIERII, one of the most beautiful plants in cultivation, about 3 feet in hieght, with neat compound leaves, and drooping clusters of large, rich *scarlet*, long petaled, pea-shaped flowers, three inches in length, something similar to the splendid blossoms of the Coral Tree, each flower being picturesquely marked with a large, black, cloud-like blotch in front. From New Holland.

CONVOLVULUS TRICOLOR. — (Dwarf Convolvulus.) Nat. Ord. Convolvulaceæ. *Linn.—Petandria Monogynia.* Beautiful, free-flowering, and remarkably showy plants, with exceedingly handsome, rich colored flowers, producing in beds and mixed borders an unusually brilliant effect, either in distinct colors, ribboned, or mixed.

CONVOLVULUS TRICOLOR, rich *violet purple* with *white* center, trailer.

CUCUMIS (Ornamental Cucumber).— Nat. Ord. Cucurbitaceæ. *Linn.—Monœcia Monadelphia.* A most interesting tribe of plants, remarkable for luxuriance and rapidity of growth, which if the soil be rich, is truly marvellous. Treat the same as the cucumber, and train against a wall or trellis, or in any way that may be desired. C. Flexuosus, commonly known as the Snake Cucumber, is most singularly interesting in its fruit.

CUPHEA.—Nat. Ord. Lythraceæ. *Linn.—Dodecandria Monogynia.* A genus of plants remarkable for their beauty, freedom of blossom and ornamental appearance, both in the conservatory and flower border, admirably adapted for pot culture for blooming in winter.

NOTES AND MEMORANDA.

AMERICAN RAILROADS.—At the close of 1875, the amount of capital expended upon American railroads had risen to 4,658,208,630 dols. The aggregate earnings of the various miles in 1875 were 503,005,505 dols.; and after payment of working expenses and interest on bonds, dividends were paid on shares and stock to the aggregate amount of 74,294,208 dols.

WIRE ROPES IN THE UNITED STATES NAVY.—Commodore Schufeldt has ordered the authorities of the Boston navy yard to make several 5 in. steel wire hawsers. The United States Navy Department requires immense hawsers to tow monitors and vessels in distress, and they are put on American men-of-war for use when required. The usual appliance is a 12-in. hemp rope, but it swells when wet and becomes very heavy by absorption of water. The new steel wire hawsers will be 7 in. less in diameter, and they will probably be in every respect better.

POLLUTION OF RIVERS.—Last week an illustration of the effect of river pollution, through manufacturing refuse being cast into the stream, was afforded between Guildford and Godalming, in Surrey, in the river Wey. Tons of dead fish were found, and in such quantities as to be sold in the neighbourhood and London for the purpose of manure. The cause of this has been traced to some paper mills situated on the Wey above Godalming, and the authorities are taking active steps to abate this nuisance. Should such an occurrence happen on a salmon or trout stream, we imagine that there would be little delay in passing the Rivers Pollution Bill during the present session, although already its discussion in Committee in the House of Commons has twice lately resulted in a "count out." Action for public good is generally stimulated when powerful, although private interests suffer in a pecuniary point of view, and perhaps the "accident" here named may have the desired effect on our tardy legislators.—*Engineering.*

ANCIENT TOUGHENED GLASS.—In a "Book of Curiosities" we read:—"There was an artificer in Rome who made vessels of glass of so tenacious temper that they were as little liable to be broken as those that are made of gold and silver. When, therefore, he had made a vial of the purer sort, and such as he thought a present worthy of Cæsar alone, he was admitted into the presence of their then Emperor Tiberius. The gift was praised, the skilful hand of the artist applauded, and the donation of the giver accepted. The artist, that he might enchance the wonder of the spectators, and promote himself yet further in the favour of the emperor, desired the vial out of Cæsar's hand, and threw it with such force against the floor, that the most solid metal would have received some damage or bruise thereby. Cæsar was not only amazed, but affrighted with the act; but the artist, taking up the vial from the ground (which was not broken, but only bruised together, as if the substance of the glass had been put on the temperature of brass), drew out an instrument from his bosom and beat it out to its former figure. This done, he imagined that he had conquered the world, as believing that he had merited an acquaintance with Cæsar and raised the admiration of all the beholders; but it fell out otherwise, for the emperor inquired if any other person besides himself was privy to the like tempering of glass. When he had told him 'No,' he commanded his attendants to strike off his head, saying 'That should this artifice come once to be known, gold and silver would be of as little value as the dirt in the street.' Long after this—viz., in 1610—we read that, among other rare presents then sent from Sophy of Persia to the King of Spain, were six mirrors of malleable glass so exquisitely tempered that they could not be broken."

MONSTER MACHINES.—The growth of the guns has necessitated a corressponding increase in the size and power of the machinery by which they are produced, and nearly all the plant of the Royal gun factories is about to undergo a transformation. *Iron* says: "Two very remarkable lathes are being made in the Dial square with the view of being prepared to turn out rapidly a succession of 30-ton guns, and if requisite to set to work upon monsters yet more tremendous. These lathes are to be nearly 80 feet long, and fitted with double saddles and quadruple gearing, and they will be capable of slicing off iron shavings eight inches broad, and thick in proportion, at a cut. A remarkable crane has been planned and is about to be erected in rear of the Royal gun factories, Woolwich. It may be described as a circular traveller. On a strong pedestal about 30 feet high, two arms or branches will radiate horizontally like the hands of a watch, the extremities of which will rest upon a circular platform supported by columns. The branches will be moved by steam power all around the compass, pivoting in the centre, and it is estimated that with sufficient tackle they will lift 1,000.

THE CENTENNIAL—ONE MORE MONTH.

There remains only two weeks before the closing of the greatest exhibition the world has ever seen. We hardly know how to say more than we have already said, to induce all who can possibly manage to do so, to visit this wonderful exhibition. It is really worthy of any sacrifice that may properly make to compass the means of visiting it. In extent it is overwhelming, in artistic beauty it has been surpassed by European exhibitions, but in instructiveness, in interest for all—no matter what one's tastes, it is very far the greatest "World's Fair" yet held. The American portion would be naturally the strongest in machinery, and it is certain that such a gathering of devices, in which iron, informed by ingenious brains, is made to do the work of hands, was never known. Such another assemblage of machinery at work (and machine products), as are now congregated in the acres of the Machinery Building, and worked by the miles of shafting all moved by the famed Corliss engine—itself an exhibition—is scarcely possible in any other part of the world, and will not be seen in this country during the life time of most of us. Then there is the farm machinery in the Agricultural Building, equally extensive in its way, and presenting objects for many days' study. Then the Main Building will give a careful observer a better idea of the products and manufactures of the whole world, than many get in a journey abroad, and though there is much rubbish in the two immense Art galleries, there is still much that is of great interest. The Horticultural, the Dairy and the Government Buildings have already been noticed; besides there are the Mineral, the Shoe and Leather, the Carriage, the Wagon and many other buildings, which, though called "Annexes," are exhibitions of themselves. One can spend a day satisfactorily in visiting the various State buildings, some of which, like Kansas and Colorado, Arkansas and West Virginia, have each collections of more interest than one often finds at a County or State Fair. The writer, after his fourth visit from 3 to 10 days each, finds that at each visit the immensity and excellence of the exhibition grows upon him. While feeling that one can say that he has thoroughly seen the *whole*, not if he began on the first and staid until the last day, we are sure that every one who can possibly manage to visit the exhibition, whether for one week or more, or if unable to manage that, gives only three days to it, will feel amply repaid—repaid not only in the instruction he may receive, but in the feeling of pride that he is an American citizen, in the 19th century of the world's history, and at the end of the first century of his country's history. We would repeat that the expense of living in Philadelphia is not large. We know of those who found good board and rooms for $8, or $10 a week, and we have had letters from private individuals offering to furnish lodging, breakfast and 6 o'clock dinner for $1.50 a day. One accustomed to look out for himself in a strange place will have no difficulty in finding comfortable quarters. Go to the exhibition even at some sacrifice—it is an investment that will make large returns.—*American Agriculturist.*

EXPERIMENTS WITH PRESERVING WOOD.

The *Polytechnic Review* makes a summary of some valuable experiments which have been made with preserving wood with different mineral solutions. The tests were made with railway sleepers. Of pine sleepers impregnated with chloride of zinc, after 21 years of service, the proportion that had been renewed was 31 per cent; of beech sleepers impregnated with creosote, after 22 years, 46 per cent. had been renewed; of oak sleepers, not impregnated, after 17 years, 49 per cent. had been renewed; of oak sleepers treated with chloride of zinc, at the expiration of 17 years, 20.7 per cent. had been renewed. In all of these cases, the conditions to which the wood had been exposed were very favourable—the road bed being a very good one, and permitting of excellent drainage.

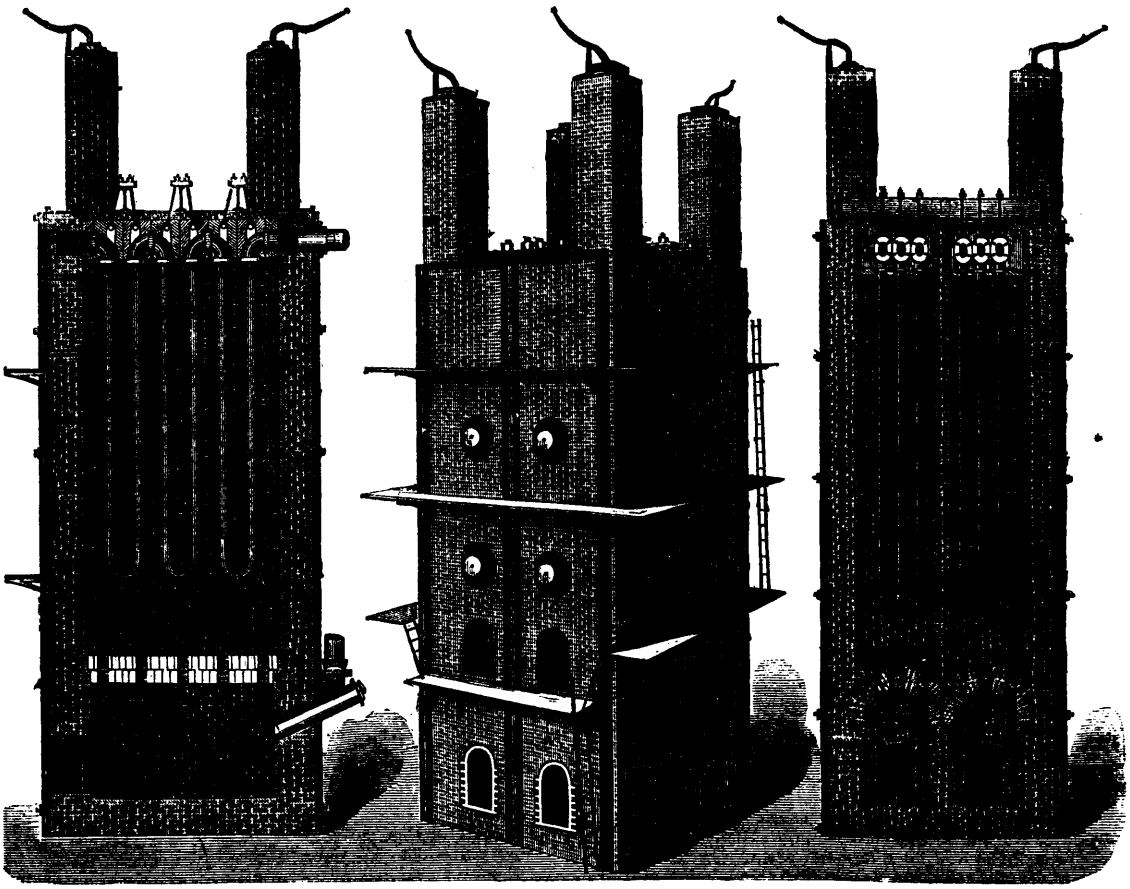
Test samples taken from sleepers that were allowed to remain at the expiration of the respective periods named, exhibited a perfectly sound cross-section.

