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CANADIAN MECHANIC'S MAGAZINE AND PATENT OFFICE RECORD

Vol. 6. SEPTEMBER, 1878. No. 9.

## BOSTON PUBLIC LIBRARY.

THE NECESSITY OF FREE LIBRARIES IN CITIES AND TOWNS IN CANADA.

E have received through the courtesy of A. M. Knapp, Esq., Assistant Librarian to the Public Library of Boston, the report of that valuable institution for 1878, which we have perused with the greatest interest. The boon of the library of this free institution, and the reading-room in connection with it, to the citizens of Boston, and to all strangers visiting that city, cannot be over estimated—in fact no greater proof can be adduced of the high estimation in which it is held, than the figures in the report showing the great increase that is annually taking place in the circulation of its volumes, and the number who resort to it, particularly to the Bates Hall; men of science, scholars, students and authors come from distant parts to obtain reference to the valuable works to be found on its shelves.

The number of libraries in the United States, particularly in the New England portion, is a marked feature in the character of the people; a thirst after knowledge always marks a high state of civilization. In the New England States alone, there are upwards of 300 libraries—more than two-thirds of which are free to the public. Would that we could say as much for the whole Dominion of Canada, in which there is scarcely a single free library, if there is even one. The citizens of Boston hold, and justly so, in high regard the memory of those generous founders of their noble institutions, from which they now enjoy so much valuable knowledge and literary pleasure; indeed to such an extent have the books increased, that the present library is no longer capable of containing them, and enlarged and improved accommodation is now strongly recommended for early action by the city government. The total number of volumes now contained in the Bates Hall and Lower Hall amount to 345,734, being an increase for the year of 33,724 or 12 per cent. The loans increased from a total in the previous year of 1,140,572, to 1,183,991, a gain of 43,419 volumes.

The reading rooms of the libraries were open to the public 357 days during the year, inclusive of Sundays, during which 371,693 readers were furnished with 471,984 periodicals, an increase of 32,179 readers and 47,320 periodicals, and these amounts, the report states would have been largely increased had the sitting accommodation in the central library been sufficient for the visitors. The record of books lost speaks most highly for the honour of the borrowers, only 1 volume missing in one department out of 11,723 issued. Among the five branch libraries connected with the same institution not one volume lost from an aggregate circulation of 275,654. In South Boston, but one out of 140,677. The gifts to the library during the year have been unusually large. By the public spirit of the Directors of the Mercantile Library Association, their library, which had been in the process of collection for 55 years, and containing 16,927 volumes, was presented to the Boston Free Library. Five hundred dollars was donated by a gentleman for the purpose of increasing the value of the mathematical collection. A special collection of 890 volumes, relating to history and biography, and embracing a great variety of valuable historical portraits, was presented by a lady; and another lady presented not only the whole of her valuable private library, but also the large sum of $10,000—the interest to be expended for the purchase of books published previous to the year 1850; besides these gifts in one single year amounting to 18,935 volumes, the library was indebted to 674 givers for 2,271 volumes and 12,453 pamphlets. These figures are undoubted evidence of the public spirit of the citizens of Boston and of their intellectual character.

We quote the following words from the report of the Chairman of the Examining Committee, the Rev. Warren H. Cudworth, as aptly describing the Library Building, the character of the institution, its usefulness and growth:

"The first impression made upon the visitor by the Library is very favourable, and to the City of Boston extremely credit-

able. The building is imposing without and within; and although situated in one of the busiest quarters of the city, where horse-cars and vehicles of every description pass and repass continually, and thousands of pedestrians hurry along intent on work or pleasure, the rooms are filled with the spirit of repose, and by their very aspect seem to invite thoughtful contemplation, or silent fellowship with those gifted minds or soaring souls, the record of whose best hours or noblest efforts rise shelf above shelf from floor to ceiling.

"It seems scarcely credible that only twenty-six years have elapsed since the movement was started whose already attained proportions are so colossal; scarcely credible that in 1852 the first book was deposited in this collection so vast and valuable, which has been followed by 347,244 companions, varying in size and value, of course, but nearly all worthy of the places they occupy and the consideration they have received. One would think that he was beholding what it had cost centuries of labour and millions of treasure to collect; and that this library had been established by some opulent, powerful, and cultivated nation long before the present generation appeared."

The Boston Free Library receives its support from the interest derived from the donations of its original founders, and subsequent gifts, and also from an annual appropriation of funds by the city government.

Now we submit the question to the people of Canada, and to the citizens of the city of Montreal in particular, whether it is not time that free libraries, like free education, should form a portion of the institutions of the country? If cities in the United States of far less population, importance and wealth than Montreal, can afford to support these valuable institutions, why should not we? In these literary institutions certainly there are no distinctions of religion, country or class; they are institutions in which all may meet in amity for the culture of the mind, culture which goes far to remove national and religious prejudices.

The Government of this country has done much of late years to give almost free education to the people, and it is but just to that Government which represents the people that cities through their corporate bodies, aided by the generosity of wealthy men, and by contributions and donations from the people themselves, should now do something to raise up institutions to improve and perfect the education of their children after leaving school or college. Is it not time that some move should be made in this direction? We think so. We feel certain that if this question was taken up by such men as Professor Dawson and other eminent literary men of the country, it would be nobly responded to in every city and town; only let the *right class of men* be selected to carry out the work, and success will surely follow. Let the first step towards it be initiated—a small commencement made in every city or town to form a nucleus, donations would soon be drawn towards it, and increase in size from year to year. There is not a town in the Dominion in which a supply of books is not greatly needed for study and reference by students in law, medicine, theology, art and science, and especially in mechanics and manufactures, for we always uphold that to her manufactures Canada must look for future wealth and power. A judicious selection of works which shall attract, instruct and improve at the same time, would be an invaluable acquisition in every town in the Dominion.

Now who among us in a position so to do, will step forward and give an impetus to this suggestion? In Montreal we have the means of creating a valuable free library, if only those in existence were all united, and an annual grant made by the city towards its support. We feel certain that if a general appeal were made to the men of wealth in this city of every denomination, that it would be well responded to, and the boon to the city from such an institution could not be over estimated by her citizens.

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The following United States Patents were granted to Canadians during the months of May and June last:

T. Northy, of Hamilton, Ont., May 14, 1788, No. 203,553, "Stuffing Box."

T. Boardman, of Charlottetown, P.E.I., May 21, 1878, No. 203,882, "Machine for Inserting Rivets."

J. Goodwin, of Montreal, Que., May 21, 1878, No. 204,026, "Invalid Bed."

J. B. and G. R. Elliote, of Moncton, N.B., May 28, 1878, No. 204,143, "Well Drilling Apparatus."

F. G. Hunter, of Moncton, N.B., May 28, 1878, No. 204,226, "Seal Lock."

J. S. Kemp, of Magog, Que., May 28, 1878, (re-issue), No. 8,254, "Manure Spreader."

J. Amess, of Rosemount, Ont., June 4, 1878, No. 204,478, "Fire Escape."

J. A. Mumford, of Avondale, N.S., June 4, 1878, No. 204,499, "Sawing Shingles."

H. Atkinson, of Etchemin, Que., June 11, 1878, No. 204,781, "Planing Machine."

H. Atkinson, of Etchemin, Que., June 11, 1878, No. 204,782, "Saw Mill."

C. Boeckh, of Toronto, Ont., June 11, 1878, No. 204,655, "Brush Bridle."

E. H. Bronson, of Ottawa, Ont., June 11, 1878, No. 204,711, "Railway Switch."

G. H. B. Hooper, of Toronto, Ont., June 11, 1878, No. 204,670, "Cartridge Extractor."

S. Maneer, of Craigvale, Ont., June 11, 1878, No. 204,744, "Vehicle Pole Tip."

L. Anderson, of Corseley, Ont., June 18, 1878, No. 204,876, "Musical Transposing Instrument."

J. Campbell, of Almonte, Ont., June 18, 1878, (re-issue), No. 8,293, "Churn."

C. Cole, of Ottawa, Ont., June 18, 1878, No. 205,055, "Converting Motion."

G. Blatchford, of Mitchell, Ont., June 25, 1878, No. 205,341, "Reed Organ."

A. Brault, of Montreal, Que., June 25, 1878, No. 205,346, "Artificial Marble."

J. Kieffer, of Montreal, Que., June 25, 1878, No. 205,191, "Moulding Shoe Counters."

J. E. Stong, Newtonbrook, Ont., June 25, 1878, No. 205,438, "Farm Gate."

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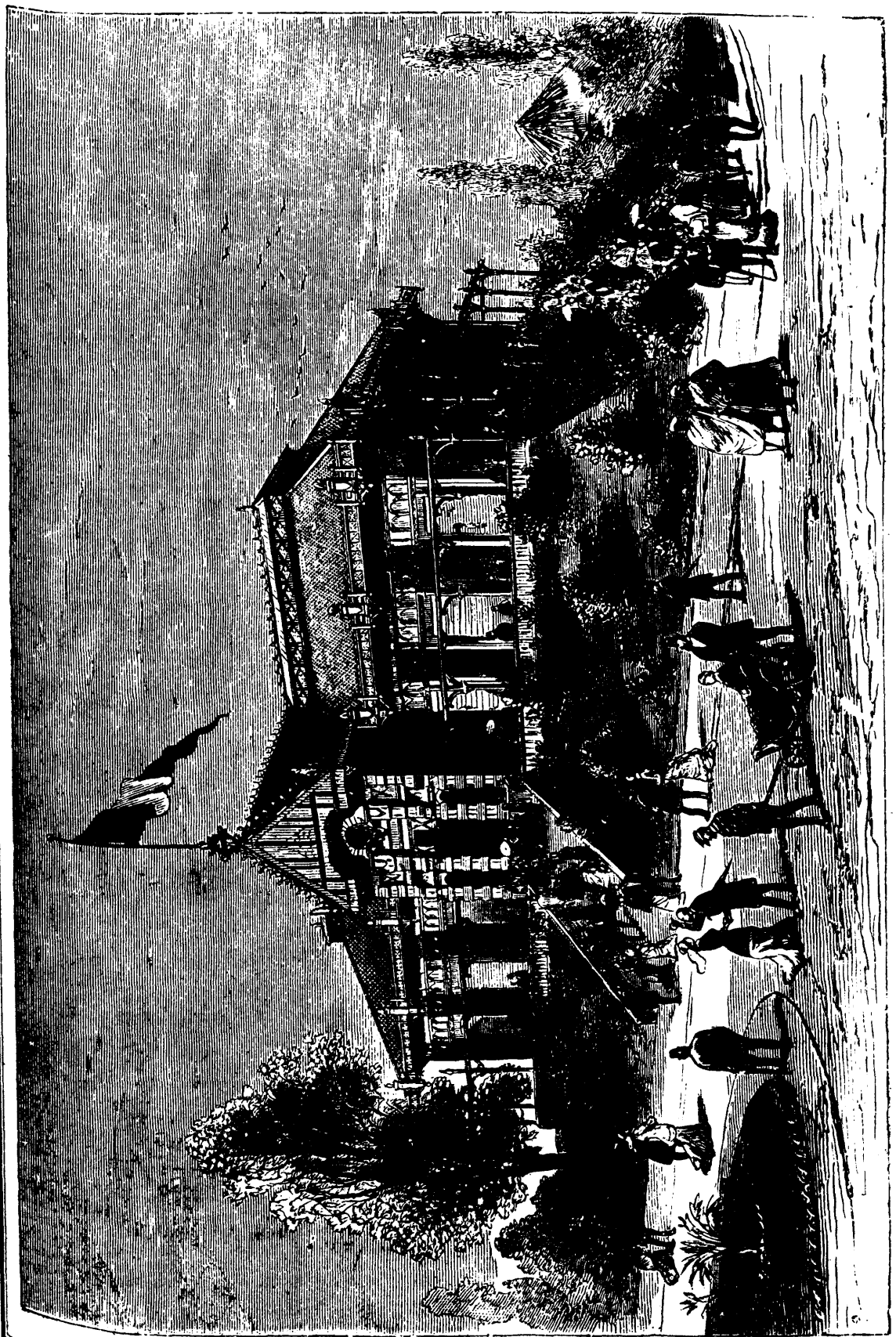
ANCIENT GEOGRAPHY.—Some stir was lately produced by the discovery, in the Lyons library, of a globe of 1701, in which the Zaire Congo was represented as flowing from a large lake westward to the Atlantic, much in the direction shown by Stanley. M. Costambert remarks in a recent number of *La Nature*, that not only in this case, but in all old documents from the fifteenth century such representations occur. The knowledge acquired was doubtless due to the Portuguese, who, from the fifteenth century, repeatedly crossed the African continent, both from west to east and from east to west. They went rather as merchants than explorers, and were often, no doubt, ill-informed; yet they were able to give pretty precise information about the center of Africa. In most of those old maps the Congo is shown as flowing in a nearly direct line from Lake Zaire or Zambra to the Atlantic. On one Spanish globe, however, probably dating about 1530-1540, the river appears as rising from a lake, flowing northward, describing a large curve north of the equator, then turning west-south-west toward the Atlantic, more nearly as Stanley represents. Some of these maps are reproduced in *La Nature*, May 4th, and are well worth examination



PAVILION OF THE FRENCH FOREST CONSERVATORS, IN THE TROCADÉRO PARK.


POSTAGE STAMP MUCILAGE.—The following is said to be the formula for the mucilage used on the United States postage stamps: Dextrine, 2 oz.; acetic acid, 1 oz.; water, 5 oz.; alcohol, 1 oz. Add the alcohol to the other ingredients, when the dextrine is completely dissolved.