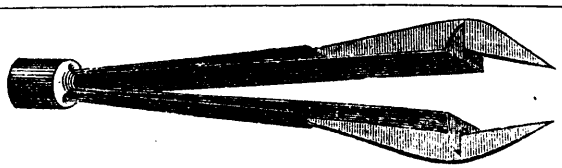
The following statement contains the results of a similiar set of observations made upon the Kaiser-Ferdinands Nord R. R., viz:

According to these observations, the proportion of renewals was, with oak sleepers (not treated) after 12 years' service, 74.48 per cent.; with oak sleepers, treated with chloride of zinc: after seven years, 2.29 per cent,; with oak sleepers, impregnated with creosote oil, after six years, 0.09 per cent.; with pine sleepers, impregnated with chloride of zinc, after seven years of service, 4.46 per cent.

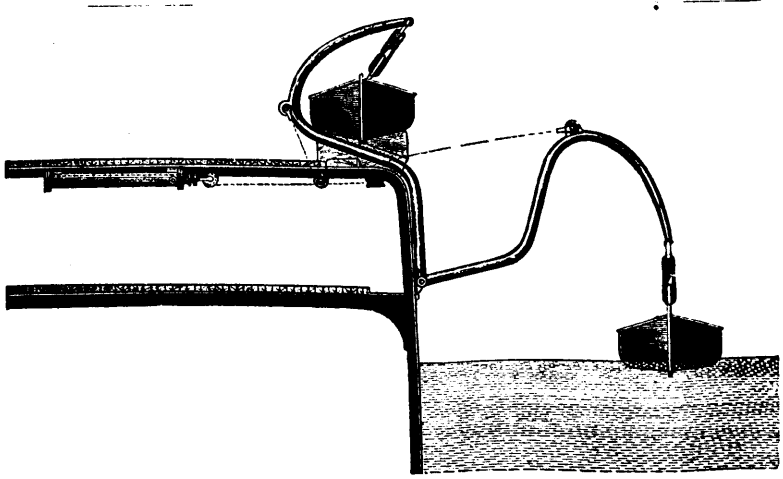
The practise of the Kaiser-Ferdinands-Nord R. R., since the year 1870, has been to employ only oak for sleepers, which are impregnated either with chloride of zinc or with creosote oil.

WEIMER'S HOT BLAST STOVE.





KNOTT'S TUBE SCRAPER.



BOAT LOWERING APPARATUS.

AUTOMATIC UMBRELLA RUNNER.

THE FAMILY FRIEND.

This part of the MAGAZINE, for the future, will be devoted to instructive domestic reading for the *Home Circle*, such as SHORT PLEASING STORIES, DRAWING, MUSIC, BOTANY, NATURAL HISTORY, POPULAR GAMES, and amusements for boys and girls, NEEDLE WORK, AMATEUR MECHANICAL PURSUITS, and all the elements of a *practical domestic education*; also GARDENING and AGRICULTURAL NOTES.

FLORAL CULTURE.

CUCUMIS PERENNIS.

CUCURBITA LEUCANTHA LONGISSIMA.

CUCUMIS FLEXUOSUS.

CLIANTHUS DAMPIERII (GLORY PEA).

CUCUMIS DIPSACEUS.

CENTAUREA CYANUS.

BEES AND THEIR INSTITUTIONS.

(See page 316.)

(Concluded from our last.)

Each insect, as it quits the cell in which it was reared, leaves behind it its cocoon. As soon as a cell is vacated, some of the workers go in to clean it out and prepare it for future use; in doing this the film or silky threads is not removed, but is incorporated into the walls of the cell; as many as seven of these cocoons have been removed, one after the other, from a single brood cell. While the successive deposit of the cocoons strengthens the comb, it also contracts the cells, and in these smaller apartments the nurse bees are reared. These bees differ from the other workers only in their size and in the functions which they fulfill.

A colony of bees frequently becomes queenless either by accident or through natural causes. In this case a most singular scene may be witnessed in the hive. The bees leave their ordinary work when the news has been communicated throughout the hive; they huddle together as if in the deepest consternation. A great buzz, apparently of consultation, is heard. Finally they seem to come to the conclusion that there is no mending the matter, and they agree to set to work to make another queen. Several worker larvæ, in cells not adjacent, are selected and devoted to royalty. (Several are chosen, to provide against contingent loss). The worker maggot chosen may be two or even three days old. The first thing the bees do to each of the selected larvæ is to enlarge its cell by cutting away the partition walls of three adjacent cells, thus throwing them into a single apartment. The worms occupying two of these three cells are destroyed, and all the ordinary food removed. The maggot is then supplied with different food, known as royal jelly, and with a much larger quantity of it. This jelly is a translucent substance, possessing a slight acidity and astringency of taste. The embryo bee which has been taken from the ranks and anointed queen receives the most devoted attention. She is royally supplied with a superabundance of food. When she is ready to go into the condition of a nymph, the bees cap her cell over with a pendent convex cover; and the cell looks, in this condition, more like a roasted peanut than anything else. When the queen is mature, the bees thin the cover of her cell by scooping out waved circles, till it becomes easy to distinguish the royal nymph within. She is generally retained prisoner by her subjects for some days after she has reached her full development. This is more frequently the case when the queens are reared for swarming time than when they are made by the bees in order to supply a deficiency.

The captive queen seems very impatient of her detention. She utters a cry, called by apiarians piping. The workers supply her with honey by means of a small hole in the cap of the cell, through which she extends her proboscis to be fed. Many observers, and among them some of the most accurate and faithful, say that the worker bees stand with their heads inclined, as if in reverence, while this note is sounding.

The moment a queen is released her whole energy is concentrated upon one point. She traverses the comb eargerly seeking for other royal cells. When she finds one, she falls upon it in fury, tears away the cover, and stings the nymph within to death. In this way she destroys every possible rival to her own power within the hive.

The bees generally provide against the simultaneous emergence of the several queens which they rear, by selecting larvæ in different stages of development. Occasionally, however, two queens come out at once. They soon meet as they wander over the comb in search of royal cells. When this is the case, the workers, who under every other combination of circumstances defend their queens with their very lives, draw back, clear a space, and watch to see the result of the royal combat. The two queens rush upon each other, they grapple, and each endeavours to sting her antagonist fatally. If they happen to get into such a position that the thrust of the stings would prove fatal to both at the same time, their instinct teaches them to withdraw; the hive must not again be left queenless; private animosity must yield in favor of the public weal. They, however, soon rush again at each other. Finally one or the other gains such an advantage that she can destroy her rival without forfeiting her own life, and then the fatal thrust is given. It was long believed that the queen, like the drones, possessed no sting, because she will allow herself to be torn limb from limb rather than use it on any but a royal antagonist.

The peculiar treatment by means of which the larva of a worker is converted into a queen is, as far as we at present know, without a parallel in the annals of natural history. A difference of food, in kind and amount, increased room, and possibly a change of position, to which the embryo insect is subjected, has wrought a transformation almost too wonderful for belief. It is not a mere superficial change which has been effected, but one which penetrates far below form and structure, to the very mystery of life itself; it is a transformation alike of function, of structure, and of instinct. The larva which, under the ordinary conditions of development, would have become a worker, which would have gathered the provisions and stored them, which would have defended the hive and guarded it, which would have reared the young, and performed the thousand domestic, civil, and military offices of the common hive, is converted into a queen who does not possess a single habit in common with the workers. The whole structure of the insect is also changed. The head, instead of being triangular, is round, the legs lose the pollen baskets and brushes, and the ovaries, which in the common bee are rudimentary, become enormously developed. The instincts are not only changed, but in many cases are reversed by this difference of treatment. The worker goes out of the hive many times every day, the queen but twice in her life. The worker is ready to sting anything which interferes with it, but never under any circumstances uses its sting upon a queen; the queen will die sooner than use its sting upon anyordinary foe, but will fly in fury upon another queen and thrust her through. The maternal instincts belonging to the brute creation are curiously divided between the workers and the queen. As mother the sovereign carefully deposits her eggs where they will have the best chance of coming to maturity; here her care ceases. Just at this point the workers take up the maternal duties, and they perform them with a zeal and devotion worthy of all praise. Increased room and two days' feeding on different food have wrought this miracle. It is remarkable, too, that the queens require four days less to develop, and live six or eight times longer than the workers.

Among the workers of a swarm there are found, here and there, a few which are fertile. In the cases where investigation has been possible, it is found that these workers, when larvæ, occupied cells adjacent to the royal cell, and so, it is probable, partook of the royal jelly and became partially transformed. They have bodies which are longer and slenderer than become bees, and which approximate more nearly to those of the queen. They never lay anything but drone eggs.

Before swarming time several queens are reared (in this case on the edge of the comb, and frequently they depend from it by a sort of stem). It is not by any means true that swarming takes place always in consequence of the overcrowding of the hive. It seems to be closely connected with extreme heat, whether as cause or effect has not been very satisfactorily ascertained. A number of royal cells have been constructed, so that when the old queen leads off the swarm, a new one may be ready to emerge and take her place in the old hive. The queen wanders over the comb in a restless way; her agitation is communicated to the other bees; a commotion arises; the bees gorge themselves with honey, send out a few scouts to discover a secure place for the swarm, and finally pour out of the entrance in a steadily increasing stream. Among them is the queen, who generally rises, and the workers cluster around her. Sometimes she falls and is lost in the grass, and then the bees return to the hive from which they have just issued. An inverted hive is held below the cluster of bees, which have happily found their queen and settled around her. As many as thirty swarms have come from a single stock in one season; some of these, however, were in the second generation.

Usually the fertilization of the queen take place in June; after this, early in July, there is a general massacre of the drones. When there is no queen, or only a drone laying queen, in the hive, this slaughter is deferred. The bees fall upon the defenseless drones, pierce through their abdominal rings with their little barbed and poisoned darts, and then twist themselves in order to extricate the sting without injury to themselves.

The sanitary regulations of the hive are very wonderful; nothing uncleanly or offensive is ever allowed to remain which it is within their power to remove. Réaumur mentions that a snail once invaded one of his observing hives and attached itself to a pane of glass. The weight of the creature was too great for even bee industry and enterprise, but not too much for bee ingenuity. They fastened the shell securely to the glass by means of propolis, and then sealed over the mouth of the shell with a quantity of the same gum. A slug which was once caught in one of Marelde's hives met a similar fate, except that, in this

case, the whole body of the creature was entombed in the propolis.

This same substance is used to exclude every enemy of the insect tribe, as well as moisture and draft. The bees know very well that currents of air are desirable and drafts treacherous. While they cut off every avenue for the entrance of air where it would make them liable to disease, they supply a steady ventilation where it is needed. Lines of workers station themselves radially from the door to every portion of the hive; by a constant and well timed motion of their wings, steady currents of air are generated, which keep the hive pure and sweet. The force of the current is sufficient to turn small anemometers.

A guard is always stationed at the door of the hive to exclude enemies. The insects inside assume that the guards have done their work properly; for after robber bees or any other intruders have found their way in, it is generally long before any notice is taken of them. Occasionally a large moth, the *sphinx atropos*, or death's head moth, effects an entrance (Figs. 12 and 13) in spite of the vigilance of the guard. Once inside, the ravages of this creature are terrible. On dissecting one, a tablespoonful of honey was found in its stomach. A very curious instance of transmitted intelligence is recorved of a swarm of bees, in connection with this foe of theirs. One of these moths had committed a serious raid upon the winter store of the swarm before it was discovered: several years afterward another member of the same family of moths entered the same hive; the bees at once took measures to secure themselves; the moth was excluded; barriers of wax were erected so that the door would not admit it, though the opening was still large enough for the bees themselves. The tradition of this Goth had evidently been handed down: they knew all about him the second time he came. Several generations of workers had been born and had died in the meantime, for the workers live only from five to seven months at the furthest. The ordinary bee moth is a terrible enemy to the hive, and does much greater damage than the sphinx, because its attacks are so much more insidious, and because it not only devours the honey, but the brood as well.

Bees are pugnacious little creatures, if roused by any fancied wrong or by the very human vice of cupidity. They are not disposed to sting if let alone, but are sure to revenge any hurt or indignity. Whole swarms often engage in pitched battles; this is almost always for the possession of territory. One piece of carelessness on the part of a bee keeper, and a whole swarm is sometimes demoralized; if they once gain access to honey, and can steal it, they are very apt to abandon all pretense of honesty, and give themselves up to a predatory life. Some of them, as has been before said, are professional sneak thieves; others are highwaymen. Huber and other apiarians mention the shameless behavior of some of these highway robbers. One of them will arrest a luckless humble bee on its way home laden with honey, and force it to disgorge its treasure. Violence will not do here, for the humble bee's honey pocket is far beyond the reach of our little thief. He does not kill his victim, but only calls "stand and deliver at the peril of your life," and generally succeeds in exacting that for which he asks. When the humble bee yields and gives up its honey, the bee allows it to depart in peace, and licks up the sweets with great gusto.

Our little honey bees, with all their wisdom and virtue, have their faults; and robbery, wholesale and otherwise, is not the only one. They sometimes make themselves thoroughly drunk on the juices of ripe fruits, and may be seen lying on the ground in a state of intoxication.

There are some things in the history of the honey bee which show a fidelity and devotion that is really touching. There is something also human in their loyalty towards their sovereings. Several instances are upon record where bees watched over and guarded the remains of their queen for days, licking and caressing her as though they were trying to restore her to life. Though food was supplied they refused to eat, and at the end of four days every bee was dead.

When a queen makes a royal progress through the hive; she is always attended by a body guard; not a particular number of bees which are devoted to her person, but a body guard which forms itself at her approach out of the subjects through whom she is about to pass, but who fall back into their regular work when she has gone by. She never lacks the most dutiful and devoted attention; those about her, whenever she moves, caress her, offer her honey, and cluster around her to keep her warm if she is chill.

When a swarm loses a queen, they are at first in deep and violent grief; if a new queen is immediately given to them, they refuse to accept her. If, however, twenty-four hours is allowed to elapse, they reconcile themselves to the idea of her loss, and receive a substitute with royal honors.

The instinct of the bee denies all our traditions of instinct; it adapts itself to circumstances, overcomes new and unexpected obstacles, benefits by experience, employs temporary expedients, and then casts them aside when the occasion for their use is gone, in a way which is marvellously like reason. It is, indeed, difficult to draw any line between the two qualities when looked at in minute detail: it is only in its cumulative power, which produces such different effects, that we can dare to make the distinction, and then we are still at a loss for a definition. It is strange to find in the insect world, among an order of beings so low in the scale of the naturalist, a faculty so nearly akin to the divine gift of reason which is man's crowning glory. But it is just here, among the bees and among the ants, that it is most marvellous and most perfect.

IRON WELL-COVERING.

(See page 340.)

BRUCK, ON THE RIVER MUR.

BRUCK, on the river Mur, is one of the oldest and most interesting places in Upper Styria. It appears to have existed 861, when, as it is related, King Louis, the German, sent a proclamation to the city of Salzburg "Bruck on the Mur."

Rudolph of Hapsburg raised Bruck to the dignity of a town in 1277. Many of the historical details concerning Bruck have been lost, from the ill-fate of the town, which has been so often destroyed that its chronicles have perished also. In the course of years this city has survived twenty wars and ten fires. Its position is extremly beautiful, being situated on the confines of the two rivers Mur and Mürz. Independently of its natural beauties, it possesses many interesting objects worthy of notice. Amongst the latter is the great iron well, the age of which is given in an inscription on it, which may be thus Englished:—

"In the year 1620
By my good town
Was I formed."

On the south side of the well can be read in German:—

"I, Hans Prasser,
Drink rather wine than water.
Did I drink water so gladly as wine,
So should I a richer Prasser be."

And then in another place:—

"Therefore have I been dug,
That all a big draught can have,
And may drink freely of me."

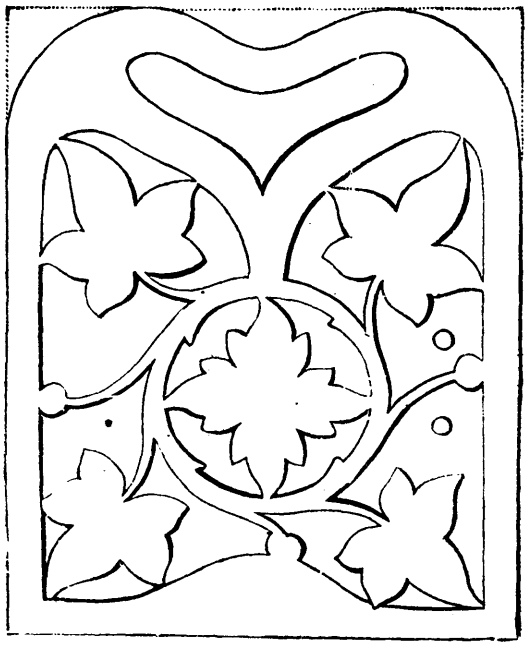
Looking beyond the Iron Well is seen on the horizon the historical "Rennfeld." From Rennfeld we have a surpassingly lovely view of the river Mürz and the peaks of the Upper Styrian range of mountains.

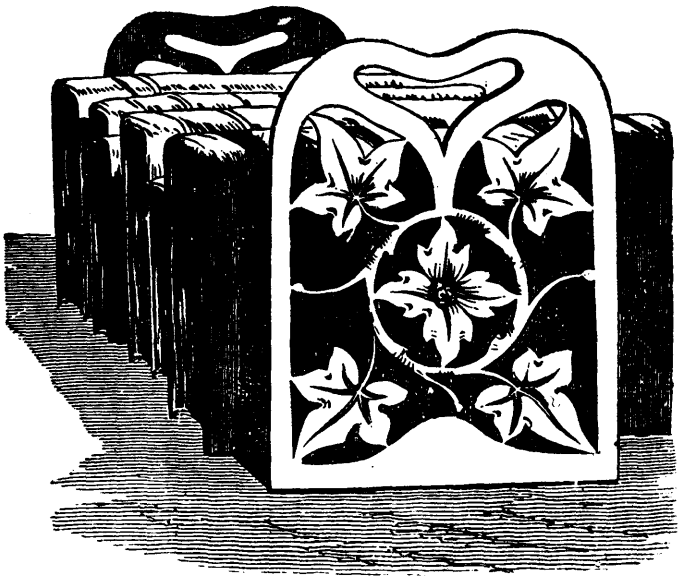
History relates that the Knights of Stubenbeag and Kneuring, with their followers, went up to the Rennfeld, 4,800 ft. high, in order to throw themselves down between the highest points of the mount to break their necks, out of desperation, through unrequited love for Agnes of Bernegg, beloved by both of them.

Near the well stands the old palace of the Archduke, now a private dwelling-house. It was built in the year 1390. Archduke Ernest, styled the Iron Duke, was its builder. Inside the palace are shown the remains of a small chapel of the same period. A large hall, in which the state councils used to be held, still remains. Added to the well and the Duke's palace, a third object worth noticing is the iron door of the sacristy of the town church. This must be as old as the well. At the Exhibition of Vienna, in 1873, this held a prominent place in the "Pavilion of Amateurs," and excited great attention and admiration.—*Builder.*

AN IMPROVEMENT NEEDED IN SLEEPING CARS.—A writer to the *Railroad Gazette* says; "The recent accident on the St. Louis, Kansas City & Northern railway, at which the treasurer of that road and some other passangers lost their lives by reason of the 'shutting up' upon them of the upper berth in which they were sleeping, should induce the Pullman Palace Car Company to take at once the necessary steps, by some efficient appliance, to prevent the possibility of such a horrid fate to any passenger. Surely some simple means can be devised to insure the rigidity of the berths, even after the spring gets loose, at some point where the passengers can get out; and every one of the hundreds of the Pullman coaches should have the upper berths secured in that manner without delay."

FRET WORK; BOOK HOLDER.

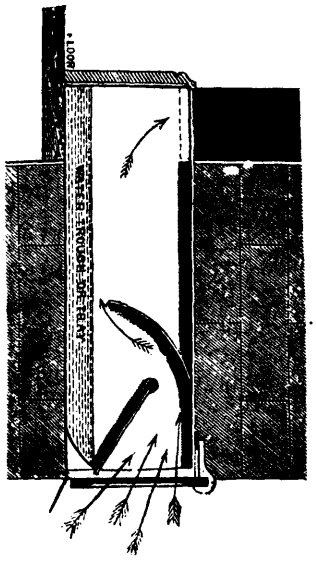




IRON WELL COVERING; BRUCK, ON THE RIVER MUR.

VERTICAL TUBE VENTILATION.

INSIDE OF ROOM.



THE CROWNED GOURA PIGEON.

THE DOVE-COT.

(See page 341.)

THE CROWNED GOURA PIGEON.

This magnificent and beautiful bird is a native of many of the islands of the great Indian Archipelago, being by no means rare in Java and Banda. In New Guinea it is abundant, as well as in most of the Molucca Islands. It inhabits the forests, and feeds upon berries, seeds and grain. It exceeds in size all the other Columbine species, being from 20 in. to 28 in. in extreme length. The bill, which is 2 in. long, is black; the tips of the mandibles are thickened, and that of the upper one moderately deflected. The head is adorned with a large, elevated, semi-circular, and compressed crest, composed of narrow, straight feathers, furnished with disconnected silky barbules, and always carried erect. This as well as the head, the neck, and all the inferior parts of the body, are of a pure grayish-blue colour. Its nest is built upon a tree. These birds are easily rendered tame; and in the East Indies they are frequently kept in courtyards, as poultry. They have all the habits of the common pigeons—billing, inflating the breast, and cooing. The sounds which they emit, however, are far from being so gentle as those to which we apply that term; they rather become a loud noise. It is said that M. Bougainville's sailors were greatly alarmed on hearing it for the first time, in the wild and unfrequented spots of some of the islands they visited; and no wonder, when they considered it to proceed from the savage cries of hostile natives in their ambush about to break forth upon them. Fear, when one is excited, as is well known, strangely exaggerates what is seen, as well as what is heard

VERTICAL TUBE VENTILATION.

(See page 341.)