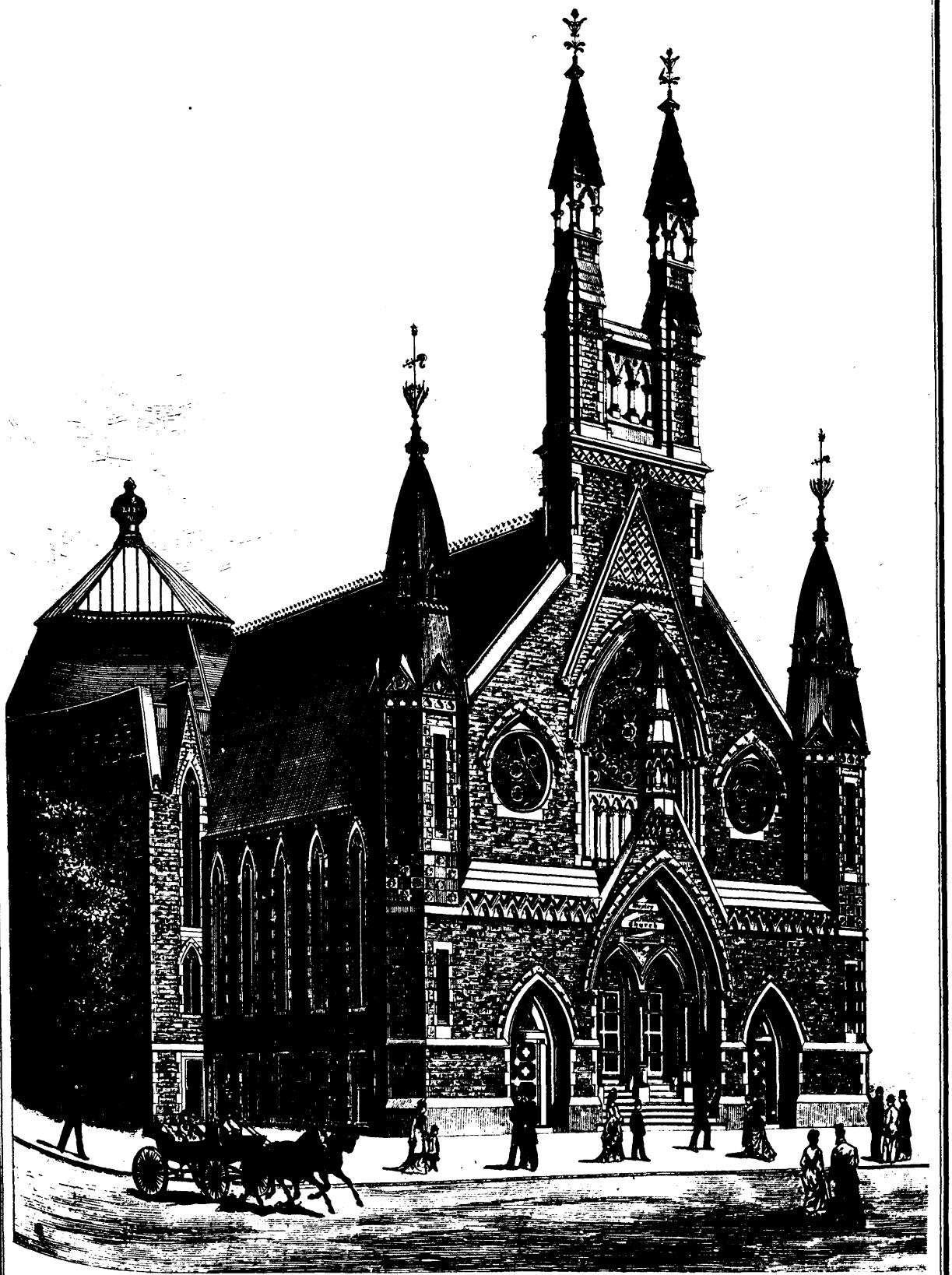
THE ART OF MOULDING.—At a meeting of the King's College Engineering Society, Mr. E. W. Anderson read a paper on this subject. He gave the following general rules to guide the moulder in the running-in of the metal in moulding, which are not altogether novel but will bear repeating: 1. Choose, if possible, the thickest part of the casting for the runner. 2. If the casting is deep, run in the metal at the bottom. 3. Where the casting has a flange in the form of a pipe it is generally preferred to run the metal in at the flange; but this case is subject to rule 6. 4. When the casting is thin, and has many branches, or when it is of great length, it is advisable to run in the metal in the center. 5. Care should be taken to choose a place in the mould so that the metal will have no tendency to wash any part away in its first rush. 6. (This rule may be called a continuation of No. 5.) The metal should not be allowed to fall from any height upon a weak part of the mold, or it will be liable to break down portions thereof.

## WESLEY CHURCH (CONGREGATIONAL), MONTREAL.

The interesting ceremony of laying the corner stone of this beautiful new church was performed by Mrs. G. B. Burland on the 18th July last. We give an illustration of the beautiful silver trowel manufactured for the occasion, which was presented to Mrs. Burland by the Rev. Mr. Roy, the pastor, as a tribute and memorial of the esteem in which Mr. Burland is held by the congregation.

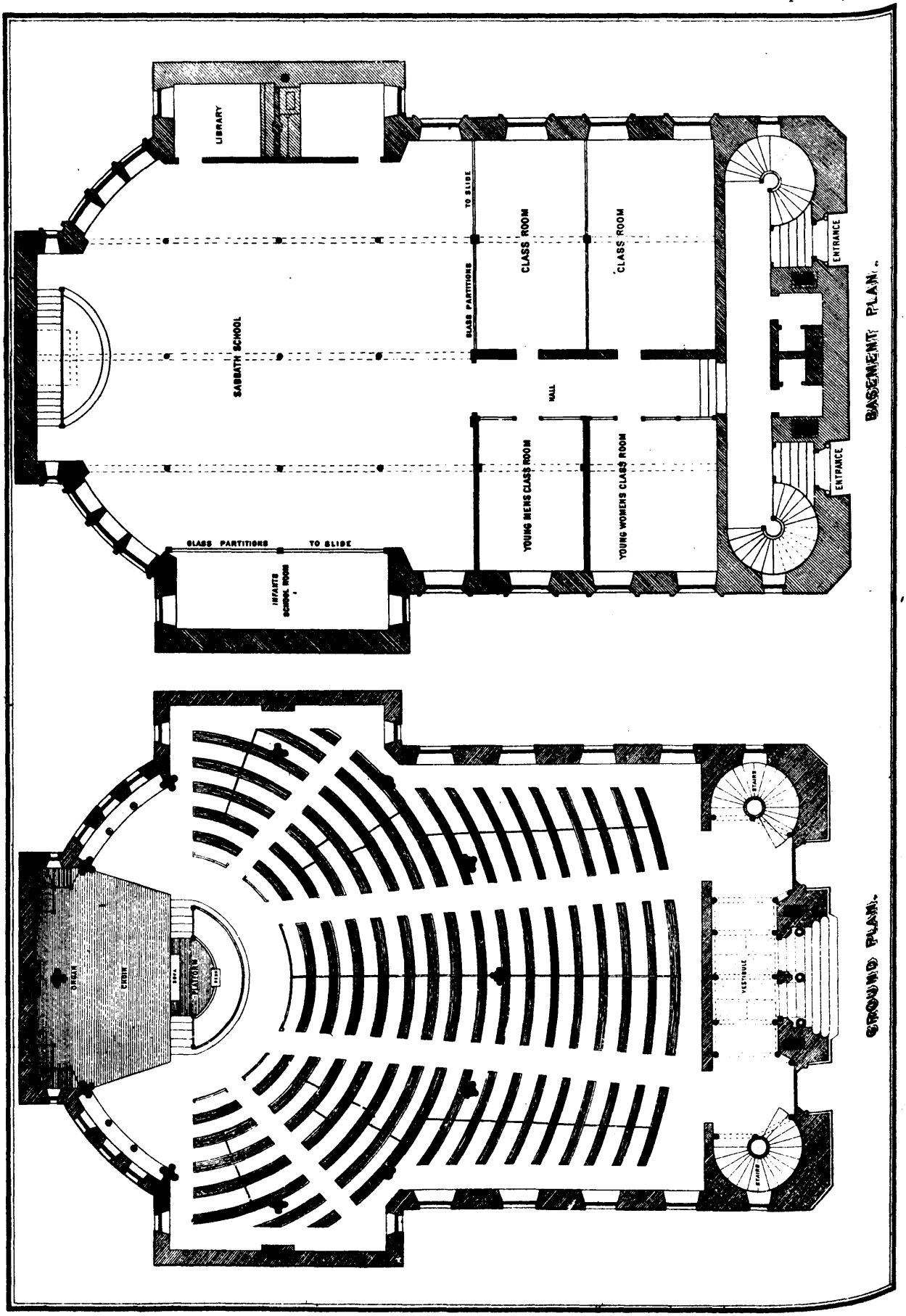
The following description of the building was read on the occasion by Mr. Crane, one of the building committee:

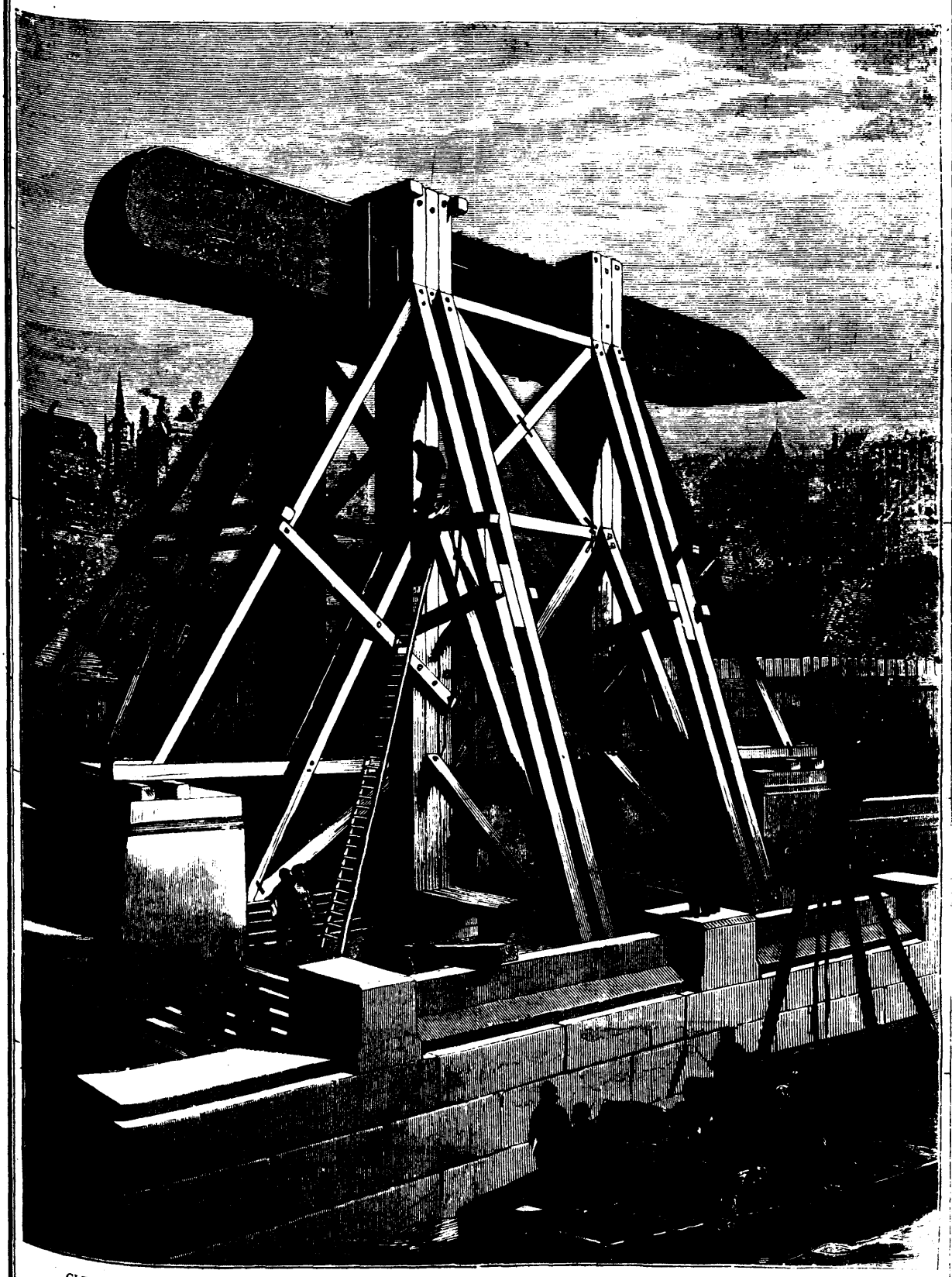
The site is on the south side of St. Catherine street, between Phillips' Square and St. Alexander street, a very favourable one, being on an eminence from which a splendid view of the city can be had. The foundations of the whole building are now completed to the ground floor level, eight feet high above the ground; they are massive and constructed of limestone, the dressings and quoins chiselled, and courses rock faced. The work is not sufficiently advanced to give an idea of the symmetrical and striking beauty of its architectural proportions. Our engraving represents the finished edifice, which will be one of the most imposing structures of the kind in the Dominion, bold in design, simple in detail, but noble in expression. Our view is on St. Catherine street (taken from a drawing prepared by Mr. John James Browne, the architect), with the easterly side of the structure in perspective. The front has three doorways, the centre one deeply recessed with moulded jambs, detached columns with bases and foliated capitals, moulded arches, being the main entrance thirteen feet in width and twenty-four feet in height, with a flight of stone steps to give easy ascent to the main hall. The doors on either side give access to the basement, with circular staircases to the main hall and to the galleries. In the tympanum over the main entrance "Wesley Church, Congregational" will be cut on a band; a richly carved and panelled gable with a grand foliated octagonal flèche nobly crowning it rising fifty feet above the ground level. On each corner is an octagonal tower terminating with ornamental finials; between these towers and over the entrances the front wall recedes three feet, having richly panelled and moulded pediments running the whole length of front. Below the superbly ornamented apex of the main gable is a large rose window, the tracery of which is wrought in a style of rare ornamentation; the lower arc of the circumference of this grand window touches the mouldings above the panels with columns, bases and carved caps. This window is deeply recessed 14 feet in width and 22 feet in height, having columns, pilasters and moulded jambs and arched mouldings, richly carved tympanum terminating in a very rich cross of foliated design. Between this window and each octagonal tower there will be a rose window seven feet in diameter filled with ornamental tracery. Above the apex rises a blocking with pilasters and columns, moulded bases and carved capitals, water tables and grand foliated pinacles. This church will be specially adapted to requirements of Congregational worship and oral instruction. The plan determined upon by the architect is cruciform with short nave. Choir and transepts meeting in a circular centre of fifty-four feet in diameter, having twelve clustered columns, moulded bases, enriched and foliated capitals to support the arches and dome (fifty-five feet above the floor level), ceiling light, twenty-five feet diameter, filled with cut and coloured glass, with lantern above to give light to the centre of the church. The number of sittings to be provided rendered it necessary to introduce galleries, which are placed across the nave and the transept. The choir and organ will occupy the platform in rear of the minister, which will be six feet above the floor, with steps ascending on either side; in the centre is a desk, rich in design, and in front a circular railing for communicants. The seats are all curved and radiate from the centre; every sitting (eight hundred in number) will have an unobstructed view of the minister, and he will have a view of the faces of all the congregation. Vestries for the minister and choir will be under the platform. There is also a capacious and well-lighted basement, twelve feet in height, which will contain school-room or lecture hall, 48 x 52, library, five class-rooms — two of these have sliding glass partitions, which at any time will afford additional space to the Sabbath-school, or the two made into one for weekly meetings. There is a sub-cellar in front under the hall for fuel and furnaces to heat Sabbath-school and class-rooms with hot water, and the church with warm air. Ventilating flues are placed in nave transepts, and a large shaft in dome, regulated with iron rods.



WESLEY CHURCH (CONGREGATIONAL), MONTREAL. J. J. BROWNE, Architect.

(FOR GROUND AND BASEMENT PLANS, SEE NEXT PAGE.)


LIBRARY
SABBATH SCHOOL
GLASS PARTITIONS
TO SLIDE
CLASS ROOM
CLASS ROOM
HALL
YOUNG MENS CLASS ROOM
YOUNG WOMENS CLASS ROOM
INFANTS SCHOOL ROOM
ENTRANCE
ENTRANCE
BASEMENT PLAN.
ORGAN
CHOIR
PLATFORM
VESTIBULE
STAIRS
STAIRS
GROUND PLAN.