Few subjects have occupied the attention of scientific men to a greater degree than the important one of ventilation, and yet with so little practical result to the community. It has long been admitted that every department should be supplied with a steady inflow of fresh air, in order to maintain the health and comfort of its occupants; but the realisation of this requirement has been impeded by two principal difficulties. For a long time it has been found impossible to admit a sufficient volume of air without occasioning draughts, and without an undesirable lowering of the temperature; and when, at the beginning of the present century, these difficulties were overcome by the introduction of vertical currents maintained by the pressure of the external atmosphere, it was discovered that the smoke, blacks and other impurities, constantly present in the air of populous places, rendered the free admission of such a current of air itself an evil. In the most important buildings in the metropolis, such as the Houses of Parliament and the British Museum, it has been found necessary to filter the air before it could be allowed free ingress; but the arrangements for this purpose have been such as to counteract the external pressure, and to necessitate an elaborate and expensive system of fans, exhausts, and other mechanical appliances for the purposes of forcing the air so filtered into the apartment where it was required.

A company has been formed to perfect this vertical system of ventilation by cleansing the air admitted, in accordance with an ingenious system designed by Mr. James Livesey, C.E., and by supplying it in a pure state, in any quantity that may be desired, to every room in the house.

The method by which this desirable purification is effected will readily be understood by reference to the accompanying illustrations. The section shows the vertical tube, to be fixed in the interior or an apartment communicating with the outer air by means of an elongated box kept constantly supplied with water. The arrows show the direction of the external air entering the grating on the outside face of the wall; the current impinges upon the deflecting place and is driven down by it on to the surface of the water, where it leaves behind any extraneous matter. It then ascends by the vertical tube, pure and fresh, and deprived of all injurious articles, which, besides being prejudicial to health, work such destruction on furniture and works of art. The water-box is easily accessible either from the inside or outside of the house; and in very hot weather lumps of ice may be placed in the trough for the purpose of cooling the air as well as purifying it. In the engraving of the apartment fitted with the tubes—which, it must be admitted, rather improve than detract from the appearance of the walls—it has been found necessary to assume a little license and show by dotted lines that which is invisible, just as in a mechanical drawing those parts which are hidden by others are frequently shown dotted; but that the currents really do ascend almost to the ceiling and then become broken up and distributed, much in the manner depicted, may readily be proved by a lighted taper held at different distances from the orifices of the tubes.

The current of air diffuses itself throughout the upper part of the room, and gradually descends, the vitiated air passing away by the chimney or other openings provided (if no chimney exist), and the air thus constantly changed removes the oppressive and "stuffy" feeling of a room heated by gas. The free admission of air gives a better draught to the fire and prevents the chimney from smoking or the necessity of opening the door. Each tube being provided with a valve, the admission of air can be regulated at pleasure.

The Purified Air Ventilating Company not only supply the tubes and accessories, but are also prepared to fix them either in new buildings or those already existing. We are informed that the system is now being extensively introduced, and we can only wish success to any efforts for promoting the general health and comfort.—*Engineer.*

EXPERIMENTAL AMUSEMENT.—MYSTIC AND CHEMICAL EXPERIMENTS.

By F. R. Jerome.

The Invisible Coin made Visible.—If a coin be placed in a basin so that on standing at a certain distance it be just hid from the eye of an observer by the rim or edge of the basin, and then water be poured in by a second person, the first keeping his position, as the water arises the coin becomes visible, and will appear to have moved from the side to the middle of the basin.

The Vaulting Knife.—Have a pot full of water standing on a table; take a pretty stiff bit of whalebone, about three inches long, also a new stiff card, which fold down the middle, longways; cut a hole through both folds at each end, half an inch or more from the ends. Put one end of the whalebone in at one end of the card, bend it like a bow, and then put the other end of the whalebone into the other end of the card. Set this into the pot with two or more inches above it of water, then place the handle of your knife upon the uppermost part of the whalebone, with the point upwards; use some words of art, as "Presto, arise!" and the knife will leap out.

The Silver Tree.—Pour into a glass globe or decanter four drachms of nitrate of silver dissolved in a pint or more of distilled water, and lay the vessel on the chimney-piece, or in some situation where it may not be disturbed. Then add four drachms of mercury. In a short time the silver will be precipitated in the most beautiful arborescent form, resembling real vegetation. Another way of producing the same tree is by pouring into a diluted solution of nitrate of silver, as above, two drachms of nitrate of mercury dissolved in four drachms of water.

The Chameleon Spirit.—A liquid which is blue when the bottle containing it is open, but colourless when the bottle is closed, may be made thus:—Put some shreds of clean copper into a small phial, fill it with liquid ammonia, and cork it air-tight; nothing will take place. Open the bottle and let it remain for a few hours; the liquid will become blue. Cork the phial; after some time the liquid will become colourless. Re-open the phial, the liquid will become blue again. It will be found necessary sometimes to add to the mixture, after it has remained exposed to the air for some time, a little more copper.

The Faded Rose Restorer.—Take a rose that is quite faded, and throw some sulphur on a chafing dish of hot coals, then hold the rose over the fumes of the sulphur, and it will become quite white; in this state dip it into water, and put it into a box or drawer for a few hours, and when taken out, it will be quite red.

The Sub-Aqueous Volcano.—Take one ounce of saltpetre, three ounces of powder, of sulphur vivum three ounces, beat, sift, and mix them well together; fill a paste-board or paper mould with the composition, and it will burn under the water till spent. By this many a wager may be won, as few will believe it before they have seen tried.

A Lamp that will Burn Twelve Months without Replenishing.—Take a stick of phosphorus and put it in a large dry phial, not corked, and it will afford a light sufficient to discern any object in a room when held near it.

A new freak of fashion consists of birth-announcement cards. They are very small, and read thus:—"Compliments of Mr. and Mrs.——and son (or daughter, whichever the case may be), Feb. 30, 3 p.m." Among relatives we presume these cards will have more or less significance in the silver cup line.

RECEIPTS FOR SICK PEOPLE.

FOOD FOR THE SICK.

Any person obliged to provide food for the sick must have been struck, after a few days, with the difficulty in getting a *variety*. There are really but few things a sick person cares to eat, and does not want to eat the same thing too often. As a rule, the sick prefer *plain* articles, of the best quality; cook in the most approved, simple style. As a general thing, they do not eat game or fish, and prefer good beef to almost any thing else, unless lamb-chop. Occasionally, fowl is eaten, usually chicken. Greasy foods, or foods cooked in grease, will not be tolerated; nor are spices or highly seasoned dishes as apt to be liked as those without them.

As sick people do not eat a great deal, too great a variety should not be offered for any single day. If there is reason to think the illness may be a long one, the nurse should keep in mind her resources, in the shape of foods likely to be eaten by that particular patient in that special attack, and may out the future accordingly. In this way, the more delicate and concentrated can be held back until she shall have been compelled to abandon some of the others, quite as useful early, but less so later. For instance, where beefsteak, lamb-chop, or soups *can* be given, the nurse should keep back the beef-tea until the later stages of the disease, when the stomach can digest only the most delicate food. By delicate is meant digestible, with the least tax upon the stomach; not expensive, or saturated with some almost intolerable "flavor," as some persons about the sick-room seem to imagine.

The reader has doubtless often seen beefsteak, lamb-chop, beef-tea, and brandy and cream given during the day, when the first *alone* should have been used.

Tenderloin cut across the grain, as all meats should be, is the best part of the beef for the sick. The steak should be about half an inch or a little more in thickness, and broiled over fresh coals not giving off smoke. The object in broiling all things should be at once, before the *escape* of any of the contained juices of the piece, to secure over the whole surface a film of cooked substance which will act as a shell to *retain* the useful parts within until they become cooked.

The meat should be cooked enough to be palatable. The hard, dry portions should be rejected as carefully as scraps of bone. Pepper and salt should be used according to taste.

A tender lamb-chop, if properly broiled, with the fat removed before serving, is often acceptable, and is as easily digested and as nutritious as any thing likely to be given.

The convalescent often strongly express a desire for something salt, and with a different taste from the ordinary food. Thin shoving of dried beef cut across the grain, or a fragment of broiled smoked herring, or herring-roe, is a grateful and usually harmless addition to the meal.

Roasted potatoes are preferred by the sick, as a rule, to all other forms of preparing them. To get a couple of mealy ones suitable for the delicate, at least half a dozen should be cooked. During convalescence, when beefsteak begins to be eaten, a little well and dryly cooked tomato it not only palatable, but useful. Potatoes fried in very thin slices, without a particle of grease appearing on them ("Saratoga style"), are often grateful to the convalescent.

BOILED RICE.

Most readers think this is something easily prepared. So it is, perhaps, but few nurses have an idea of the necessity of having it properly done—that is, cooking it until every grain becomes perfectly *softened*. If the grains are not reduced to this soft state, rice is almost certain, when swallowed, to irritate the digestive organs, and instead of soothing the parts and sustaining strength, will actually produce a diarrhœa, &c. This has been frequently noticed in hospitals.

When properly boiled until each particle becomes so softened that the *grain* cannot be detected when eaten, but not cooked so much that the shape of the grain is destroyed, and the mass reduced to the appearance of paste, there are few articles of diet for the sick which can be made more acceptable to the taste of invalids than boiled rice.

MILK BLANC-MANGE.

A quarter of a pound of loaf-sugar, one quart of milk, one and a half ounces of good isinglass. Pour the milk into a lined sauce-pan, add the sugar in powder, and the isinglass in small shreds; then boil gently until the latter ingredient appears all dissolved. Keep stirring over the fire for about ten minutes, observing especial care to prevent these easily scorched materials from becoming so.

Strain into a pitcher, and when nearly cold pour into a mould oiled with a little of the freshest oil. When required for use, it may be carefully turned out.

RICE BLANC-MANGE.

A quarter of a pound of the best rice-flour, two ounces of loaf-sugar, one ounce of butter, and one quart of milk. Mix the ground rice with some of the milk into a perfectly smooth paste, placing the remainder of the milk into a lined saucepan, with the butter, sugar, and enough lemon-peel to give the desired flavor. Bring the milk to the boiling-point, and stir in the rice-paste. After boiling for ten minutes, pour into a mould previously greased with salad-oil. When perfectly cold, it is ready for use upon removal from mould.

ARROW-ROOT BLANC-MANGE.

Two table-spoonfuls of fresh arrow-root, three quarters of a pint of milk, lemon and sugar to the taste. Mix the arrow-root to a perfectly smooth paste with a portion of the milk, putting the rest into a linen saucepan with the pulverized sugar, butter, and lemon-peel. Let it boil, constantly stirring until thick enough for use, then pour into the mould until could enough for serving.

FROST BITE.

Exposure to the cold, of severe degree, often leaves the fingers and toes, nose, ears, and lips, more or less frozen. This condition, short of absolute *death* of the part, is termed Frost Bite. It will be observed that the portions of the body just enumerated are those most exposed, in area, to the influence of the cold, and are furthest situated from the heart; and it will, perhaps, be unnecessary to remark that persons who are *debilitated* are more apt to suffer with the same amount of exposure than the *robust*.

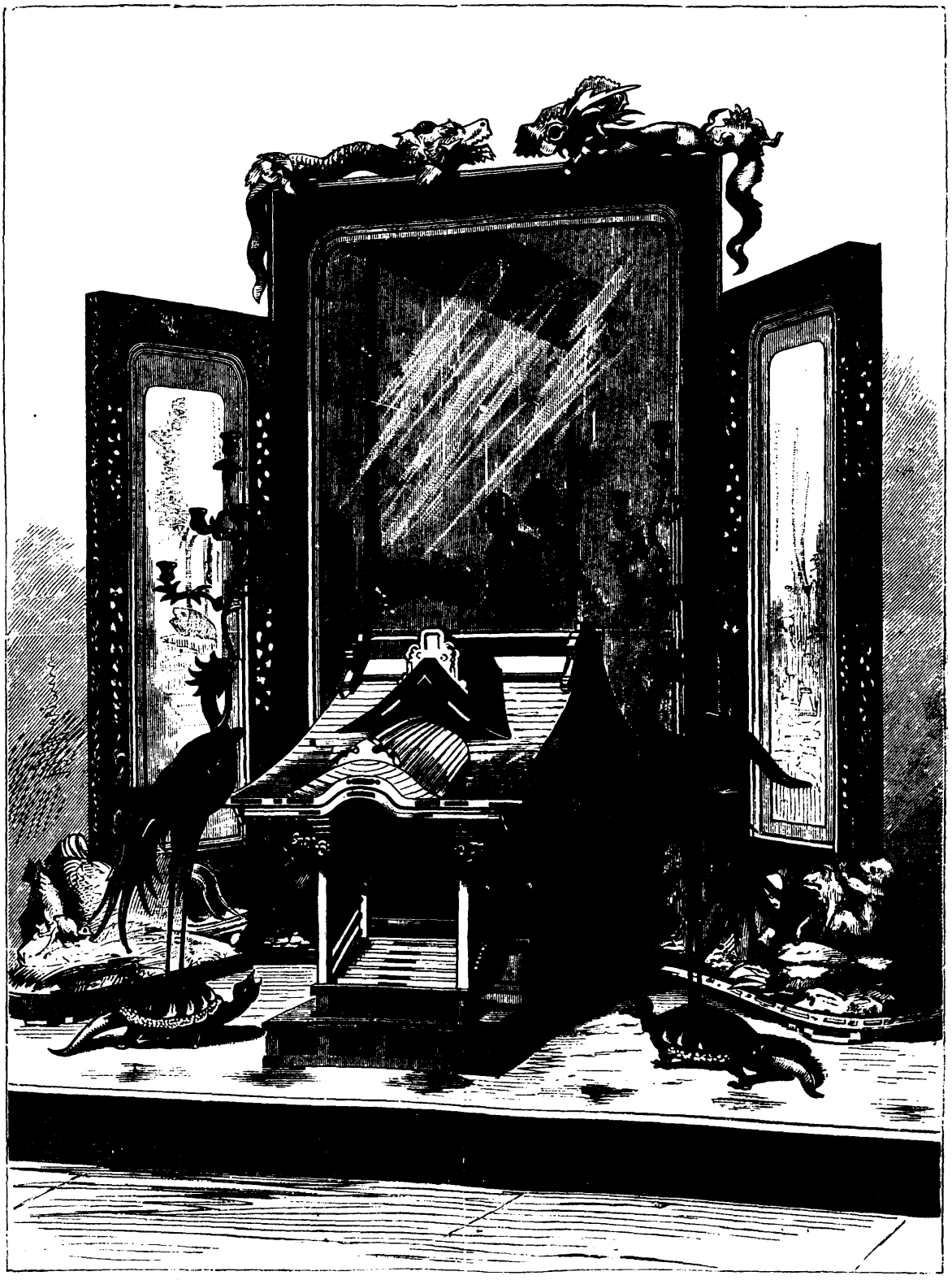
When the circulation of any part begins to succomb to the influence of the cold, it becomes puffy, blueish, and smarting. This is because the blood moves more slowly than natural through the vessels exposed near the surface. Soon this blueness disappears, and the part becomes pallid, as if the influence of the cold had contracted the vessels to an extent incompatible with the passage of blood through them. The *pain* at this point ceases; indeed, until he meets a friend, he often does not know of his mishap. At this stage the injury has become so great that, unless proper means are taken to restore circulation, complete *death* of the part ensues, and in due time sloughs away, and is detached from the line of living tissue.

What takes place in a *part* of the body, known as Frost Bite, may take place in the *whole* of it, which is known as "Frozen to Death." The blood of the extremities being gradually forced from them, under the continued subjection to the cold, is forced inward upon the larger blood vessels, heart, lungs, and brain. There is increasing difficulty in breathing, owing to the engorged state of the chest, and, what should always be remembered by one so exposed to cold, an *unconquerable desire to sleep*. To sleep *then* is to die. If the person exhibits such a symptom, he must, by all means, be kept constantly moving.

TREATMENT.

Persons exposed like those just described must be treated promptly, and with one thing never lost sight of. That is, keep the frozen person away from the heat. A person taken up insensible, or approaching it, from exposure to cold, should be taken into a *cold* room, his clothing removed, and thoroughly rubbed with snow, or cloths wrung out with ice water. The friction to every part of the body, particularly the extremities, must be continued for some time, until signs of returning animation appear. When the frozen limbs show signs of life, the person should be carefully dried; put in a cold bed in a cold room; artificial respiration used until the natural condition is established; then brandy given, also ginger tea, and beef tea. Usually, by this time medical advice will have been secured to direct further treatment. Should it not, do not forget that the patient is to be brought by degrees into rather warmer air; and lest in some *part* there might still be defective circulation, the person should be kept away from exposure to the heat of the fire.

Milder degrees of the same condition, as suspension of life in the ear, nose, finger, or toe, from exposure to cold, must be treated with the same general directions in view. The part should be kept away from the heat, and rubbed with handfuls of snow, or towels dipped in cold water, until circulation appears re-established. Exposure of the part to the heat before, we may say, it has been almost *rebuilt*, is apt to be followed by *sloughing*.



THE JAPANESE TOILET MIRROR IN THE MAIN EXHIBITION BUILDING, PHILADELPHIA.

THE TRAVELLER'S-TREE.—(URANIA SPECIOSA.)

Chilblain,

As the name implies, is when the circulation of the part has become chilled—*disturbed*, not detroyed. It is generally attended with much itching, tingling, and smarting, and is usually found in the toes, outside edge of the feet, just where the toe emerges, or in the heel. Sometimes, in persons of debilitated state of health, the hands suffer. These symptoms are particularly annoying just after lying down in bed, owing to the exposure to the heated air formed and retained between the bed-clothing by the body.

The most useful thing for these annoying symptoms, and a condition which often extends into ulceration and sloughing, is to keep away from the fire, and every night, before retiring, to bathe the feet in cold water, or rub them with *snow*. They should then be well dried with a soft towel. After this, the application of the ordinary Compound Resin Ointment of the apothecaries is often of use in stimulating the circulation through the part. The efficiency of this ointment for this special purpose can be increased by asking the apothecary to add to an ounce of it a couple of drachms of the Oil of Turpentine. It may be remarked that persons who suffer in winter from cold feet are often benefitted to a surprising degree by bathing them at night, before retiring, in *cold* water. Such persons should always keep their feet away from the fire.

Convulsions.

Convulsions, or "fits," as they are often called, are a frequent cause of alarm in the streets, or at public assemblages. In the decided majority of instances, the convulsions may be safely presumed as Epileptic; so, unless otherwise specified, the remarks here made apply to that form. Ordinary *fainting* may be confounded with it; but here the face is pale, the person perfectly still, and there is no preceptible breathing. Besides, in fainting there are no *convulsive* movements.

Often the Epileptic seizure is ushered in with a peculiar *sharp cry*, as the person falls over. It does not always occur, but when it *does* there can be no doubt, if it is a convulsion at all, that it is Epileptic. There is frothing of the mouth, sometimes tinged with blood from the tongue or a fold of the lips having been caught between the teeth at the moment the spasm commenced in the muscles of the jaws. Sometimes there are general convulsive moments of the whole body; often of parts of it only. At first the face is pale, but usually, in the course of a few moments, it becomes livid, except around the mouth, which often continues pale, in strong contrast with the color of the rest of the face. As a general rule, it may be said that the convulsive feature of attack does not last much longer than four or five minutes, although to bystanders the time naturally seems longer. Then the person open his eyes with a certain degree of intelligence, or revives enough to speak; and, as will be said, it is at this point of the attack that most must be done. Sometimes there is nothing beyond it, and the individual gets up, hurriedly puts on his hat, and walks off, apparently the least concerned of anybody about.

If this happy termination does not take place, this brief semi-conscious interval gives way to a *heavy stupor*, varying in duration from thirty minutes to three or even six hours.

In Epileptic Convulsions there is usually nothing to be done. Ignorant people on such occasions are apt, upon the general plea, "if you do not know what to do, do something," to insist upon "opening the hands," as the phrase is, saying that the patient will be better as soon as they can do it. The truth is, they cannot do it until the patient is better. All interference of this kind is *hurtful*, and no good can come of it. All rude efforts aggravate the trouble, perhaps, by exhausting still further the muscular strength of the patient.

All that can be done is to keep the person from injuring himself or hurting others during the violent convulsive movements, by removing him to some clear space where there is nothing to strike against. Do not even attempt to hold the limbs, but loosen everything about the throat and chest.

Treatment.

Wait a few minutes for the convulsive moments to cease, and the semi-conscious state to appear. As said above, it will soon be seen. Then, if the person is a stranger, get his *name* and *residence*, if possible, with such other knowledge as may be useful. In the meanwhile, keep the crowd away. This is a very important measure of assistance in convulsions, as in every other emergency. By this is not meant that people cannot bend over the victim, but that a *perfectly* free space of at least two feet on each side should be kept, with none in it but the one or two immediately assisting him.

Thirty drops of the Aromatic Spirits of Ammonia, in a teaspoonful of water, may be given the patient, as it is thought by many physcians to lighten and shorten the later stupid stage. The spasmodic condition of the muscles of the jaws can usually be overcome enough, with a little gentle dexterity, to permit it to be got into the mouth with the assistance of another spoon or a piece of smooth stick. After getting the liquid into the mouth, press down the base of the tongue, and the mixture will readily run down the throat. As much of it will necessarily be lost during the operation, double the quantity may be prepared for use. If more than the thirty drops should be given, no trouble from it need be feared.

If the name and residence have been secured, as it often can, at the interval alluded to, the friends of the person can be advised. If not, he should be taken to some place of security until consciousness returns.

Persons liable to Epileptic Convulsions should *never* be permitted go from the house without a strip containing the name, residence, and disease, attached inside of the coat, where it will at once be seen upon the unbuttoning the coat over the chest. A reference on it to a memorandum in some pocket containing a suggestion as to the duration of the attack, useful remedy, if any, in assisting restoration, would often materially add to the comfort and advantage of the afflicted person.

Other Convulsions are Apoplectic. These are not common, in comparison with others. As a rule, little can be done by bystanders, further than loosening everything about the neck. This should be done in all Convulsions.

The Convulsions known as Hysterical are usually found in young women who are not very strong. Until assistance comes, act as directed in Epileptic Convulsions. The distinction between them cannot be expressed, to a useful extent, to unprofessional persons.—*Accidents and Emergencies.*

LYCOPERDON GIGANTEUM.

(PUFF BALL.)

(See page 348.)