CLEOPATRA'S NEEDLE — THE MACHINERY FOR PLACING THE OBELISK IN POSITION ON THE THAMES EMBANKMENT

## THE "DREADNOUGHT."

The *Dreadnought*, double-screw iron turret-ship, armour plated, 10,886 tons, 8,000 horse-power, was built at Pembroke Dockyard, but has been completed at Portsmouth. With her four 38-ton guns, worked by hydraulic power, this ship will be the most powerful fighting vessel in the world. Though belonging to the same type as the *Devastation* and the *Thunderer*, she differs from them in some important particulars. These ships of the *Devastation* class, in which a vast advance was made, represent the first-class fighting ships, carrying heavier armour and armaments than vessels previously built, and capable of fighting an action in mid-ocean. For this purpose they have their stability increased by a half-raised unarmoured forecastle, and by an unarmoured superstructure on each side of the breastwork, protecting the foundations of the turrets, whereby the freeboard amidship is raised to the full height of the breastwork deck. The armament of the *Devastation* consists of four 35-ton guns. In the sister ship, the *Thunderer*, the armament was still further increased, and the formidable offensive fire was considerably augmented by the first introduction of hydraulic gun-gear. The *Dreadnought* is a further improvement upon the other ships in various ways; several modifications of the earliest turrets having been introduced in her construction at the suggestion of Admirals Elliott and Ryder. The most important is the erection of a central box, in place of the narrow breastword of the *Devastation*. The unarmoured superstructures in the latter ship were added to the original design in obedience to remonstrances from outside, notwithstanding the opinion of the Committee on Designs that the addition was not necessary for safety. In the *Dreadnought*, to secure a larger reserve of buoyancy and stability, the breastwork has been carried out flush with the side of the ship, by which an armoured wall eleven inches thick is obtained amidship. It was proposed to take advantage of this widening of the breastwork to place the turrets out of line with each other, as in the case of the *Inflexible*, so that the whole armament might be fired direct ahead and astern as well as abeam. This idea, however, was not adopted, both the turrets being placed in line, as in the *Devastation*; but the increased space has enabled the whole crew, some 380 all told, to be accommodated in the breastwork, which is lighted and ventilated from above. As proposed by the constructor, the lateral extension of the breastwork would have still necessitated the retention of the cul-de-sac, which has been condemned by many naval architects. But the constructor was of a different opinion, and even went so far as to believe that the light forecastle of the *Devastation* might be dispensed with. The forecastle was partly designed to give lifting power to the bow; and the constructor stated he did not consider that lifting power was required there in the *Devastation*. He, on the whole, would rather not have it, preferring to avoid pitching as much as possible, which weight at the end encouraged. With a high bow a ship rises with more of a spring, and makes a corresponding plunge afterwards, whereas a low deck forward, immersed, would, it was believed, check her rising by a kind of keel action. Pitching, of course, exposes the bottom to shot. This is a necessary evil in masted ships, in which the decks have to be kept dry, but it has been considered that this danger could be avoided in the case of monitors The construction of the *Dreadnought* was delayed until this and several other matters had been further discussed. The alternative plan was either to dispense with forecastles altogether and allow the ship to bury herself forward, or to build up the ends flush with the top of the breastwork. The latter plan was ultimately adopted in the case of the *Dreadnought*, a slight inclination in the weather deck being allowed fore and aft to admit of the guns being depressed. The cul-de-sac has consequently been obliterated, and a high free-board has been obtained of nearly the same height throughout the length of the ship. In the *Dreadnought*, again, the armour belt, which was cut down in the two sister ships, is completed forward, and the recommendations of Admirals Elliott and Ryder for the protection of the fore magazine of the *Devastation* have also been carried out by sloping the bow armour down to the spur. The armour-strakes along the length of the breastwork are of a parallel thickness before and aft, while they taper to 8 inches in thickness at the stem and stern. The armour on the ends of the breastwork is 13 inches, and that on the side 11 inches, except for a length of about 20 feet in the wake of each turret, where the plaiting is 14 inches thick. In the *Dreadnought* the constructor introduced another valuable improvement in the shape of a longitudinal water-tight bulkhead between the respective sets of engines and boilers. In the event of injury to the ship from rams, torpedo attacks, or other such engines of war, it would act as a valuable protective agent, provided always that the weight of the inrush of water could be equally distributed. The total weight of the *Dreadnought's* hull is 7,350 tons and the whole weight of armour, engines, coals, &c., amounts to 3,598 tons. The estimated cost of the hull is 400,000*l*. She will carry 1,200 tons of coal, will be provisioned for a month, and will be armed with a 65-pounder Gatling gun, in addition to her turret armament.

## ANNEALING IN BOILING WATER.

An English expert on metal working, Prof. W. Mattieu Williams, is writing a series of articles for the *Metallurgical Review*, entitled "Studies in Sheffield." In one of them we find a few paragraphs on annealing by immersion in boiling water. We quote as follows: "I will narrate some curious experiments that I commenced when in Sheffield, but have not satisfactorily completed. They were made at the suggestion of Mr. William Bragge, then a managing director of Sir John Brown's works. He had learned that the steel wire strings of piano-fortes are annealed by what appears a very anomalous process, viz., by making the wire red hot and then plunging it into boiling water.

Ordinary experience would suggest that this must harden the steel in some degree, but I tried it upon many samples of steel—mild Bessemer steel, shear steel of different qualities, and the hardest old-fashioned Sheffield 'pot steel'—and found that in every case, when the operation was properly performed, the steel was remarkably annealed. I compared samples cut from the same bar—one heated and slowly cooled by burying in ashes under a furnace grate, the other by immersion in boiling water—and found that when subjected to bending test those which had been cooled in the boiling water would bear a more severe degree of flexure without cracking than the pieces which had been more slowly cooled in the ashes. They were not so soft, as tested by the touch of the file, but unquestionably tougher and more reliable when subjected while cold to violent bending blows of a hammer. It was more effectual than any device of 'oil toughening' or slow cooling I have had opportunities of testing.

"Certain precautions are necessary. In the first place, the water should be quite at the boiling point and the steel at a bright red heat; and, secondly, the steel should be fairly surrounded by the water. These conditions being fulfilled, the steel remains red hot under water for some time. It is evidently surrounded by a film of vapor and is not in actual contact with the water, which assumes the so-called 'spheroidal state,' continuing in this condition until the metal has cooled considerably. I suspect that the toughening is due to the uniformity of cooling thus effected.

"I commend this method of annealing or toughening to the attention of manufacturers engaged in the production of all kinds of steel that is to be used for purposes where tenacity rather than hardness is demanded."

THE MICROPHONE IN SURGERY.—The value of the microphone in operations for stone and other delicate surgical manipulations has just been shown at the London University College. The apparatus consisted of the usual feeble battery with wire, connected with two telephones running to different parts of the room. The ordinary sound used in operations for crushing the stone was attached by a wire to the circuit of the battery. Near the handle a piece of carbon, such as is used by Professor Hughes, was carefully balanced and attached by a delicate string to the battery circuit. When the end of the sound strikes against the smallest piece of calculus, the acoustic wave is transmitted along the steel of the instrument to the carbon, where it is transformed into electric vibrations, which are multiplied through the telephone, so that the noise becomes loud an unmistakable. The carbon arrangement on the sound must not be too delicate, nor the battery too strong; but with the microphone properly adjusted, it was easy, by trial, to detect the presence of even a minute fragment of unremoved calculus. The carbon needed only to be fitted to the probe, also to detect bullets or fragments of bone. But while it is quite possible for a skilful surgeon to make himself absolutely certain by means of the microphone of what he was previously only morally convinced of, no very remarkable results, at least in ordinary practice, are anticipated from the use of the instrument.

DRYER FOR OIL COLORS AND VARNISHES.—Water, 100 parts; gum lac, 12 parts; borax, 4 parts.

SHELL lime, which contains considerable phosphorus, is superior to stone lime for agricultural purposes.

THE "DREADNOUGHT." THE MOST POWERFUL IRONCLAD IN THE WORLD.

## FRENCH PAVEMENTS.

(From *Scientific American.*)

There are few things that more forcibly strike a stranger in Paris than the general excellence of the paving of the roadways. It is a matter of notoriety, and perhaps it is true, that the granite block paving, often called the "Belgian system," was abandoned to a large extent in Paris because the blocks furnished a convenient material for the barricades with which the insurgent population of the city occasionally amuse themselves and bother their rulers. There yet remains a large amount of block pavement, and the macadamized road is still common. So far as these are concerned there is nothing particular to say except that they are kept in excellent condition by repairing whenever a portion begins to grow faulty, and by sweeping regularly every night and watering every day when required, and very often when there seems to be no necessity. The sidewalks are swept very early, and the gutters are all thoroughly washed out and swept clean with brooms every morning.

These matters cannot be overlooked, but they involve questions of taste, care, and the economic administration of public funds, perhaps a more important question to us than most of the matters which occupy the time of Congress. It is not of them that I propose to write, but of the asphalt pavements which are fast becoming the principal mode of pavement in the city. The substitution of asphalt for blocks is going on all the time.

There are several companies of Paris which execute this work by contract, perhaps the largest being the "Compagnie Générale des Asphaltes de France," which claims to have the sole concession for this country of the products of the mines of Seyssel, and of the Val de Travers in Switzerland.

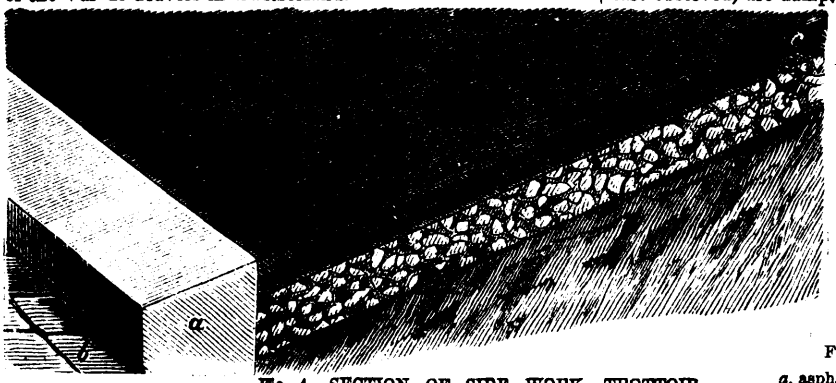


Fig. 4.—SECTION OF SIDE WORK.—TROTTOIR.

*a*, curb; *b*, street; *c*, asphalt; *d*, mortar; *e*, béton.

The asphalt paving is of two kinds; the *asphalte comprimé*, that is, beaten and compacted with hot rammers; and the *asphalte coulé*, in which the material is spread with trowels.

We may consider them in this order. This company has laid their *asphalte comprimé* in 158 of the streets and places of Paris, between 1855 and 1877. This shows the period within which the great change in the system of paving has been effected. Beginning under the Second Empire, it is still in progress.

The *asphalte comprimé* is especially employed around the churches, schools, theatres, concert halls, banks, and public buildings, on account of its freedom from noise; and generally for the additional reasons of cleanliness and salubrity in the places mentioned, and also in the main streets of the city. In the fashionable drives macadam is preferred on account of its freedom from slipperiness, and on the quays and warehousing quarters of the city the block system yet remains a favorite.

In the preparation of a good concrete foundation for asphalt pavement, as practiced in Paris—and the lesson cannot be as well learned elsewhere—four things are necessary:

1. Materials of good quality. 2. Used in proper quantity. 3. Mixed energetically; and 4. Allowed proper time to consolidate.

Not one of these is to be dispensed with; the second and fourth may not be inflexible, as a difference in the quality of articles procurable in different countries or cities may require special treatment in the working of it.

A general idea of the method adopted in Paris may be gained from an observation of the process as pursued in the Rue Scribe, where I observed them to be taking up one-half of the granite block pavement, from the middle of the street to the gutter stones, preparatory to laying down asphalt. The reason for taking up half at a time is manifest, as the street is a busy one and could not be entirely spared even for a while.

The bed of gravel found beneath the stone paving was considered sufficient and was not disturbed, the first operation to be described consisting merely of placing a layer of concrete upon it to form a bed for the asphalt. There are but three materials used and but three tools. The materials are: Gravel screenings or sand; a silicious gravel in pieces, say, from ½ inch to 3 inches in diameter; a gray hydraulic lime, usually Portland cement. The tools are: Pointed shovels; two rakes with long bent prongs; two flat beaters, about 18 inches square and with handles set in obliquely. To this may be added six wheelbarrows, holding about a bushel each, and 18 water buckets, of 2½ gallons each.

Twenty men formed the gang under a foreman, who worked diligently in giving the final shape to the surface of the concrete, preserving the proper camber of the street, gauge pegs being driven into the gravel foundation to work by, their tops representing the future surface of the asphalt. The illustration shows a small gang of men, but I give the actual number observed, as the proportion is a part of the accuracy of description.

Carts brought the various materials from the river and dumped them alongside where they were needed, on the pavement of the undisturbed half of the street. The water was obtained by turning on a hydrant and damming, flooding the gutter on the side of the street just mentioned.

The work now proceeds as follows: A man dumps a wheelbarrow load of sand and another spreads it out to 4 feet diameter. A bag of 3 pecks of lime is emptied on to it and spread evenly. On this 3 barrow loads of silicious gravel are emptied, and the heap is trued up into conical form by shoveling from the foot of the heap and throwing it on the apex. The materials (in the case observed) are damp, and the lime clings to the gravel where it touches. The heap is torn down and built up in a spot alongside, the effect being to mix the materials of three different finenesses. The heap is presently flattened out to 6 feet diameter and a bucket of water distributed over it. As the middle is the wettest a cone is made at the center, so that a second bucket of water reaches the outside ring of the material. The conical heap is again constructed, and about a quarter of a bucket of water splashed by the hand upon the outside—the outlying portions of the spread mass as it lay previously upon the ground.

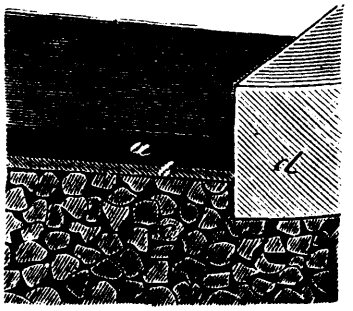


Fig 2.—SECTION OF PAVEMENT.

*a*, asphalt; *b*, mortar; *c*, béton of Portland cement and gravel; *d*, curbstone.

It rests thus a certain time, but a few minutes, and then is torn down, beginning at one side and throwing it, shovelful by shovelful, into a new location, a man with the three pronged rake, like a manure hook, working it energetically and unceasingly as each new shovelful arrives at the heap. This mixing is a very important matter, as it insures that every particle of silicious rock shall be covered with the lime, and the heap now is, instead of the yellow of the flint gravel, a uniform gray. The water is only sufficient to cause the parts to adhere, and some little (without attempting to trace the chemical reactions) lost as such in the attack of the lime on the silex and in slaking.

The heap is ready in a few minutes to be removed in barrows and dumped on the line of working, where it is spread with shovels and with a second one of the three tined rakes. Here the eyes of the master is called for, and he gives it the final shape, so far as the shovels are concerned, due regard being paid to the gauge pegs.

A man with the flat beater compacts and levels the surface by his blows, and the concrete is then surfaced with an inch thick coat of hydraulic lime mortar laid on with a trowel, and on this a coat of loose sand, which roughens it and forms a bond for the asphalt, which is afterward laid hot upon it, rolled and beaten. Of this presently. The sand appears to become partially im-

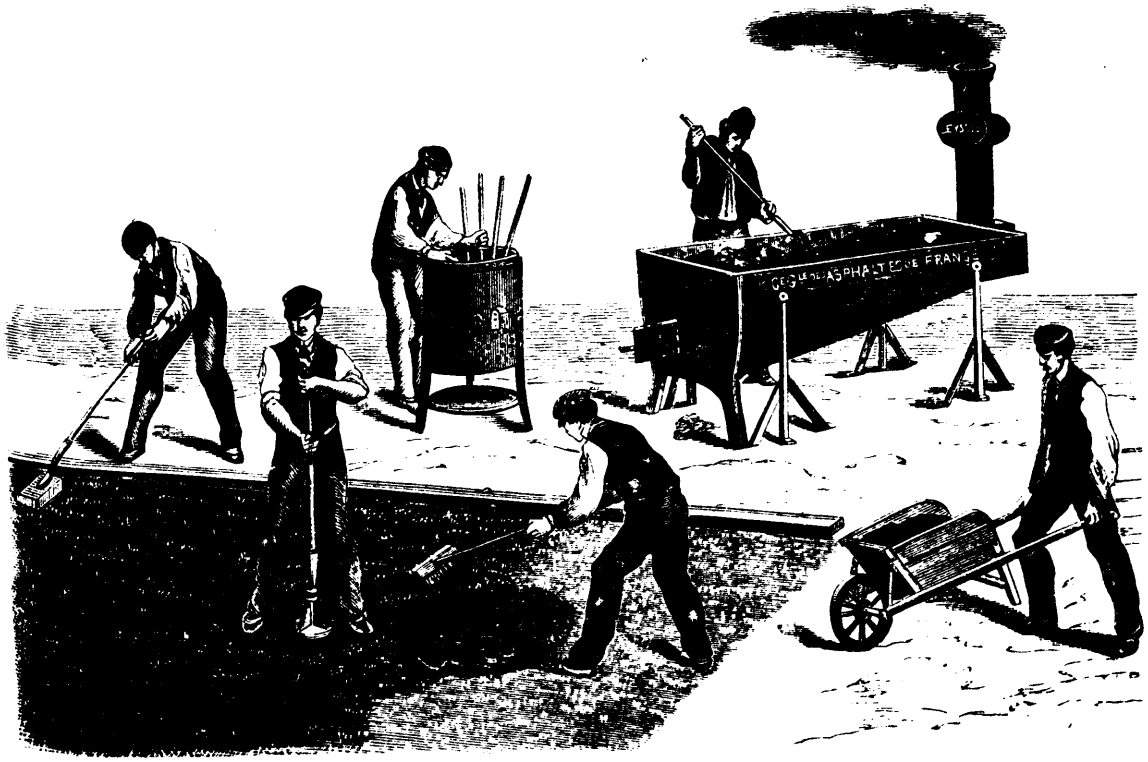


Fig. 1.—SYSTEM OF LAYING DOWN THE ASPHALTE COMPRIMÉ.