We give a sketch of a Lycoperdon Giganteum gathered, with several others of similar size, on the western mountain, Cote St. Antoine, by Mr. Fleet. This fungus may be found at this season in various parts of the mountain and in the woods. It grows from one inch in diameter to fifteen and eighteen inches. The largest one on record is noticed by Lindlay as three feet in diameter. Some are a perfect sphere, others are irregular in form like the one which we sketch. They are at first white in flesh, of a mushroom order, resembling cream cheese in texture. During this state they are edible, but when the spores are ripe they change to a dark colour and are unwholesome. The spores which one of the larger kinds contains are countless. Lindlay calculated that the large fungus alluded to contained ninty-six billions of spores. Yet with this profuse quantity of spores very few are propagated. Should all the spores germinate, the crops and trees would suffer. All fungi serve a most important part in the economy of nature. They render all decaying matter harmless to man, and are useful in reducing it to the condition of fertilizers for other plants. The spores seem to germinate only where their growth would be useful for this object. The fungus in question forms a most excellent food, and one of them would be sufficient for a family for a day. It is cooked in various ways. Like a beefsteak, it may be cut in slices and broiled with pepper, salt and butter. It may be cut in small squares after a slight cooking, mixed with white sauce and stew. Beefsteaks and cutlets may be dressed with it while cooking. Omelettes may be made by first stewing small bits with butter and then adding them to the omelette before cooking. But steak, chicken, veal and mutton pies are much improved by placing bits of the fungus in them before cooking. A gentleman, who has given several lectures on fungology, lately gave a lunch at the Carlton Club at which the Lycoperdon formed the chief article of diet. The menu was as follows:

Potage:—Purée de Lycoperdon Giganteum.
Timbales de Volailles au Lycoperdon Giganteum.
Côtelettes d'Agneau do do
Lycoperdon Giganteum à la Beefsteak.
Filets de Bœuf au Lycoperdon Giganteum.

Dr. Edwards, food annalist, one of the guests, declared the fungus a most excellent and nutritious article of diet, while its flavor is most delicious and superior to the mushroom. The Lycoperdon is unlike any other fungus and cannot be mistaken for any that are unwholesome. Just now, the fields are almost white with the harvest of mushrooms, and a walk into the country cannot fail to procure a good basket full.

DISCOVERY AT POMPEII.

A discovery has been made at Pompeii, consisting of a number of objects of gold and silver, and close to them the carbonized skeletons of two men, who would seem to have been borne down in the storm of ashes while endeavouring to escape with their valuables or plunder. Among the articles found are eight rings, six pieces of money, two pairs of earrings, two large armlets, each ornamented with thirteen pairs of half globes, with little shells upon them, held together by chainwork, and a necklace of chainwork, all of gold ; a silver ring, 332 pieces of silver money, a *casserole* of the same material broken in pieces, and three large bronze coins.

The city of Pompeii, it will be remembered, was completely buried up in the year 79, nearly 1,800 years ago, by ashes from the neighbouring volcano of Vesuvius. The ruins of the city were rediscovered in 1748.

OLD SAYINGS AS TO CLOTHES.

It is lucky to put on any article of dress, particularly stockings, inside out: but if you wish the omen to hold good, you must continue to wear the reversed portion of your attire in that condition, till the regular time comes for putting it off—that is, either bedtime or 'cleaning yourself.' If you set it right, you will 'change the luck.' It will be of no use to put on anything with the wrong side out *on purpose*. It is worthy of remark, in connection with this superstition, that when William the Conqueror, in arming himself for the battle of Hastings, happened to put on his shirt of mail with the hind-side before, the bystanders seem to have been shocked by it, as by an ill omen, till William claimed it as a good one, betokening that he was to be changed from a duke to a king. The phenomenon of the 'hind-side before' is so closely related to that of 'inside out,' that one can hardly understand their being taken for contrary omens.

The clothe of the dead will never wear long.

When a person dies, and his or her clothes are given away to the poor, it is frequently remarked : 'Ah, they may look very well, but they won't wear ; they belong to the dead.'

If a mother gives away *all* the baby's clothes she has (or the cradle), she will be sure to have another baby, though she may have thought herself above such vanities.

If a girl's petticoats are longer than her frock, that is a sign that her father loves her better than her mother does — perhaps because it is plain that her mother does not attend so much to her dress as she ought to do, whereas her father may love her as much as you please, and at the same time be very ignorant or unobservant of the rights and wrongs of female attire.

If you would have good-luck, you must wear something new on 'Whitsun-Sunday' (pronounced Wissun-Sunday). More generally, Easter Day is the one thus honoured, but a glance round a church or Sunday-school in Suffolk, on Whitsunday, shews very plainly that it is the one chosen for beginning to wear new 'things.'

While upon the subject of clothes, I may mention a ludicrous Suffolk phrase descriptive of a person not quite so sharp as he might be: he is spoken of as 'short of buttons,' being, I suppose, considered an unfinished article.

COMPOSITION FOR COVERING BOILERS, &c.—Road scrapings, free from stones, 2 parts ; cow manure, gathered from the pasture, 1 part ; mix thoroughly, and add to each barrowful of the mixture 6 lbs. of fire clay ; ½ lb. of flax shoves or chopped hay, and 4 ozs. teased hair. It must be well mixed and chopped ; then add as much water as will bring it to the consistency of mortar,—the more it is worked the tougher it is. It may either be put on with the trowel or daubed on with the hand, the first coat about 1 inch thick. When thoroughly dry, another, the same thickness, and so on, three inches is quite enough, but the more the better. Let each coat be scored like plaster, to prevent cracks, the last coat light and smooth, so as to receive paint, whitewash, &c. The boiler, or pipes, must first be brushed with a thin wash of the mixture to ensure a catch.

RULE FOR SIZE OF CYLINDER.—The requisite diameter of cylinder for a 25 horse beam engine is 28 inches, and about 5 feet stroke. The nominal horse-power of any sized cylinder can be found by the following formulæ:—For low pressure or beam engines, divide the area of cylinder by 25, which will give the number of horse-power. For high pressure horizontal engines divide the area of cylinder's diameter by 12-5, which will give the number of horse-power, including all friction.

SCRAPS.

THERE are no small steps in great affairs.

WEAK men never yield at the proper time.

CREAM OF TARTAR. — The Czar. — *Punch.*

WHAT fruit is the most visionary ?—The apple of the eye.

AN INTELLECTUAL FEAST. — The entertainment of an idea.

A MAN who distrusts himself never truly confides in any one.

WHEN is an umbrella like a person convalescent ? — When it is re-covered.

IT is impossible to love a second time what we have once really ceased to love.

THE prosperous man who yields himself up to temptation bids farewell to welfare.

OUR CONSTRUCTION.—Indispensable qualifications in ironclad. —To "wear" well.—*Fun.*

A GENTLEMAN, having engaged a bricklayer to make some repairs in his cellar, ordered the ale to be removed before the bricklayer commenced his work. "Oh ! I'm not afraid of a barrel of ale," said the bricklayer.—"I presume not," said the gentleman ; "for I think a barrel of ale would run at your approach."

IT was once, says Chitty, in his work on "Contract," a mere matter of choice whether one paid or did not paid his doctor's bill. Down to the present reign the physician could not sue for his fees unless charged on special contract, the service being purely honorary. Hence the use of the term *honorarium*. A high view of professional life and duty !

LORD CHESTERFIELD happened to be at a ball in France where Voltaire was one of the guests. The former was gazing about the brilliant circle of ladies, when Voltaire accosted him with, "My Lord, I know you are a judge ; which are the more beautiful —the English or the French ladies ?"—"Upon my word," replied his lordship, with his usual presence of mind, "I am no connoisseur of paintings."

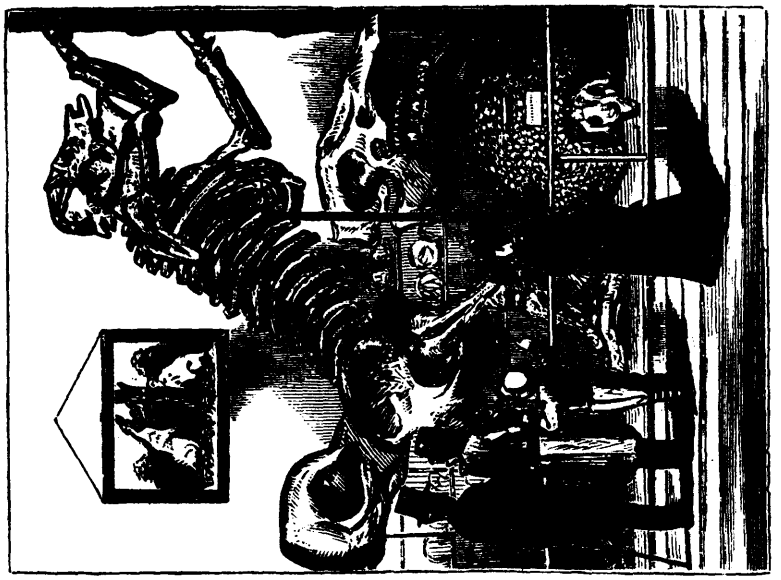
SHARP PRACTICE.—Limb of the Law : "What do you mean, sir ? You said distinctly, when I asked you the price of your ducks, they were any price I liked. Well, half-a-crown a pair's the price I like, and there's the money ; and they're legally mine, as you'll find to your cost if you're foolish enough to summon me." (Puts ducks into bag, and walks off, leaving worthy tradesman dumbfoundered.)

KEEPING FAITH.—Parents are apt to ignore the importance of keeping faith with children ; but one of the world's talented men was fortunate in having a father who never broke a promise. On one occasion, he told his little son that he should see a condemned wall demolished. But it chanced to be thrown down when he was absent. To keep his faith with the child, the father had the wall rebuilt, and the lad was present at the second demolition.

IT is said that the great pianist Liszt found himself recently in the company of a number of ladies, who begged him to produce for them "the ecstasies, the artistic raptures which his artistic talent inevitably produced." He obligingly seated himself at the piano and played. When he had finished some of the admirers had fainted. "Well," said Liszt, "I played wrong notes all through, intentionally ; so badly, indeed, that I should have been turned out of doors at any elementary school of music."

LET the winds and waves of adversity blow and dash around you, if they will ; but keep on in the path of rectitude, and you will be as firm as a rock. Plant yourself upon principle, and bid defiance to misfortune. If Gossip, with her poisoned tongue, meddles with your good name, heed her not. Carry yourself erect ; let your course be straightforward, and by the serenity of your countenance and the purity of your life, give the lie to all who would underrate and belittle you.