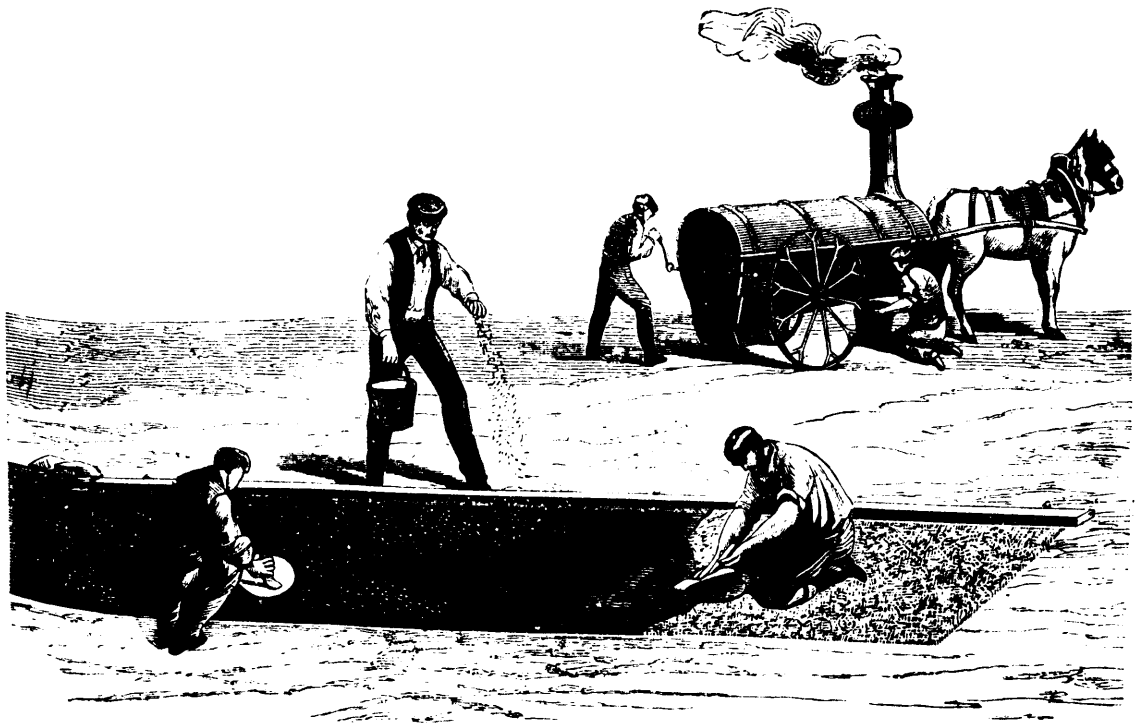


Fig. 3.—LAYING DOWN THE ASPHALTE COULÉ.

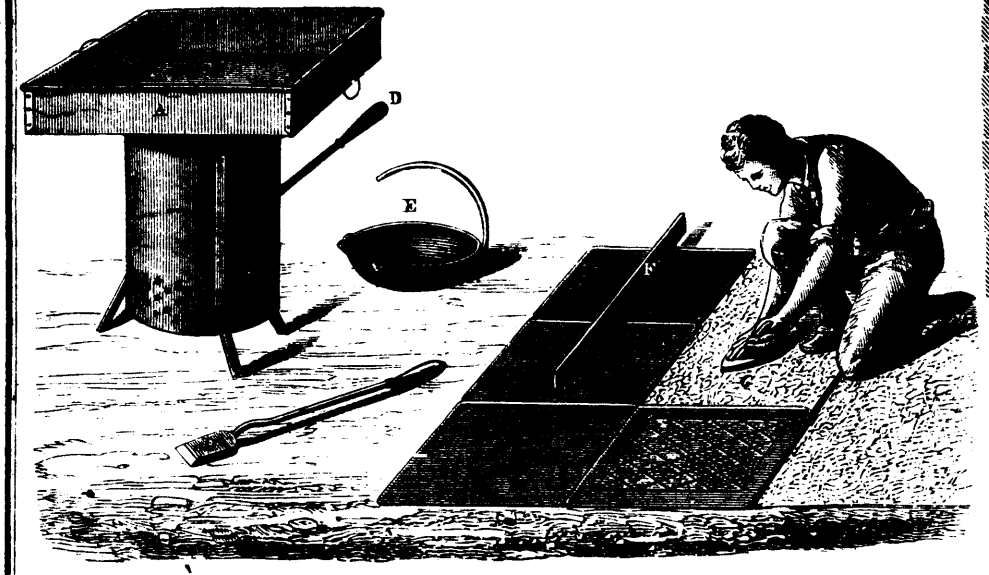



Fig. 5.—IMITATION OF TILE PAVEMENT (*carrelages*) IN ASPHALT.

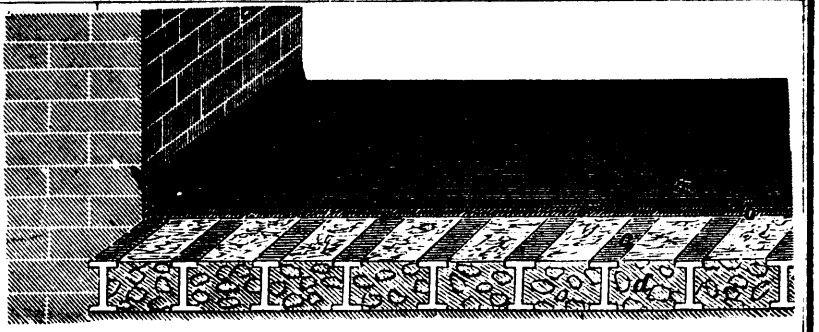



Fig. 6.—TERRACE OF CHATEAU DE CHAMBORD,
*a*, asphalt; *b*, mortar; *c*, joists; *d*, masonry filling.

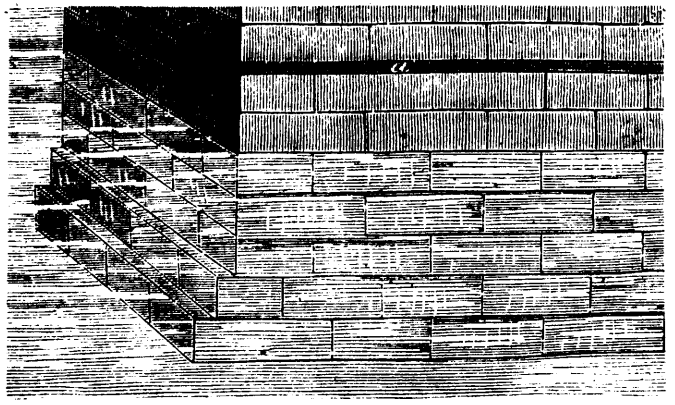



Fig. 12.—WALL CONSTRUCTED IN THE WATER.

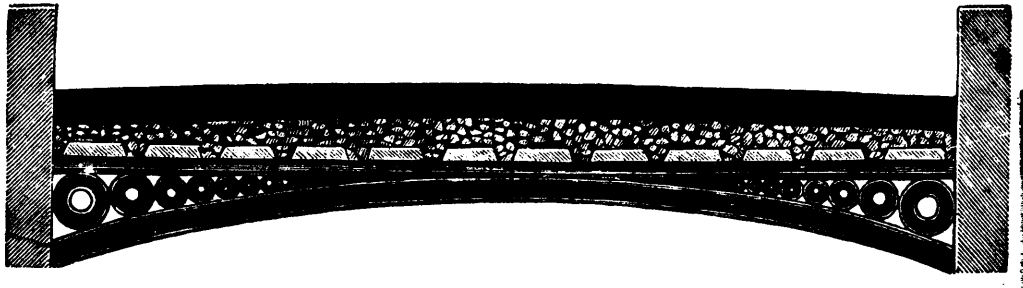


Fig. 7.—BRIDGE OVER THE SEINE AT ELBEUF.

Fig. 8.—JOISTS AND FLOOR UPON A FOUNDATION OF BITUMEN AND CONCRETE.

bedded in the yet soft mortar, and is in turn grasped by the asphalt. If the final asphalt were laid upon too smooth a surface it would be apt to fail in adherence and to flake off. Its mere adhesive quality is aided by a mechanical bind to the particles of sand which are, so to speak, riveted in the mortar, and it in the concrete.

I have been thus particular in stating the matter in order that persons disposed to try the experiment may have some data to save them time in experimenting.

The result of the carefully executed work would repay any city or corporation which should be in need of smooth, clean, and easily repaired ways.

After a few days, the foundation, having been carefully guarded from disturbance by travel, having become fully set, the asphalt compound is brought hot in carts, and being transferred to wheelbarrows, dumped upon the surface of the foundation concrete and spread by rakes to a thickness of about 4 inches. It is then lightly pounded by a very hot iron rammer with a circular face 10 inches broad. A furnace is kept on the sidewalk for heating the rammer. A second ramming with hard blows of the same rammer then takes place, condensing the asphalt to but little more than one-half its thickness apparently, and causing its intricate union with the rough surface of the layer beneath.

The final smoothing is given by a hot iron block, which is pushed and pulled over the surface and burnishes down the elevations and rough marks of the pounders.

The *asphalte coulé* is laid with a trowel upon the concrete basis and is not pounded, as in the case of the *asphalte comprimé*. It is used for sidewalks, platforms, and waiting saloons of railways, prisons, skating rinks, baths, warehouses, breweries, and manufactories of all kinds.

To make a square meter of surface, 15 millimeters thick, it is necessary to use 1½ kilo. of bituminous minerals, 23 to 24 kilos. of Seyssel mastic, and 13 to 15 kilos. of washed, dried, and sifted gravel. 1,200,000 square meters of *asphalte coulé* have been laid down in Paris by this firm.

A large portion of the floor area in the Exhibition Building, Champ de Mars, is covered with this material. Many of the covered ways in the buildings, the transverse passages, and the walks under the verandas are floored with this material marked off into squares so as to resemble tiles or marble slabs.

The material is also wrought up into the form of tiles and laid upon a soft and level bed of concrete, melted mastic being poured into the joints and fashioned by the rule and jointing iron. The prices of these tiles are as follows:

| Thickness, metric. | Weight per square meter, kilos. | Price per square meter, francs. |
|---|---|---|
| 0·015 | 36 | 2·50 |
| 0·020 | 48 | 3·35 |
| 0·030 | 72 | 5·00 |
| 0·040 | 96 | 6·70 |
| 0·045 | 108 | 7·50 |
| 0·050 | 120 | 8·35 |

The two lighter descriptions are used for walks, stables of the smaller animals, thrashing floors, coach houses. The thickest for the driveways of hotels and paving of courts serving for the passage of loaded vehicles.

The bridge over the Seine at Elbeuf has 1,200 square meters of *asphalte comprimé* surface laid upon concrete above the joists and iron arches. If affords another instance of the mode of application, the joists being supported upon the iron trusses.

The foundation of bitumen or asphalt when properly laid is proof against permeation by water or vermin, and is much used in the manner indicated.

The coating is of mastic mixed with sand and applied hot over a surface of mortar of silicious sand and hydraulic lime.

Cellars and caves (silos) are much used in France for storing roots and grain. It is the old Eastern and Southern practice, and seems to have been adopted from abroad. At St. Ouen, near Paris, are immense subterranean storehouses for grain, where it may be kept undamaged for years.

Corn fodder (maize) is put away in large quantities, in silos as much as 60 feet long, being packed in tightly salted. The circulation of air is prevented, and it affords green forage all winter and early spring.

Roots are kept with less difficulty for animals, and the beet root, which is the principal source of sugar in France, is stored in enormous quantities, so as to spread the process of extraction over a larger period of the year.

The silo shown is especially constructed for the conservation of the pulp of beets.

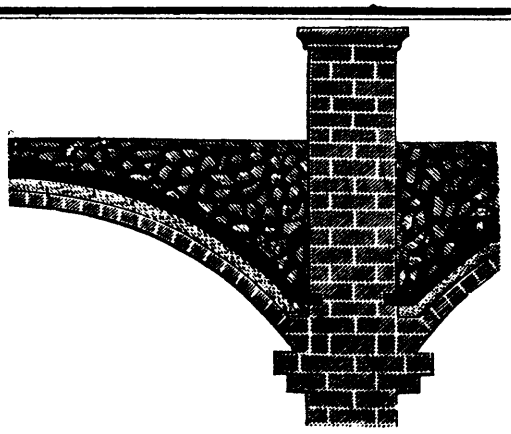


Fig. 9.—WATERPROOF COVERING FOR ARCHES.
(Bridge over the Loire near Tours.)

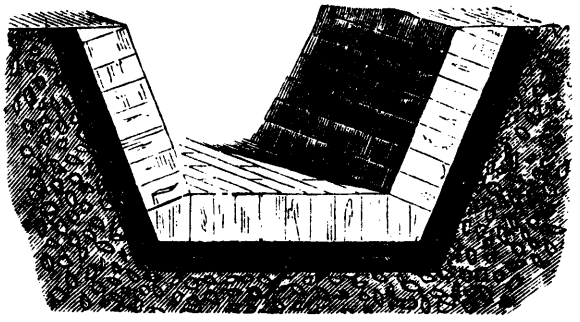


Fig. 11.—SILO FOR BEETS, PULP, OR GRAIN.

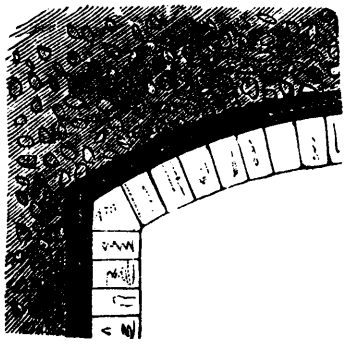


Fig. 10.—COVERING FOR CASEMATES.
Fort de Tourneville, Havre.)

A layer of asphalt affords a means of excluding the water in wet or damp foundations from the upper part of the structure, as in the case of the stratum *a*, interposed between two courses of bricks or masonry.

The above will give some idea of the variety and extent of the uses to which asphalt is applied in France, and especially in Paris, and may be useful to some who read your valuable paper.

EDWARD H. KNIGHT.

Paris, June 28, 1878.

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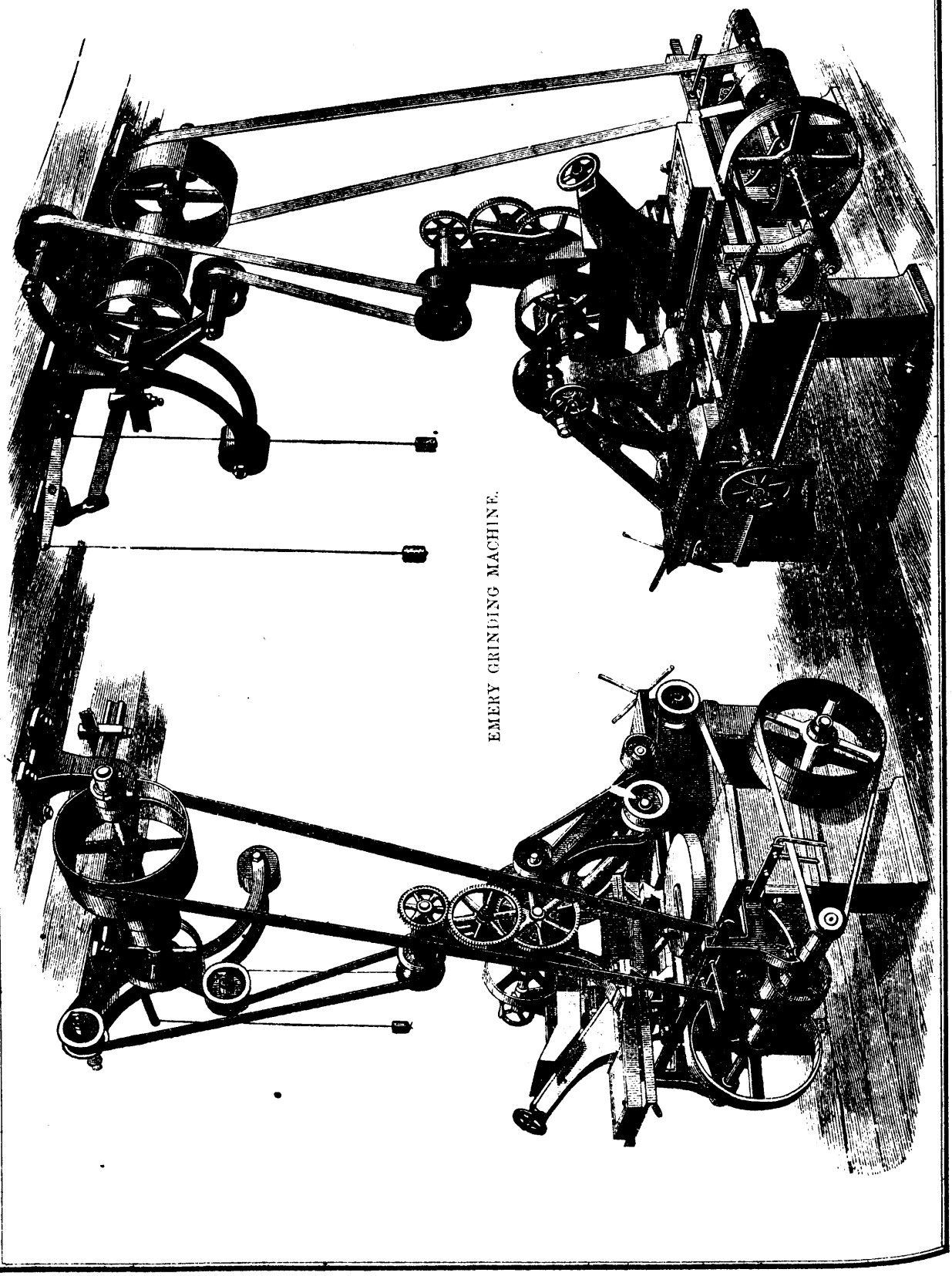
*Concrete Bridge.*—At Seaton, Eng., a three-arch bridge is being built of concrete, on a new principle invented by Mr. Brannon, of London. The idea of the inventor is that concrete would, for such work, prove far more enduring than stone. The toll house at the end of the bridge is being built on arches. Mr. Brannon suggests that by constructing cottages on arches, instead of on the solid ground, all fear of fever caused by exhalation from the soil would be avoided; and he understood that Sir Walter Trevelyan, on whose estate the bridge was being built, was about to have a number of workmen's cottages built on that principle at Seaton.



EMERY GRINDING MACHINE.

## EMERY GRINDING MACHINERY.

We take from *Engineering* the accompanying engravings of Handyside's pulley grinding machine, made by Messrs. Thomson, Sterne & Co., of Glasgow.

This machine is capable of grinding pulleys with either straight or curved rims, and all the belt pulleys of Messrs. Thomson, Sterne & Co.'s machines are finished by it. Referring to our engraving, it will be seen that the machine consists of a substantial frame on which are mounted two heads, the one carrying an emery wheel and the other a mandrel on which the pulley to be operated upon can be fixed. The first mentioned head can be shifted to and fro along its bed, so as to enable the emery wheel to be brought to bear upon pulleys of different sizes, and, as will be seen from our left hand view, the driving belt arrangements are such that the tension of the belt which gives motion to the emery wheel is not altered by the head being shifted on the bed.

The second frame or head which carries the pulley to be operated upon has more complicated movements. Thus in the first place the frame carrying the mandrel is adjustable toward or from the emery wheel, so as to bring the center line of the mandrel either directly over the center of the base, or at different distances from that center; secondly, the casting on which the mandrel frame immediately rests is capable of being moved to and fro at right angles to the plane in which the emery wheel revolves; and, thirdly, the base which carries this slide has cast on it a strong hollow vertical cylindrical center to which a reciprocating rotary motion can be communicated. Referring to the left hand view, it will be seen that the transverse movement of the pulley carrying frame is imparted by a connecting rod coupled to an adjustable crank pin in a disk crank at the upper end of a short vertical shaft, this shaft carrying a worm wheel into which a driving worm engages. By this arrangement the pulley to be ground can be slowly traversed to and fro across the emery wheel. At the lower end of the vertical shaft just mentioned is another disk crank with an adjustable pin which can be coupled by a suitable rod with an arm on the bottom of the vertical center with which, as we have already stated, the base of the pulley carrying frame is provided. By the use of this crank alone, or by its employment in conjunction with the other crank, combined with the power of adjustment afforded by the upper side of the pulley carrying frame, such a motion is given to the pulley as to impart to its rim any desired convexity.

The right hand view shows clearly the manner in which the pulley under treatment is mounted on its mandrel, and also the arrangement of the gear by which a slow revolving movement is imparted to the latter so as to bring all parts of the pulley rim successively under the action of the emery wheel. The arrangement of the belt gear for maintaining a proper tension on the belt, while leaving the pulley carrying frame free to move, will be readily understood from an inspection of our engraving without special explanation. One of the great advantages of the machine is that it enables pulleys to be cast much lighter and more nearly to their finished size than would be possible if they had to be turned in a lathe, while when once set it is perfectly automatic in its action.

### Patterns for Fret Saw Work.

Those who wish to duplicate the above named patterns find the use of impression paper tedious and inaccurate. My method is as follows: Take two pieces of wood of proper size, cut any number of sheets of common writing paper to the same size as the wood, place the sheets on one piece and tack the other piece of wood to it with the paper between. Paste your design on one side and saw through paper and all. Saw the holes first and then the outlines accurately; and when done you will have as many beautiful designs as you wish with the least possible labor.

TIMBER CULTURE.—Congress has passed what is known as the Timber Culture act, which is intended to encourage the growth of timber upon prairies. It provides that any head of a family or member who has arrived at the age of 21 years, who shall plant, protect, or keep in a healthy, growing condition for eight years ten acres of timber trees thereon, not being more than four feet apart each way, on any quarter-section of any of the public lands of the United States, or five acres on any legal subdivision of eighty acres, or two and one half acres on any legal subdivision of forty acres, or one eighth part of any fractional subdivision of land less than forty acres, shall be entitled to a patent for the whole of a quarter-section, or of such legal subdivision of eighty or forty acres, or fractional subdivision of less than forty acres, as the case may be, at the expiration of said eight years, on making proof of such fact by not less than two credible witnesses; provided that not more than one quarter of any section shall be thus granted, and that no person shall make more than one entry under the provisions of this act.—*N. W. Lumberman.*

## EFFECT OF SEA-WATER IN THE EAR.

As it is the season for sea-bathing and the surf at the favorite resorts is full of swimmers, it is timely to talk of a possible ill effect of the salt water. If you don't wish to run the risk of becoming deaf, take a handful of cotton along with you, and when you go in bathing, put plugs of cotton in your ears. This may save you from earache and perhaps from more serious trouble. Dr. Samuel Sexton, surgeon-in-chief to the New York Ear Dispensary, in a recent communication to the *Medical Record*, estimates that a thousand people of New York city are sent to their physicians, to be treated for ear diseases, every year, whose trouble has arisen from getting water in their ears while bathing or from catching cold at such times by exposure or neglect.

It appears from the doctor's researches that salt water is peculiarly irritating to the delicate structures of the inner ear. Very cold water of the freshest kind may, however, be equally harmful, and there is a short list of cases resulting from the Russian bath, two of the patients being themselves physicians. A few instances are cited where the trouble came from using the so-called "nasal douches;" water having penetrated to the ear by the passage from the back of the mouth. But these are unimportant compared with those where trouble has come from salt-water bathing. In all of 65 of the last named cases inflammation occurred; in 57 it was acute. A variety of subsequent damages may accrue when the trouble spreads; permanent deafness is not among the least of these and life itself may be endangered.

Surf bathers are especially exposed to such injuries, since a breaker may strike them on the side of the head and drive the water into the ear; the same result may ensue if the bather gets a sudden mouthful from an unexpected wave, the water then being forced through from the mouth to the inner ear. Man, the doctor thinks, is not naturally amphibious. Animals fitted for aquatic life are provided with various arrangements for keeping the water out; seals, for instance, have a movable membrane in the ear, which closes and shuts out fluid. The muscles of the water-shrew are competent to shut the ear-passages. People who are blessed with very small openings of their ears run the least risk in bathing. A man should never dive, says the doctor, if he wishes to preserve his hearing. When in the surf, he should take the wave on his chest or back, "closing his mouth and nostrils;" though how a man can close his nostrils, the doctor does not state. But the pledget of cotton for the ears is essential and every bather should be provided with it.

## PATTERN-MAKING—TURNING.

(By Mr. Joshua Rose.)

Fig. 53 represents a side and face view of a very useful chuck, suitable for holding core boxes while boring them. It is shown attached to one of the metal plates that fit the mandrel of the lathe, and is usually made of hard wood; but for a large-sized one, say 15 or more inches in diameter, the disc portion may be made of pine wood. The two sides, B B, are usually fixed to the disc, their inner edges being planed at an acute angle to it. The work is held by driving the wedges C C, and may be truly chucked by them in a comparatively short space of time.

Another vertical drill chuck is shown in Fig. 54, and it will answer the same purpose as that shown in Fig. 53. It is, however, made entirely of metal somewhat similar to a machinist's dog chuck, but much lighter. Pieces of wood may be screwed on the jaws at A A, and bored to the curvature of any round piece of wood—an advantage which the chuck shown in Fig. 53 does not possess. Or the jaws may be turned round in their places, so that the faces, A A, will stand outwards, and the wooden pieces screwed thereon may be made to fit a hole. This chuck will be found to save much time over the plan of screwing work to the common face plate. V pieces of wood may be fixed to the jaws, and a piece of work in the rough held by them during the process of facing, boring, and turning the projecting part. The work can then be reversed in the chuck, and similar operations performed on the opposite end; and the work can be taken from the lathe and tried as to either fit or conformation, and, if necessary, restored in a moment to its original position in the chuck, so as to run quite true; but, at the same time, for first-class work, it is better not to use the V's or finished surfaces. For holding bits and small work, neat littly chucks may be purchased at the hardware stores, and they act similarly to the nipping arrangements applied to boring braces. These chucks can be supplied to either screw on the lathe mandrel; and they will, with a taper shank, fit into the taper hole provided to fit the holes which receive the lathe centres. It is well to have one of each, so as to be able to use one of them in place of the still lathe centre, to operate upon work already chucked on the face plate of the lathe.

A simple and very useful chuck still remains to be described, being what is known as the cement chuck, which is made as follows: A disc of hard wood is screwed to a metal plate, where it should remain permanently; but if the face plate cannot be spared, bore a slight taper hole through the disc, a little smaller than the diameter of the screw of the lathe mandrel, and partly through the disc. Then screw the disc on the mandrel, working the disc backwards and forwards to form a thread in the bore of the disc, and then turn and face it perfectly true. Then bore a small hole in its centre, and drive in a piece of soft steel wire, leaving a short length projecting from the face, and turn it to a point, as shown in Fig. 55.

The object of this chuck is to drive thin delicate work, which it would be difficult to screw or clamp by adhesion, and this is accomplished as follows: We first prepare a wax composed of

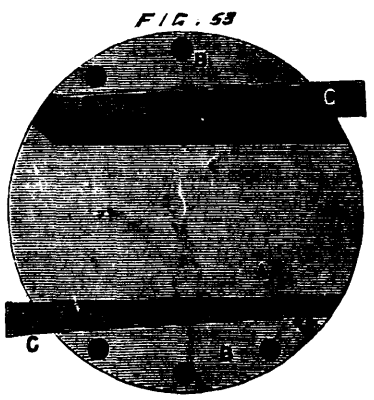


FIG. 53.

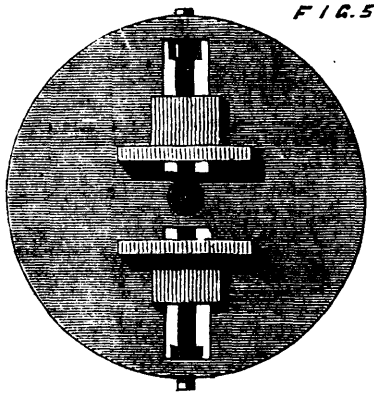


FIG. 54.

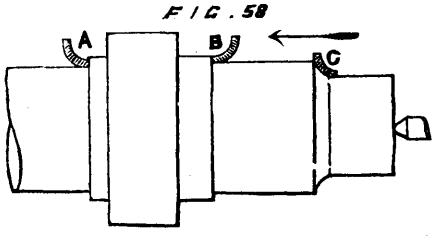


FIG. 58.

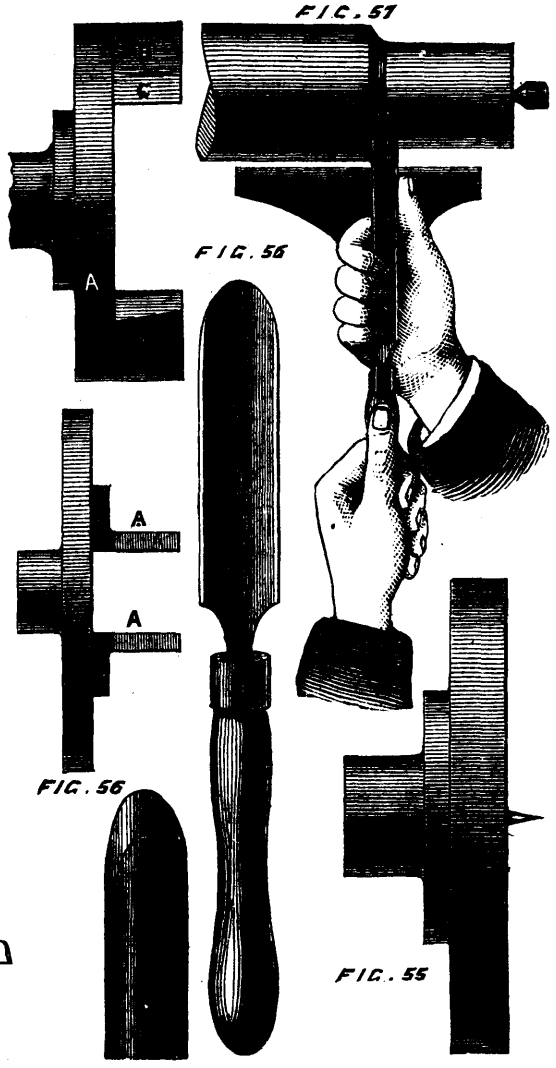


FIG. 57.