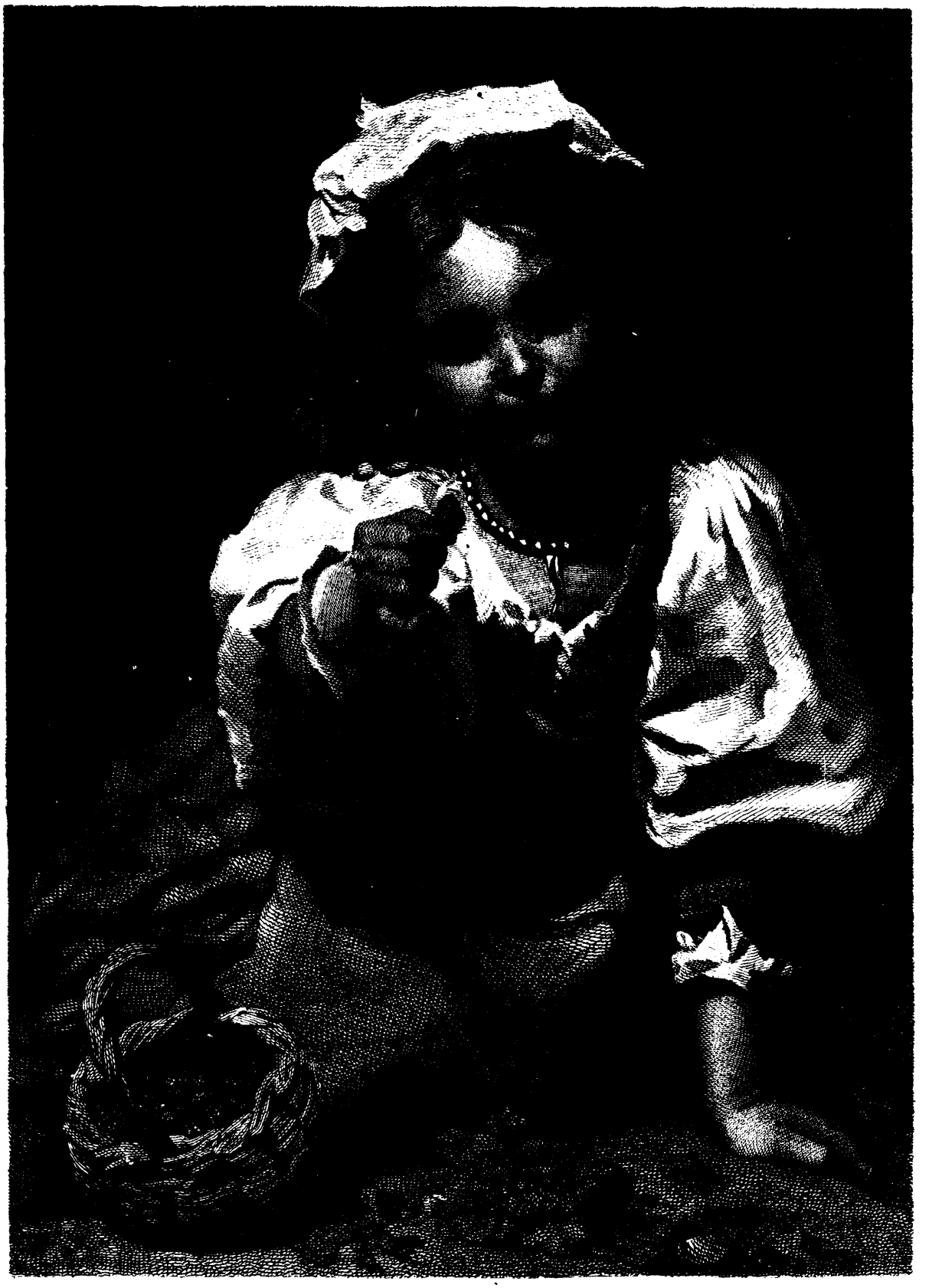
THE LONGEVITY OF TOADS is again under discussion, owing to a discovery made near Ortay. In digging up a garden some workmen unearthed two terra-cotta vases, which they at first supposed to contain treasure. On breaking them, however, two live toads were found clad in green velvet. This strange attire showed that they must be at least 200 years old, as an ancient treatise on magic and dæmonology mentions that, at the beginning of the 17th century, sorcerers dressed up toads in this manner for the achievement of certain charms. The same treatise tells the fate of an unlucky citizen of Soissons who baptized a toad, which he had gaily caparisoned for the ceremony, and was burnt alive for the sacrilege.—*Graphic.*



ANTEDILUVIAN RELICS.

FROM THE MUSEUM AT ALBANY, N. Y.

THE LYCOPERDON GIGANTEUM (OR PUFF-BALL).



THE STRAWBERRY GIRL.

FLOWER GARDEN AND LAWN.

Frames and Pits should be in readiness to receive all half-hardy plants.

Seeds.—Sow seeds of shrubs and perennials in boxes, which may be set in cold frames.

Pœonies.—The best time to set these is in the fall, when they are in a state of rest; divide and reset in good garden soil.

Bedding Plants.—Make cuttings of all to be saved over winter, as it is seldom worth the trouble to keep old plants, when new ones can be made so readily.

Cannas should be taken up before the leaves are killed by frost and stored in a shed where they can dry for a week or so; finally store them where frost and dampness cannot injure them; a good place is under the benches in a greenhouse.

The present is a better time for laying out new walks, drives, and doing any such jobs, than the spring, when work is driving. After the plan is thoroughly made and all needed materials at hand, it will be comparatively easy to carry out the details.

Clematis may be raised from seeds which should be sown at once; if they fail to start next spring, they will be quite sure to grow the following one. Many very handsome varieties can be raised from seeds of good named sorts. Some native species are worth trying.

Bulbs.—This is the best month for putting in Hyacinths' Tulips and other spring flowering bulbs. Cover with coarse litter before severe weather sets in Store tender bulbs, such as Tuberoies, Gladioluses, etc., in a dry place, where the mice will not injure them, carefully labelling the named sorts.

Dahlias.—Keep tied to stakes, and if covered cold nights with a cloth or even a paper, their bloom will often be prolonged for some weeks. After the tops are killed by frosts, leave the tubers in the ground for a few days, to ripen; dig on a sunny day, label, and take to the cellar, handling carefully, as they break readily.

Hardy Herbaceous Perennials.—The fall is the best time to divide and re-set most of these, as many start so early in the spring that they cannot then be moved with safety. Hardy herbaceous perennials should, as a general thing, be moved and divided once in three years, to keep them at their best. When left longer, the roots get matted and the soil around them exhausted.

Walks need thorough work, and to have the foundations well laid at the start; at least two feet of earth should be dug out and the space filled with stones to within six inches of the surface; then put on broken stone, and finally finish with good gravel; a walk or drive thus made will last, with the addition of a little gravel occasionally, for a life time. Always make the centre sufficiently higher than the sides, to allow the water to run off quickly.

CURIOUS PRAYER.

A gentleman in America has projected a work to be published under the title of *The Book of Uncommon Prayer.* Any one conversant with books of anecdote, will readily bethink him of much suitable material for such a volume. Perhaps no more appropriate example than the following from an old copy of *Fog's Journal*, has ever appeared: 'O Lord, thou knowest that I have nine houses in the city of London, and likewise that I have lately purchased an estate in fee-simple in the county of Essex. Lord, I beseech Thee to preserve the two counties of Essex and Middlesex from fires and earthquakes; and as I have a mortgage in Hertfordshire, I beg Thee likewise to have an eye of compassion on that county. And, Lord, for the rest of the counties, Thou mayest deal with them as Thou art pleased. O Lord, enable the Bank to answer all their bills, and make all my debtors good men. Give a properous voyage and return to the *Mermaid* sloop, which I have insured; and Lord, Thou hast said, 'That the days of the wicked are short,' and I trust Thou wilt not forget Thy promises, having purchased an estate in reversion of Sir J. P., a profligate young man. Lord, keep our funds from sinking; and if it be Thy will, let there be no *sinking* fund. Keep my son Caleb out of evil company, and from gaming-houses. And sanctify, O Lord, this night to me, by preserving me from thieves and fire, and make my servant honest and careful, whilst I, Thy servant, lie down in Thee, O Lord. Amen.'

GREENHOUSE AND WINDOW PLANTS.

Climbers.—Tie up climbers to the rafters or wires, and cut back the too rampant growers.

Annuals.—Sow seeds of annuals for winter flowering now, and keep in a moderately cool place, so that the plants will be stocky and healthy.

Bulbs.—Pot and put in a dark place all which are to be grown for winter flowering. After they have formed roots they must be brought into the greenhouse from time to time, as wanted.

Forcing Plants.—Where shrubs and herbaceous plants are forced for flowers, they should be taken up now and potted or planted in the cold frame or cellar, and then into heat as required.

Insects.—Before bringing a plant into the greenhouse, see that those left there are free from insects, and then that all that are taken in are first thorougly examined, and all insects removed.

Hanging Baskets.—Re-stock with such plants as are fitted for the purpose and let them stand a few days in the shade, until they become established, when they can be hung in the house or greenhouse.

Everything should now be ready, so that there will be no delay in removing tender plants to the house or greenhouse whenever the weather shall render it necessary. The heating apparatus should be in order, else many plants might be lost by frost. Do all needed glazing and make everything tight.

Ferneries.—Remove the old plants, keeping only such as are worth saving, and plant ferns, selaginellas, and such as require a moist atmosphere. The ferns from the woods seldom do well in a case, as the fronds or leaves of most kinds die down to the ground on the approach of winter.

Window Gardening.—Plants that have been turned out into the borders, or those that have been plunged, should be taken up before cool nights check them too much, and placed on a veranda or other partially protected place. In potting, cut back all rampant growth. Observe the directions as to insects given for plants to be taken into the greenhouse—indeed nearly all in relation to the greenhouse is applicable to the window garden.—*American Agriculturist.*

UNIFORM WEIGHT OF COINS.—The Metrological Society has, through its president, memorialised Congress for the preparation of coins of metrical weight and uniform finess, and for the passing of laws and conclusion of treaties whereby such coins shall become a legal tender, according to their weight.

STROKE OF ENGINES.—The stroke of an engine varies according to circumstances, which the designer must take into consideration, but the general rule is to make the stroke about twice the diameter of the cylinder. The diameter of the fly wheel should be about 4 times the stroke of the engine, and the rim should weigh about 3 cwt. per horse power.

THE DIGESTIBILITY OF MILK.—Dr. Carter of London, in a paper on the digestibility of milk, after discussing various methods which have been generally used with a view of promoting its digestibility, points out that their efficiency is essentially due to the dilution of the casein of the milk, thus causing the precipitation, on its introduction into the stomach, in granular form, of what otherwise would be firm, bulky, and compact. He has found by experiment, that simple dilution with water is insufficient for this purpose, and that this object is far better attained by admixture of alkaline or starchy water with the milk. He himself gives a decided practical preference to barley-water for this purpose.

BALANCE WHEELS.—Every balance wheel should be speeded up so as to run twice or three times as fast as the crank shaft it is intended to balance. When a balance wheel is applied in this way it makes the machine run a great deal more steadily, for, when the balance wheel is geared into the crank shaft, and runs two or three times faster than the crank shaft, it forms a power of itself, when going over the centre, which propels the crank shaft until it reaches the quarter where it again takes it power from the machine. Although it takes an additional shaft and gears to apply a balance wheel in this way, the saving of metal in the balance wheel fully compensates for the extra labour, for, when a balance wheel is speeded three times as fast as the crank shaft, it needs only one third of the metal in it that it would were it not speeded up at all, and if balance wheels were applied in this way generally, it would make all engines run far more steadily.

AMERICAN GLEANINGS.

FROST TIMBER.—According to calculation the forests of the United States will hold out but seventy years longer, if nothing is done to renew the natural resources.

SHRINKAGE OF CASTINGS.—In locomotive cylinders 1-16 inch in a foot; in pipes ⅛ in a foot; girders, beams, &c., ⅛ inch in 15 inches; engine beams, connecting rods, &c., ¼ inch in 16; thin brass, ¼ in 9; thick brass, ⅛ inch in 10; in zinc, 5-16 inch in a foot; in lead, same; in copper, 3-16 inch in a foot; in bismuth, 5-32 inch in a foot; in tin, ¼ inch in a foot.

RENDLE'S PATENT SYSTEM OF GLAZING.—In the beginning of the week a party of gentlemen interested in building matters inspected some new ridge and furrow roofs lately erected on this principle at the terminus of the Great Western Railway. By Mr. Rendle's invention all woodwork is covered by the metal and glass; no putty is used in glazing, and bent glass is entirely dispensed with. The ribs have also the peculiarity that they will carry away, not only the rain-water which falls on the roof, but also that which arises from the condensation of vapour within the building.