FIG. 56.

FIG. 56.

FIG. 55.

8 parts of resin to 1 of the best beeswax, melted together, and we stir them well together, and run the mixture into tubes of paper or other suitable moulds. To chuck the work, we take a stick of the wax, and press its end against the face of the chuck while the lathe is running, and then place the centre of the piece of work on the steel point, applying sufficient pressure to cause the steel point to force its way into the work. Just before the work touches the waxed surface we throw the lathe belt on to the loose pulley; and the momentum of the lathe, combined with a moderately heavy pressure, will generate, by friction, sufficient heat to melt the wax and cause the work to adhere to the chuck. The work may be detached, when necessary, by inserting behind it a thin wedge or blade.

TURNING TOOLS.

The turning work necessary in making patterns is usually done by hand; although on small and plain work, such as simple boring and facing, slide rest tools may be used to advantage, inasmuch as they will operate quicker than hand tools. Since, however, pattern lathes are not usually provided with slide rests, we shall confine our remarks to hand tools. For roughing out, the turning gouge, shown in Fig. 56, is used. In grinding this gouge it is necessary to lower the back hand when grinding, at and towards the corners, so that the cutting edges may be formed by the junction of two faces, at as acute an angle as those forming the cutting edge in the centre in the width of the tool.

It is always the custom to reduce the work in the lathe to nearly the required form by this tool, the finishing tools being (with one exception) simply scraping tools, and not, properly speaking, cutting tools; hence it is evidently inadvisable to leave much for them to take off. The manner of holding the gouge is shown in Fig. 57. One hand grasps the handle near the end, while the other grasps the gouge near the cutting point—that is to say, as near as the hand rest will permit. It is sometimes, however, necessary to slightly vary the manner of holding by passing the forefinger of one hand around the hand rest, while the gouge is confined between the thumb and forefinger, thus gripping the gouge end to the rest. This is advisable when turning a piece of work that is not completely round, as, for instance, tipping off the teeth of a gear wheel, in which case gripping the gouge to the hand rest will steady it and prevent it from digging into the work. The gouge is shown, in Fig. 57, to be cutting from left to right; it will, however, cut equally well if used from right to left, in which case the position of the hands must be reversed, the left hand gripping the gouge near the cutting edge. In either case, however, the gouge is not held horizontally level, but is tilted to one side, the lower side being the cutting one; otherwise the tool would rip in the work.

Fig. 58 shows the section of the tool and the tilt of the tool when cutting from right to left; while that of the tool, A, shows tilt when cutting from left to right. The reasons for this are as follow: The face of the gouge, on its hollow side, and near the cutting edge, receives the strain which is necessary to curl the shaving—that is to say, which is necessary to force it out of the straight line. But if we were to place the gouge in the position shown in Fig. 58, at C, the whole of this strain would be placed upon the gouge, tending to force it forward and into the cut as denoted by the direction of the arrow; and as a consequence, the gouge would run forward and dig into the work, in spite of all endeavours to prevent it. When, however, the gouge is held in the positions relative to its line of travel to its cut, shown in Fig. 58, at A and B, there is but little tendency for it to run forward, and it can be fed easily to its cut. In addition to its use as a roughening tool, the gouge makes a very efficient finishing tool for hollows, though it is not often employed as such by pattern makers. In this case, however, great care must be taken in controlling its position to the work, as shown in Fig. 58.

## DECLINE IN THE PRICE OF PETROLEUM.

Great consternation has been caused in the oil regions of Pennsylvania by the recent decline in the price of petroleum to less than a dollar per barrel. It is generally admitted that these ruinous prices are a natural and unavoidable result of the immense overproduction, and in some quarters the belief is expressed that if there is no other way of curbing the desire to sink new oil wells more rapidly than new markets can be found, a still further decline will in the end prove beneficial by warning all whom it may concern of the folly of glutting the market with excessive quantities of such a product as petroleum.—*Railway World.*

## LEARNING LESSONS IN MAKING PAVEMENTS.

A great deal of time, labor, and money is continually being lost by the neglect to profit by the experience of others; thus, for instance, in London they are now laying down wood pavements, and will of course go through the same experience as we have in New York; they will end by condemning them, as we, however reluctantly, have been obliged to do. The latest reports are quite favorable, but unfortunately they are not based on the main consideration—the durability of the pavement, but solely on the chances of horses slipping, which is less than on the asphalt pavement or on the smooth stone pavements. We acknowledge this, and it was the first observation made here in the beginning of our experience in this line; but when we found that this advantage was of very short duration, especially in much travelled thoroughfares, and that the pavement was soon full in holes, making it inconvenient for waggons, very dangerous for horses, and requiring continual repair, giving all the streets provided with wood pavements a dilapidated look, we changed our mind; and this will also soon be the case with our English cousins.

On the other hand, we have not profited by the experience obtained in Europe proving that gas-tar and tar-pitch will not do to use a substitute for natural asphaltum in making pavements. The latter makes admirable roads for horses and carriages, asproved by some streets in Paris, Amsterdam and elsewhere, which have kept in order for years, and also a small piece on Fifth Avenue and Twenty-fifth Street, New York, near the Worth monument, which is improperly called Grahamite pavement, but which in reality is mostly natural asphaltum, with stones and gravel, and contains very little of the brittle Grahamite mineral. All our other so-called asphaltum pavements are poultices made of coal-tar, ashes, sand, etc., and have all soon proved their utter worthlessness; this material is scarcely adapted even for footpaths, except when very carefully laid and thoroughly mixed with plenty of proper and solid ingredients.

New York has acquired a reputation for experimenting with pavements, on which millions of dollars have been spent, or rather wasted; and when any one interested wishes practical information on this subject, he had better come here, and by looking about and inquiring, he can learn valuable lessons.—*Manufacturer and Builder.*

## FORMULAS FOR BRONZE ALLOYS.

Edward Kirke, in writing on the founding of alloys for the *Iron Age*, gives the following formulas:

A bronze in imitation of gold may be made of 45.5 parts copper, 3.5 parts tin and 1 part zinc—50 parts.

Bronze metals are generally cast of an alloy of 50 parts copper and 2.8 parts tin. This alloy is very hard.

A softer bronze for medals than the above is composed of 46 parts copper and 4 parts tin.

Ancient bronze nails were made of 40 parts copper to 1 part tin, and were very flexible.

Soft bronze is composed of 18 pounds copper to 2 pounds tin.

Hard bronze is composed of 20 pounds copper to 5 pounds tin.

The ancient bronze mirrors are said to have contained 16 parts copper to from 7 to 8 parts tin.

At the time of Louis XIV. of France, a period when the art of casting statues was much cultivated in France, statues were cast of an alloy of 30.6 parts copper, 0.11 parts tin, 2 parts zinc and 0.6 parts lead.

The statue of Louis XV. is cast of 82.4 parts copper, 10.3 parts zinc, 4 parts tin and 3.2 parts lead.

The bronze of the ancient Greeks consisted chiefly of copper and tin, but was frequently alloyed with arsenic, zinc, gold, silver and lead. All their shields and weapons of war were made of bronze, as well as coin, nails, kitchen utensils, etc.

All the ancient nations seem to have understood the art of tempering bronze and copper, and the Mexicans understood the the art of converting bronze into edged instruments in a high degree, but the art of tempering and hardening bronze and copper has been lost to modern nations; but as we understand the working of iron better than the ancients, and have steel, an alloy of iron and carbon, which the ancients did not have, we do not miss this art much.

DELUDING THE POOR FISHES.—There is now on exhibition in Paris a platinum wire which is placed in a bottle and ignited by electricity from a bichromate.

## SCIENTIFIC INTELLIGENCE.

THE telephone has brought Philadelphia nearer to New York.

THE famine-struck district of China is 13 times the size of Switzerland.

The three coal-measures of Missouri are respectively 1300, 323, and 290 feet.

IN YUTACAN AND HONDURAS musk is extracted from alligators. Their fat is used for oil, and their skin for shoe-leather.

SIR WILLIAM GULL advises those fatigued from over-work to eat raisins rather than to drink wine or alcoholic drinks.

THE SOCIAL SCIENCE ASSOCIATION of Great Britain, of which Lord Aberdeen is President, will hold its next annual congress at Chettenham in October.

MALACHITE GREEN is a new dye formed by the action of benzo-trichloride on methyl-aniline in the presence of metallic salts. It does not change color on the application of heat.

SEVERAL INSTANCES of the spontaneous rupture or explosion of toughened glass have been reported recently. Professor Ricard says that a child's drinking-glass broke in pieces a short time ago without any apparent cause.

M. FAVRE says there are more than 3,000,000 persons in France affected with Daltonism—that disease of the eye which prevents the person troubled with it from distinguishing colors. The number of color-blind women is to that of men as one to ten.

GALVANIZED IRON FOR ROOFING.—Zinc coated sheet-iron does not wear out from oxidation, and does not crumble, as does sheet-tin, from the repeated contraction and expansion produced by changes of temperature. In Vienna and Prague the manufacture of this roofing material is a growing industry.

IMPROVEMENTS IN TANNING.—An Italian chemist, Signor Paesi, proposes to substitute for the tanning-bath, in the manufacture of leather, a solution in water of perchloride of iron and common salt. Hides may be tanned, according to this process, in from five to six months. Moreover, the perchloride of iron, being a powerful disinfectant, does away with many objectionable features of the tanning business as hitherto conducted.

THE SCINTILLATION OF STARS continues to occupy M. Montigny's attention; and in a recent paper to Belgium Academy he discusses a series of observations which seem fully to demonstrate that stars, the spectra of which are characterized by dark bands and black lines, scintilate less than stars with fine and numerous spectral lines, and much less than those the spectra of which present only a few of the principal lines.

CONFIRMATION OF THE GERM THEORY OF DISEASE.—The truth of the germ theory of disease would seem to be demonstrated, at least with regard to one disease—splenic fever—by the researches of Dr. Koch. In cases of this disease there accumulates in the blood and tissues, but especially in the spleen, a peculiar kind of bacteria—*Bacillus anthracis*. On inoculating animals with fluid containing either the bacilli themselves or their sperms, Dr. Koch produced all the phenomena of splenic fever.

ELECTRIC CONDUCTIVITY OF SOLUTIONS.—M. F. Soeusen has presented to the Swedish Academy the results of his experiments on the electric conductivity of solutions of various alums. These show that in all cases the conductivity increases directly with the concentration of the solution, and that while less intense than in solutions of the simple alkaline sulphates, it is always more intense than in solutions of aluminum sulphate. The green modification of chrome alum possesses a greater conductivity than the red variety.

ETHNOGRAPHY STUDIES.—Dr. R. Andree, of Stuttgart, has just published an interesting work on "Ethnographic Parallels and Comparisons." The author has chosen over twenty different subjects, and has gathered together on these topics an enormous amount of material from all the races of the globe. Among these subjects are the views of different races with reference to constellations, cairns, measures of value, mothers-in-law, the vampyre, skull-worship, the umbrella as a mark of dignity, &c. In view of the rapid changes introduced by commerce, the author deems it important to preserve a complete picture of the intellectual condition of all the uncivilized peoples now existing.

THE PHYSICAL EFFORT OF THOUGHTS.—Dr. Lombard recently read a paper before the Royal Society in which he maintained that mental activity will at once raise the temperature of the head, and that merely to excite the attention has the same effect in a less degree. This is a curious result, as offering to show that anything of the nature of volition involves a waste of nerve tissue which is not involved in involuntary perception and observation. There is no difference, we believe, between the temperature of the sleeping and that of the waking body, or between that of a waking body and the head, so long as no act of effort is involved. But, if even the least intellectual efforts raise the temperature of the head above that which it reaches in unused and idle observation, it would seem to show that there is a waste involved in volition which belongs to no so-called "automatic" action of the mind. And that is itself a fact of no slight significance.

AN EXHIBITION OF RECENT INVENTIONS.—An interesting exhibition of new apparatus was recently made at the rooms of the Royal Society, London. Among them were: The Mechanical Chameleon, to show the mixture of two colors in any proportion. A large Holtz electric machine (by Ladd), consisting of twelve rotary and twelve stationary plates, thirty inches diameter. A micro spectroscope with improvements: (1) quick movement of the slide carrying the slit: (2) scale for registering position of slit; (3) arrangement for composing three spectra and for splitting a single spectrum; (4) new form of comparison stage made by Mr. A. Hilger. A dynamic-electric machine, speed 800 revolutions; power 1·75 horse-power required to work it; effect 1,200 candles' light, exhibited by Siemens Brothers. The telephone harp, with visible records of sound through vacuum tubes. Apparatus for showing figures in light from vibrations caused by sound. A new metallic thermometer. An apparatus for the automatic registration of the number of hours of sunlight; and finally, the phonograph, exhibited by Mr. Preece.

IRIDESCENT GLASS.—A French patent has lately been granted to M. Clémandot, for a process of rendering glass irridescent by the action of a bath of 10 to 20 per cent solution of muriatic acid under pressure and at a temperature of from 120° to 150° C. (about 250° to 300° Fahr.)

THE TELEPHONE is in daily use between the Exhibition buildings, Paris, and the office of the Ministry of Commerce, the wires being carried through the sewers or laid beneath the road. The electric light is being used extensively at the works on the Trocadéro, and at a lecture, given by M. Jamin, eight Jablochkoff's candles were successfully supplied in one circuit.—*English Mechanic*.

THE German Chemical Society of Berlin, founded in 1868, under the presidency of Prof. A. W. Hofmann, has now 1827 members, of whom 1008 are resident German members, and 542 foreign. During the last ten years, the official publication of the society, well known to the profession as the *Berichte*, contained no less than 3726 original communications. Prof. A. Kekulé is the President for the coming year.

MINERALS OF JAPAN.—Minerals used for pottery of all kinds, such as clay, kaolin, silex, etc., are very abundant in Japan, and are spread all over the country. In many instances very good ordinary refactory materials and fine porcelain clay are found close together. This is the case to a most remarkable degree in the neighbourhood of the small town of Arita, province of Hizen, the head centre of the porcelain manufacture in Japan. Within a very limited circuit, not half-a-mile in diameter, there are found imbedded in the rocks at different places, all the materials necessary for the biscuit, for the coating of the ware before glazing, for the glaze, for the "craquelé," etc., the best being of such good quality that, after being powdered and decanted, it is used without any further mixture for the finest quality of ware—the so-called egg-shell porcelain.

A NEW TANNING PROCESS.—The leather prepared by Dr. Knapp's process of tanning with iron oxide salts has recently been examined by M. Muntz, chemist to the Conservatoire des Arts et Métiers in Paris. His report is unfavorable. In a specimen of sole leather he found 12·84 per cent of iron oxide, which, however, was not combined with the skin, for by washing with weakly acidulated water it could be completely removed. The proportion of water was 21·3 per cent, and there was besides 2·11 per cent of free fatty matter along with a considerable amount combined with iron oxide. To produce 100 parts by weight of this leather, 47·9 parts of dry pure skin are necessary—thus with iron tanning there is pretty much the same increase of weight as by the ordinary process. This new leather, Mr. Muntz says, is simply natural skin in which iron oxide is mechanically deposited in combination wilh fatty matter. Tanning with metallic salts can only have a future when the metallic oxides are combined with the skin tissue—if not directly, then with the aid of mordants.

## Transmission

BY WIRE ROPES USED AS CONNECTING-RODS.

On each of the shafts A A, are arranged 3 cranks, each 120° apart. These cranks are connected by wire ropes, which may be of considerable length and may also be horizontal, vertical, or inclined, as the location demands.

The pulley, E, may receive the power from the motor, and D may transmit the same to the machinery where it is required.

It is evident that the distance of transmission by this contrivance will be subject to the sag of the ropes; but the rope connections may be multiplied by the use of intermediate shafts, and in that way uniform rotary motion may be transmitted to a considerable distance. The motion must be comparatively slow, however, owing to the severe strain which would be thrown upon the bearings by the surging and swaying of the ropes during the rapid changes of motion to which they would be liable; but what is lost in velocity may be gained in power transmitted—as that is measured by the strength of the ropes—and it is an easy matter to make them carry heavy burdens safely.

The writer saw this in use at Whirlpool Rapids, Niagara, for driving the passenger-elevator recently erected at that place.

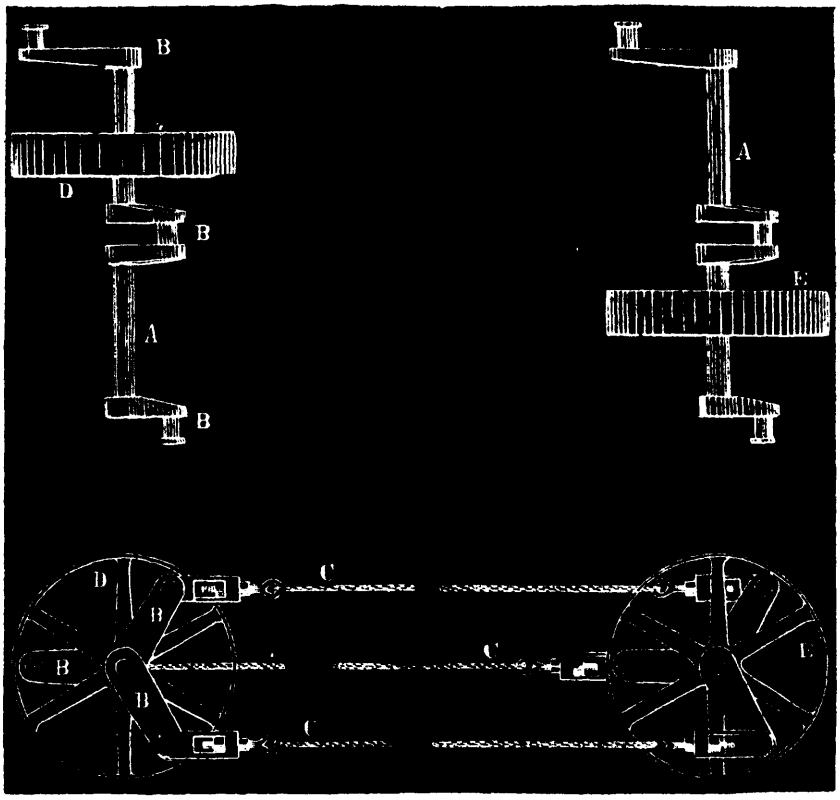



Fig. 1.

TRANSMISSION OF ROTARY MOTION BY RODS.

Reciprocating motion by a line of connecting-rods and swinging arms for working pumps and the like is old and in common use at mines and quarries.

But in order to transmit uniform rotary motion, limited in distance only by the practical working length of rods, the devices shown in the figure may be employed.

Two eccentrics, A A, set at right angles on the shaft, D, are connected by rods E E, to two cranks, B B, which are also secured at right angles on the shaft, C. The motion transmitted is steady and noiseless, is performed in the same direction and in equal time, and is very suitable for valve-gears in steam-engines and the like. The effect would be the same if two cranks were used in place of the eccentrics.

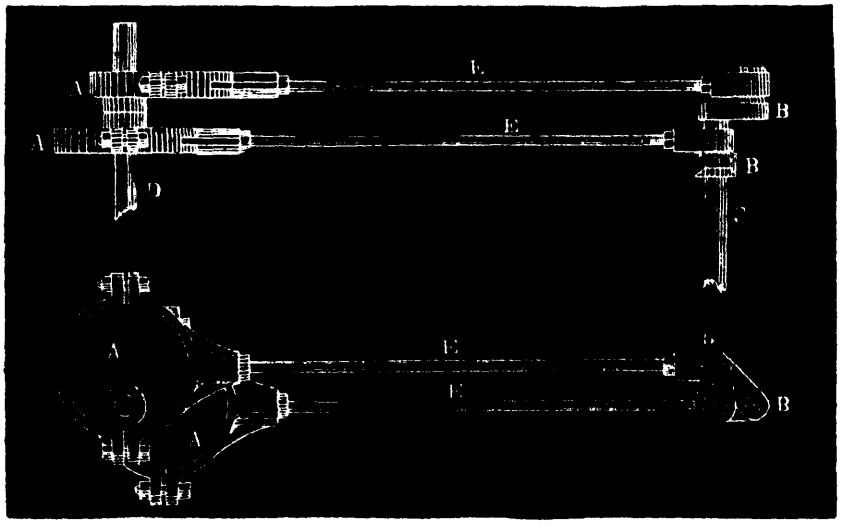



Fig. 2.

The writer devised and applied this combination of well-known parts to driving the valve cam-shaft and governor of a beam steam-engine built at People's Works, Philadelphia, in the year 1867.

[*Cooper's "Uses of Belting"—Phila., Claxton, Remsen & Haffelfinger.*

### A 20 lb. Salmon in a Halibut's Stomach.

A Wick (England) fishing boat landed a fine conditioned halibut, weighing 187 pounds, measuring 6 feet 8 inches in length, and about the same in girth. On opening the fish its stomach was found to contain a fine salmon in very good condition, and which weighed 20 pounds. The fisherman remarked that it was no wonder the halibut looked so well, seeing the sort of dinners he indulged in.

CANADIAN PACIFIC.—The track of the Canadian Pacific is now laid, and engines running from Winnipeg to Selkirk, a distance of 21½ miles, and from Selkirk eastward, on section 15 of the main line, 50 miles. This gives 71½ miles all told, in working order within Manitoba. At the eastern end of the line, Messrs. Purcell & Ryan have pushed their work to a very advanced point, and they expect to have the road built 113 miles eastward from Thunder Bay this autumn.

## NEW MECHANICAL INVENTIONS.

Mr. Thaddeus Hodgson, of Amherst, Nova Scotia, has invented a new machine for gumming and sharpening saws. A plate, bolted to the front of a work bench, serves as a support for the saw, and a sliding shaft, guided by a handle, carries a band pulley and an emery wheel, by which the grinding is done.

A horizontal wind wheel, invented by Mr. Martin Everheart, of Victoria, Texas, is so constructed as to automatically adjust itself to the force of the wind, and shut itself off entirely in case of a storm, while it may also be regulated by hand as desired. An independently rotating frame carries a pair of adjustable rudders, which hold it in any position required. At the forward end of the frame are two pairs of wings, working together, which are ordinarily held closed by a weighted cord, but expand and screen the wind wheel whenever the wind becomes too strong.

The same inventor has also patented a system of applying an irregular power, such as that produced by the intermittent action of a wind wheel, to driving light machinery regularly. This is effected by an ingenious combination of details, by which two weights are drawn upward independently, and their cords wound upon separate drums, the driving machinery being automatically shifted by whichever weight, in its downward motion, reaches the limit of its movement first.

Mr. C. T. Porter, of Newark, N.J., has invented an improved journal box of cylindrical form, which has inclined cheeks, and is secured by wedges and gibs in a novel manner. The inventor claims that by his mode of construction he is enabled to place the supporting wedges as near as possible to the line of thrust, and that it renders a horizontal engine equal to a vertical engine in supporting the shaft in the direction of the line of centers.

An improved axle lubricator, invented by Mr. E. W. Moyer, of Bernville, Pa., is claimed to be economical of oil and to exclude the dust. The axle is made hollow, with an interior reservoir, exit duct, and grooves packed with wicks; the cap also has an inclined oil duct, and the hub is similarly supplied with oil receptacles and packed grooves.

Mr. G. W. Ford, of Elba, N.Y., has invented a machine for expanding and contracting metals, for use in upsetting wires and similar work. The gripping attachments are exchangeable, so as to be applicable to various kinds of work. And the power is applied by a pair of hinged levers having a powerful purchase.

An improved grapple has been patented by Mr. A. L. Barwill, of Beaufort, S.C. The object of the inventor is to improve the construction of grapples used for digging phosphate rock, or for similar purposes, so as to relieve the strain on the claws and bent arms, and to adapt them for cutting a suitable quantity of rock to be brought to the surface. This is accomplished by adding to the grapple one or a series of cutting blades or chisels, for loosening and separating the rock.

Some new improvements in saw mill head blocks, patented by Mr. W. H. Abrams, of Eugene City, Oregon, are intended to render the action of the saw mill, to a great extent, automatic. This is accomplished by certain ingenious peculiarities in the gearing, by which the clutches are shifted and the pinions turned, with each complete movement of the carriage.

An improvement in Lewises, or appliances for connecting heavy blocks of stone to hoisting ropes, has been patented by Messrs. Walter Graham and J. A. Dennison, of Annisquam, Mass. A pair of wedge-shaped jaws, connected by a pair of links to a single link, are secured in an undercut recess of the stone by driving a key between them, and may be detached by knocking out this key.

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The Manufacture of Steel Rails was begun in this country in 1872. During that year 94,000 tons were made; in 1873, 129,000 tons; in 1874, 400,000 tons; in 1877, 420,000 tons. During the present year the product is expected to reach as many as 500,000 tons. In 1872, the average of a ton of Bessemer steel rails was $115; now the average value is about $42. Owing to recent improvements in machinery, it is expected that the cost of production will be reduced to such an extent as to enable America to compete successfully with England in neutral markets. Inquiries begin to come in from South America, and there is a fair prospect that in a few years the exportation of steel rails will become possible.—*Polytechnic Review.*

## SAND AND WATER.

An important point in the selection of materials is to procure a pure silicious sand for mixing with cement or lime to form mortar. The sand used should be free from all nitrogenous, and some saline matters, such as alkaline chlorides; if not, these matters are liable to undergo a chemical change, after being mixed with the lime and cement, and so cause a rupture of the work even after it has set. For cementing purposes, for mixing with cement, a sharp sand is undoubtedly the best. It would be a saving of cementing material to select sands of various degrees of fineness so as to reduce the interstitial space as much as possible. Pure silicious sand forms, in combination with the limes, a silicate of lime which augments the strength, especially in those parts excluded from the air, as the interior of thick walls. Sand acts as a dilutant for cement, so that its approximate strength, within certain limits, may be arrived at by knowing the proportions of sand used.

With regard to the selection of water, either fresh or sea water may be used for mixing with Portland cement. It has been shown by Mr. J. Grant, C.E., that the use of sea water augments the strength of Portland cement. This may be due to certain combinations taking place between some of the salts in sea water and the cement; on the other hand, the excess of certain salts will undoubtedly injure the cement. Sewage water, for example, should on no account be used in compounding mortar. The author has seen cases in which the best materials, both as regards cement and sand, have been used; but when mixed with sewage water the cement has never properly set, while the same cement, in the same work, compounded with pure water, has set rapidly and well. Care should also be taken in the mixing of cement that too great a proportion of water is not used. The smaller the quantity of water used in the compounding of cement, the better it will be found to be. The volume of water to be used, therefore, should only be sufficient to bring the mortar into a thick paste. Where more water is requisite, it is a sign that the bricks or other materials which are used in the construction of the works have not been sufficiently soaked, and that the mortar is robbed of its moisture, by reason of the inattention paid to this important point.—*Engineering News.*

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## THE SAGACITY OF ANTS.

Prof Leidy, in a recent article quoted by the *Journal of Chemistry*, states that, in order to ascertain whether a house he had just entered was (as he suspected) seriously infested with red ants, he placed a piece of sweet cake in every room. At noon every piece was found covered with ants. A cup of turpentine oil being provided, each piece was picked up by forceps, and the ants dropped into the oil. The cake was replaced, and in the evening was again found covered with ants. The same process was gone through the following two days, morning, noon and night. The third day the number of ants had greatly diminished, and on the fourth there were none. He at first supposed the ants had all been destroyed, but in the attic he observed a few feasting on some dead house flies, which led him to suspect that the remaining ants had become suspicious of the sweet cake. He accordingly distributed through the house pieces of bacon, which were afterwards found swarming with ants. This was repeated with the same result for several days, when in like manner with the cake, the ants ceased to visit the bacon. Pieces of cheese were next tried with the same result, but with an undoubted thinning of the ants. When the cheese proved no longer attractive, dead grasshoppers were supplied from the garden. These again proved too much for the ants, but after a few days' trial neither grasshoppers nor anything else attracted them; nor has the house been infested with them since.

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## VARNISH FOR GLASS.

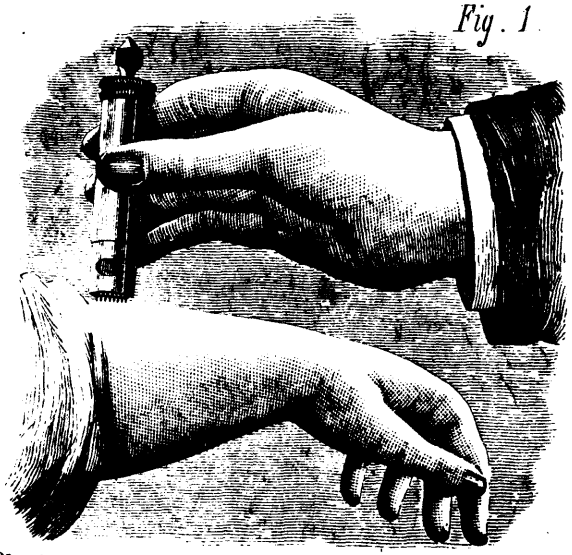
Terquem prepares a varnish for glass on which drawings can be made, either with India ink or with ordinary ink. Four parts of gum mastic and eight parts sandarac are placed in a well closed bottle with 8 parts of 95 per cent alcohol, and warmed on a water bath, then filtered. When used, the glass is heated to 122° to 140° and the varnish flowed over it. After the drawing is done, it is flowed with a weak solution of gum. The varnish is very hard, and on warm glass, it is brilliant and transparent; but when cold it is opaque and absorbs the ink. It can be employed for putting labels on glass bottles, etc.

A thin solution of gelatin applied to a plate of glass, which is supported horizontally until dry makes a good surface for pen and ink drawings for transparancies.

### ELLIOTT'S APPARATUS FOR APPLYING CROTON OIL.

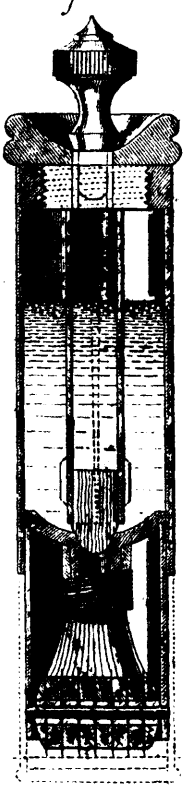
Croton oil and other substances possessing similar qualities are used by physicians as counter irritants to subdue and destroy internal or deeply seated diseases and to induce or substitute therefor a superficial inflammation. The external application of this medicament is attended with very

Fig. 1



beneficial effects; and in order to admit of said application in an easy and expeditious manner, to avoid unnecessary suffering to patients, and to insure a proper deposition of the irritant, the present device has been contrived. Fig. 1 shows the method of its manipulation, and Fig. 2 its internal construction.

Fig. 2.



The apparatus consists of a case or tube containing at one end a reservoir for the reception of the irritant. At the bottom of the case a roller is pivoted, the whole periphery of which is studded with needle points projecting a short distance from the surface. The position of the roller within the case is such that a portion only of its diameter projects beyond the lower open end. The irritant is conveyed to the roller by means of a peculiarly constructed tapering stopper, the lower portion of which is contained within a circular brush, the feather ends of which rub against the needle points.