JUMPING THE TRACK.—To prevent the accident to which railroad trains are liable from one car jumping the track, the plan has been devised of applying to cars a kind of shoe, consisting of a clamp-like arrangement which is affixed between the wheels of each truck. This runs about 2 inches from the rail, and if anything happens tending to throw the wheels from the track, the clamp at once grasps the rails, holds the car on the track, and brings the train to a speedy halt. Such a shoe will, it is claimed, prove a great saving of railroad rolling stock, and add greatly to the strength of the truck, it being constructed of iron, and weighing some 500 lb. Experiments made with cars provided with this device, show that the arrangement accomplishes very effectively the object in view, and it is estimated that on account of the additional strength thus imparted to the car, it must last much longer.

PATENT ROADWAY.—Some interesting experiments have been made at the works of the Saville Street Foundry Engineering Company, Sheffield, where a portion of roadway laid down by Messrs. Davidson, Walker and Hainge, the patentees, was severely tested. The patentees state that asphalte roadways are generally admitted to possess all the elements of a perfect road, namely, noiselessness, absence of vibration, perfect sanitary conditions, great durability, costing less than any other paving to cleanse, cheaper also, and repaired when cut into for excavations with the greatest ease; the only objection hitherto being the want of foothold for animals. This last is effected by the application to asphalte pavements of iron plates or frames with projecting iron studs or bearing surfaces at suitable intervals, the spaces between them being filled in with asphalte, thereby producing a paving of asphalte, with slightly projecting iron studs or bearing surfaces adapted to sustain heavy traffic and to give the requisite foothold for horses. The foundation was composed of 9 inches of rough concrete on cement. Above that was 1 inch of fine concrete and upon this was placed a framework of iron from which iron studs projected to the surface. Forming a surface and almost level with the iron studs was run in the Val de Travers asphalte, thus giving a foothold to the horses and a waterproof roadway.

PRICE OF GAS.—The following are the official prices of gas as supplied by some of the principal gas companies of America:—Albany, N. Y., 2 dols. 75 cents; Brooklyn, 2·75; Boston, 2·25; Charleston, 4·00; Chicago, 2·50; Defiance, Ohio, 10·00 (70-candle gas, Patton's process); Indiana, Pa., 3·00; Lowell, Mass., 2·50; Morris, Ill., 2·00 (15-candle petroleum gas, Wren's patent); Mahonay City, Pa., 10·00, 70-candles; Morristown, Pa., 3·00, (18-candle, coal); New York, 2·50; New York, Harlem, 2·75; New Brunswick, N. J., 2·70; New Haven, Conn., 2·75; Niagara Falls, N. Y., 3·50; Pittsburgh, Pa., 1·00; Philadelphia, Pa., 2·15; Plymouth, Pa., 10·00, (70-candle, Patton's); Saratoga, N. Y., 5·00; San Antonio, Texas, 7·00; Salem, Oregon, 7·00; Salem, Ohio, 2·70; Sunbury, Pa., 10·00, (70-candle, Patton's); Tidioute, Pa., 2·00 Wren's process; Washington, D. C., 2·25; Washington, C. H. O., 2·20, Wren's 6 dols. for 80-candle gas. From the foregoing statistics, we gather that the highest-priced gas is that made under Patton's process, and yielding an illuminating power of 70 candles at a cost of 10 dols. per 1000, whilst the lowest-priced gas is that manufactured according to Wren's process, at from 1 dol. 20c. to 2 dols. But for 80-candle gas under this process 10 dols. is charged; the average charge for ordinary gas being 3 dols. to 4 dols. per 1000. In one place reported—viz., Poughkeepsie—the charge is 2 dols. 70c. under Gwynne and Harris's process.

SCIENTIFIC GLEANINGS.

HOT BLAST IN THE BESSEMER PROCESS.— Experiments made at Zeltweg, in Styria, show that a hot blast cannot conveniently be employed in the Bessemer process, owing to the giving away of the bottom of the converter after two operations. Further experiments are considered desirable.

METHOD OF DETERMINING THE HARDNESS AND QUALITY OF STEEL.—M. A. Chary heats pieces of a given size as high as they will bear without burning, and then bends them by blows of a hammer to and fro until they break. Steel not red-short should stand at least ten such bendings before breaking.

IRON PYRITES AS A REMEDY AGAINTS OIDIUM.—M. François states that iron pyrites have approved themselves efficacious, even in vineyards situated in districts where the vine is treated with sulphur. The green of the leaves and young shoots is intensified by its use, the improved appearance of the plant making itself recognisable at a distance; vines treated with iron pyrites look as if they had been dressed with a rich winter manuring.

CHLORINE COMPOUNDS IN THE BLAST FURNACE.—Menecke has observed in several cases the presence of ferric, calcic, potassic, and other chlorides, as well as hydrochloric acid in the gases from blast-furnaces. He finally traced it to the coke used, and from water which had been used to wash 36 kilos. of coke he obtained 43·54 grms. NaCl and 1·38 grms KCl. A furnace using daily 1000 cwt. of such a coke would receive 60·47 kilos. NaCl, corresponding to 38·73 kilos. HCl gas, or about 2 carboys of commercial acid.

GREAT FAILURE IN THE COPPER ORE TRADE.—The whole of the copper ores of Cornwall and Devon are sold to one or other of ten firms of smelters. One of these, trading under the style of "The Governor and Company of Copper Miners of England," has announced its suspension. The company holds a charter dated 100 years ago. The failure of any firm buying copper ores has not been known within living memory, and some Cornish mines will be severe losers. The company will have to be wound up in the Stannaries Court.

EXTRACTION OF GALLIUM FROM ITS ORES.—To get this mineral, says M. de Boisbaudran, you must take the advice given in the cookery book, about catching your hare. To extract a few centigrammes of gallium you must first get matter that contains any of it, and that is the difficulty. To go exploring, at least 25 kilogrammes of ore are indispensable, for one wants at least 500 kilogrammes of rich ore, so-called, for 10 centigrammes of gallium. M. de Boisbaudran divides the ores he treats into four groups: A, rich ores; B, poor ores; C, very poor ores; D, ores containing no gallium.

BALLOON EXPERIMENTS.—On the 14th inst., at two p.m., M. Ménier will experiment with two balloons, of 50 cubic metres capacity each, with the object of showing the practicability of their propulsion and steering. Verbal explanations will be given by the inventor. The experiments will take place at the Rond-Point de l'Allée de Sept-heures, Spa.

NICKEL ORE IN SPAIN.—In the province of Malaga, there is a deposit of nickel ore, from which some tons have already been raised. Specimens of the ore have been examined at the laboratory of the Paris School of Mines, and gave 8·96 per cent. of nickel, without cobalt.

GREAT BRITAIN AND ROUMANIA.—At the instance of the Birmingham Chamber of Commerce, the Foreign Office lately made representations to the Roumanian Government as to the propriety of placing this country on the same footing as Austria in regard to the duties on hardware, &c. It is now intimated that the Roumanian Legislature has passed a law authorising their Government to offer to Great Britain the extension to this country of the privileges of the most favoured nation for a period of nine months, which places Great Britain on the same level as that obtained by Austria through her connection with Roumania.

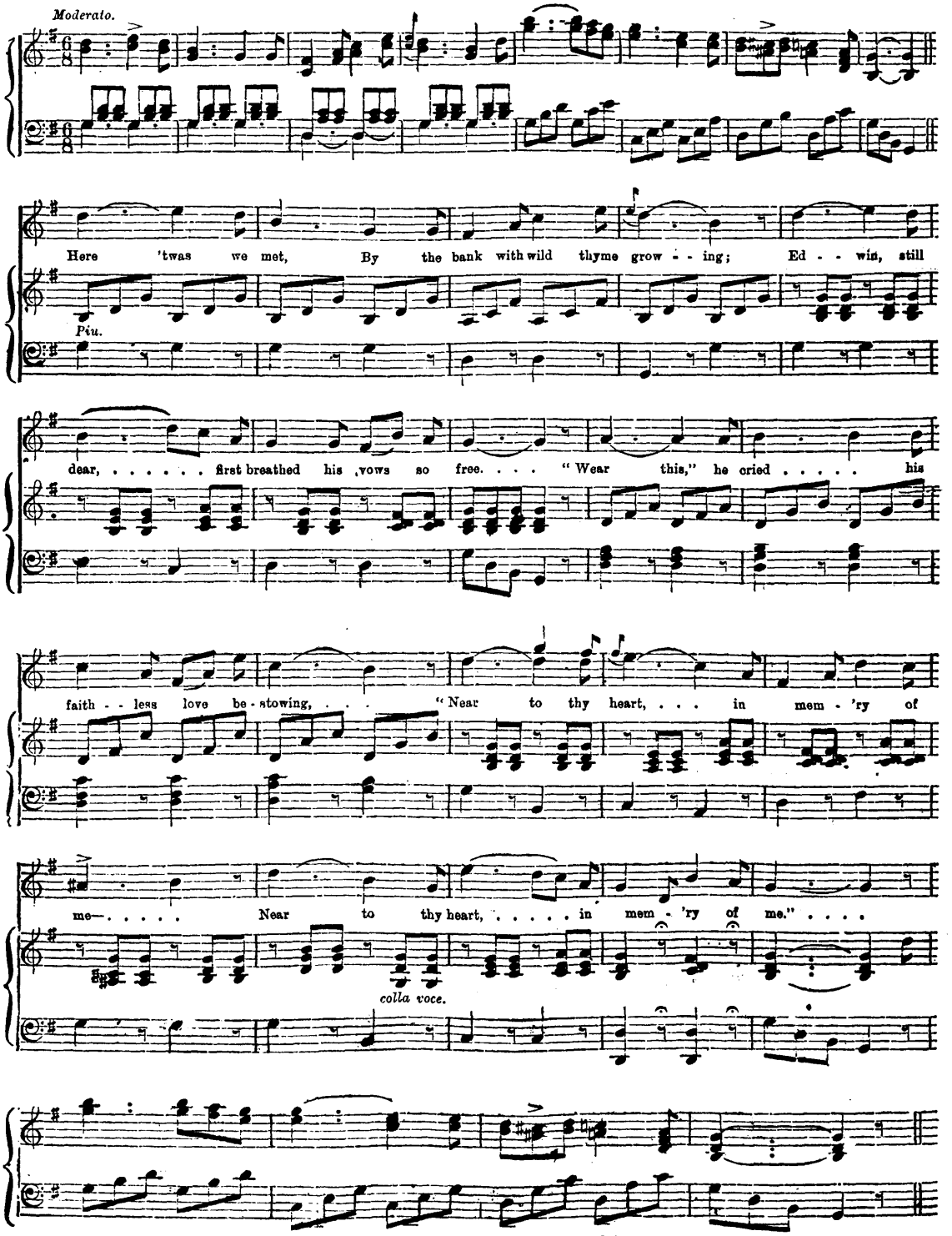
REGISTRATION OF TRADE MARKS, FRANCE AND SPAIN.—On the 30th June last a treaty was concluded between France and Spain for the mutual protection of the trade-marks of each country. The trade-mark of a manufacturer in one country may not be counterfeited in the other, or in case of infringement an action for damages will lie in the defendant's country.

COMPAGNIE FRANÇAISE DES MESSAGERIES MARITIMES.—The fleet belonging to this company was valued at the end of 1875 at £4,342,653, or £10,240 less than the estimated value at the end of 1874. Two new first-class steamers began running in the course of last year, the *Djemnah* and the *Equateur*. The former makes the voyage to Shanghai, the latter to La Plata.

MUSIC.

Here 'Twas We Met.

Words by G. A. MILLARD. (BALLAD.) Music by R. G.



Love's cherish'd gift: the rose he gave has faded;
Dreams of joy are o'er—pangs of woe remain;
The bright beam of life with clouds of grief is shaded;
Love's brightest flow'r can never bloom again.