The operation of the instrument is as follows: The croton oil is conveyed to the roller by slightly loosening the taper stopper in its seat, an application which is greatly facilitated by the double milling on its flanged head. The oil runs down the brush, and is evenly spread upon the needle points as they pass through the brush, each point being entirely and freshly coated with oil at every revolution of the wheel; thus, as the roller is passed up or down on the surface upon which the counter irritant is to be applied, no needle point enters the skin without leaving a deposit; and a peculiar advantage that this mode of applying the oil has over the ordinary method is that the needle point enters and leaves the skin at different angles, thus enlarging the hole at the bottom of the puncture and causing the oil to be deposited therein. Another advantage is that, on tender or particularly painful spots, the roller can be applied with the utmost delicacy of touch, in a striking contrast to the application of the pounding instrument now in use. And lastly, a large amount of surface can be perfectly, as well as expeditiously, covered or acted upon.

The invention was patented in Canada, February 1, 1876.

### Or-Moulu.

The or-moulu of the brass founder, popularly known as an imitation of red gold, is extensively used by the French workmen in metals. It is generally found in combination with grate and stove work. It is composed of a greater portion of copper and less zinc than ordinary brass, is cleaned readily by means of acid, and is burnished with facility. To give this material the rich appearance, it is not unfrequently brightened up after dipping by means of a scratch brush, the action of which helps to produce a very brilliant gold-like surface. It is protected from tarnish by the application of lacquer.

### A SIMPLE FIRE ESCAPE.

The annexed engraving represents a simple fire escape of English invention, its object being to catch persons who are compelled to precipitate themselves from the upper stories of burning buildings. It consists simply of a net sustained on poles, which are held up by persons on the ground. Con-

trivances of this kind kept at police stations ready for instant use on an alarm of fire, might be the means of saving many lives.

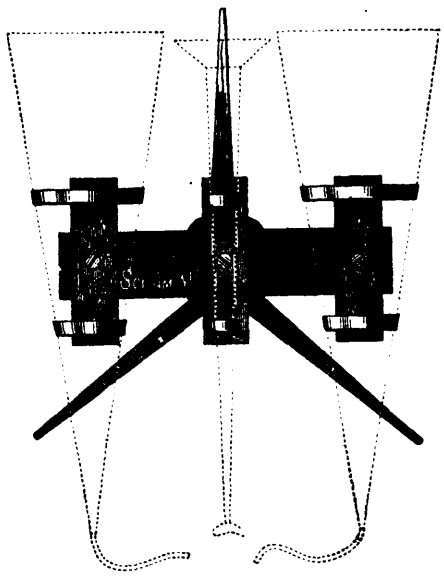
EDISON'S MEGAPHONE.

## EDISON'S MEGAPHONE.

From the time of the first man until now, men have endeavored to circumvent nature so as to grasp that which the unaided faculties could never attain. We have telescopes for viewing remote objects, microscopes for making visible the minute, telephones for talking over immense distances, and now, at last, we have a megaphone, which is to the ear almost what the telescope is to the eye, or the telephone to the vocal organs.

The speaking trumpet, which, for two centuries at least, has been employed to direct sound so that it may be heard over a long distance, is much used at sea, and is often employed on land to direct vocal sounds so that they may be heard above other sounds. It is tolerably certain that the speaking trumpet is of modern origin, and that it is the invention of Samuel Moreland, 1670.

Kircher, in his *Ars Magna et Umbra* and in his *Phonurgia*, mentions a kind of gigantic speaking trumpet, described



PLAN OF MEGAPHONE.

as the horn of Alexander. According to Kircher, this horn enabled Alexander the Great to call his soldiers from a distance of ten miles. The diameter of the ring must have been 8 feet, and Kircher conjectures that it was mounted on three poles.

Late in the last century Professor Huth, a German, made a model of the horn, and found that it served as a powerful speaking trumpet, but we are considerably in doubt as to the distance through which sounds can be projected through such an instrument.

The ear trumpet, which is the counterpart of the speaking trumpet, has been made in various forms during the last two centuries, but no form yet devised has any advantage over a plain conical tube with a bell-shaped or flaring mouth.

Common forms of ear trumpets are shown at 1, 2. The one at 3 is telescopic; 4 is provided with a diaphragm (shown in dotted lines), which renders the sound less confused, though it does not increase its strength; 5 is a shell having a mouth piece and ear tube; and 6 is a stethoscope. So much for the antecedents of the megaphone.

Professor Edison, in his researches on sound, has made many curious experiments, one of the most interesting of which is that of conversing through a distance of 1½ to 2 miles with no other apparatus than a few paper funnels. These funnels constitute the megaphone, an instrument wonderful both for its simplicity and effectiveness. In the plan view the details of construction are clearly shown, and our large engraving represents the instrument as it stands on the balcony of Professor Edison's laboratory. A mile and a half distant, at the spot indicated by the two birds, there is another instrument exactly like the one in the foreground.

The two larger funnels are 6 feet 8 inches long, and 27½ inches in diameter at the larger end. These funnels are each provided with a flexible ear tube, the end of which is placed in the ear. The speaking trumpet in the middle does not differ materially from the ordinary ones. It is a little longer and has a larger bell mouth. With this instrument conversation can be readily carried on through a distance of 1½ to 2 miles. We have conversed and heard singing through the distance named, although both the singing and talking were in the ordinary tone of voice. A low whisper, uttered without using the speaking trumpet, is distinctly audible at a thousand feet, and walking through grass and weeds may be heard at a much greater distance.—*Scientific American.*

CEMENT FOR KEROSENE LAMPS.—The cement commonly used is nothing but plaster of Paris. But this is porous, and quickly penetrated by the kerosene. Another cement is highly recommended which has not this defect; it is made with three parts of resin, one of caustic soda, and five of water. This composition is mixed with half its weight of plaster of Paris. It sets firmly in about three-quarters of an hour. It is said to be of great adhesive power, not permeable to kerosene, a low conductor of heat, and but superficially attacked by hot water. Zinc white, white lead, or precipitated chalk may be substituted for the plaster, but they harden more slowly.

## Gilding on Glass.

A new process by M. Dodon is thus given by the *Moniteur de la Céramique:* Gold, chemically pure, is dissolved in aqua regia (1 part nitric and 3 parts hydrochloric acid). The solution effected, the excess of acids is evaporated on a water bath till crystallization of the chloride of gold takes place; it is then taken off and diluted with distilled water of such quantity as to make a solution containing 1 gramme of gold to 200 cubic centimeters of liquid; a solution of caustic soda is then added until the liquid exhibits an alkaline reaction. The solution of gold is now ready for reduction. As a reducing agent an alcoholic solution of common illuminating gas is used. This is prepared by simply attaching a rubber tube to a gas jet and passing the current of gas for about an hour through a quart of alcohol. This liquid (which should be kept in a closed vessel) is added in quantities of from two to three cubic centimeters to 200 cubic centimeters of the alkaline solution of gold before mentioned; the liquid soon begins to turn to a dark green color, and at length produces the metallic layer of gold of known reflecting power.

As an improvement on the process, as well as for convenience in executing it, there may be added to the alcoholic solution of gas an equal quantity of glycerin (28° to 30° Baumé) previously diluted with its own volume of distilled water.

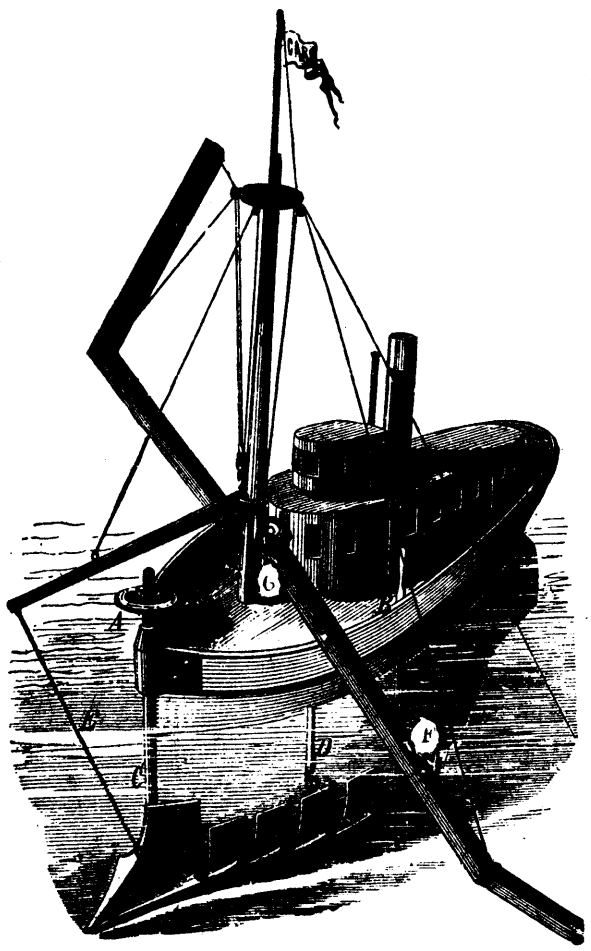
If the gold employed is an alloy, the foreign metals must

in all cases be first removed; and especially the least traces of silver, because the very smallest quantity of this metal totally prevents the regular and uniform deposition of the gold.

The bath thus once prepared, it is proposed as a method of gilding mirrors, but also for all the articles of various branches of industry where this process of gilding could be used with success and to advantage, such, for instance, as boxes, necklace beads, candlesticks, glass ornaments, frames of table mirrors, cups, saucers, spoons, lanterns, and reflectors, and for objects generally in glass or crystal that are capable of being completely gilded.

**Parties who do not receive the "Magazine" regularly are requested to at once notify the Editor of the same. Address: P.O. Box 205, Montreal.**

DEATH RATES IN CITIES.—The *Sanitarian* for May furnishes some interesting statistics of the death rates in different cities of the Union during the month of March last. New York exhibits the largest ratio of any northern city, being 25.69 per 1000 inhabitants. This, however, is far exceeded by Charleston, S. C., where the ratio is 32.89. As a rule, the southern cities show a larger death-rate than northern ones. In New Orleans it is 24.5; in Washington, 23.55; in Nashville, 22.21; in Mobile, 24.11. St. Louis, however, shows one of the lowest rates on the table, viz., 9.39, while that of Baltimore is only 1°.26. Of northern cities, Boston has a death-rate of 20.38; New Haven, 18.44; Syracuse, 18.25: Brooklyn, 18 19; Providence, 18.06; and San Francisco, 17.25; while many others are considerably below even these figures. The lowest rate in the list is that of Yonkers, in New York, where the mortality for the month was only 8.27 per 1,000.



## CONCRETE AS A BUILDING MATERIAL.

At the recent opening meeting of the Institution of Engineers and Shipbuilders in Scotland, Mr. R. Bruce Bell, C.E., as president, delivered an introductory address, in which he said:

In sea works we have not done much of late years in Scotland of any great importance, although in this branch of engineering I have to notice the advance that has been made of late years in the use of concrete as a building material.

In works exposed to the fury of the ocean the great object has been to obtain blocks of stone of such size as to be placed beyond the possibility of being lifted by the force of the sea. The old mode of building by stones obtained from the quarry, clamped and fastened together, involved great care and cost in workmanship, and as blocks of five, ten, and even twenty tons would not of themselves, by their own weight, resist the upheaval of the waves, it was hardly possible to get stones quarried of sufficient size. This is now, however, effected by the adoption of artificial blocks of concrete. The first engineer who adopted this on a very large scale was Mr. Bindon Stoney, of Dublin, who built, and lifted, and set in place, blocks of 350 tons weight in the construction of the river wall in Dublin Bay. The machinery by which this was effected was of a most elaborate and costly character, nevertheless the work was executed at a moderate cost. The situation of this work, however, was in comparatively smooth water.

In the Tyne piers, with an exposure to the open sea of the German Ocean, Mr. Messent is laying blocks of 40 to 60 tons, and Mr. Dyce Cay has also been executing some heavy work in Aberdeen, exposed to a very heavy sea; but a work at present in progress, subject to the greatest exposure, is Sir John Coode's work at Jersey Harbor, exposed to a sea and tideway unsurpassed anywhere in its destructive character. Mr. Imrie Bell, the engineer who is constructing this work, is now forming blocks of 100 tons weight, which are carried out to sea suspended under the bottom of a large welled barge and set in their places, the bottom foundation having been previously prepared with concrete in bags containing 10 to 20 tons in each, lowered through the wells of barges.

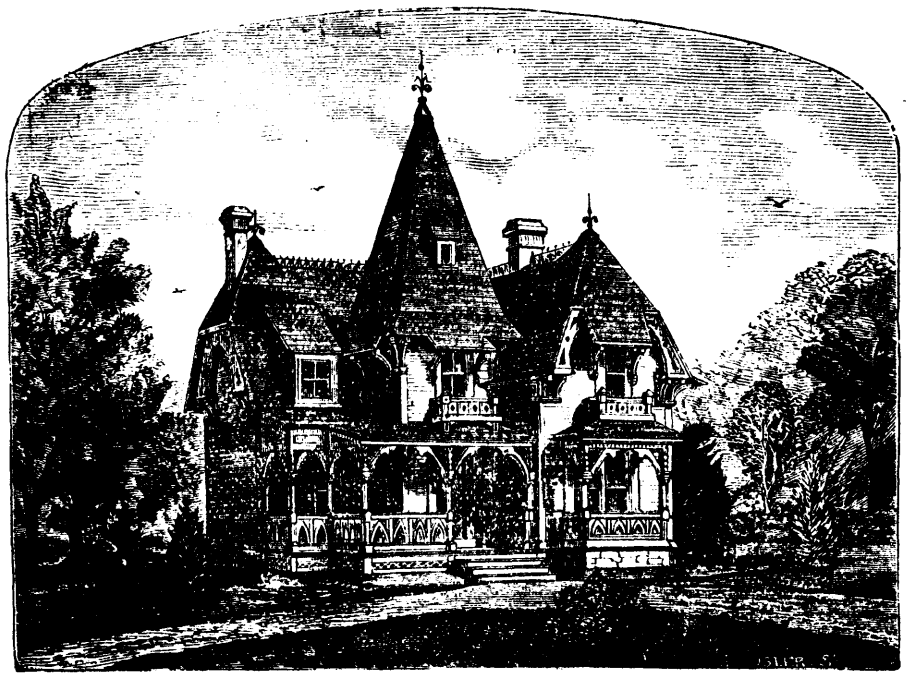
Another mode of using concrete is by setting it in a mass *in situ*, thus making the pier or wall a monolith, although it is not many years since this mode of using concrete, or of setting concrete in any form under water, was looked upon by engineers with distrust. Its first introduction for harbor works on a large scale, placed *in situ* under water, was in the foundations of the sea walls of the Albert Harbor at Greenock, which were built without cofferdams by Mr. Miller and myself in 1861, and at the time we could hardly get any engineer to support our view as to its being a reliable mode of building Of late years, however, concrete has become a universal system of building sea works where cost and time are matters of importance.

## CARR'S DREDGER.

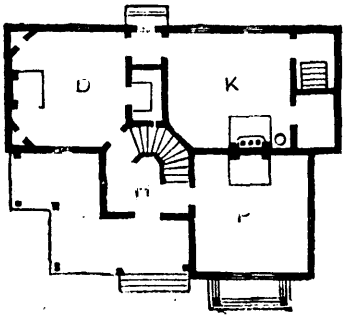
The accompanying engraving represents a novel form of excavating apparatus, which will be comprehended from the following description. It is designed to be attached directly to the bow aud sides of a vessel, for the purpose of removing sand-bars, submarine mud-banks, and other obstructions that impede navigation.

On the bow of the boat is an iron bar, to the lower end of which is secured a double mold-board plow. The upper end of the bar forms a screw-rod, passes through a bearing, and is provided with a wheel A. To each wing of the plow is pivoted a bar, and to these bars are attached several single mold-board plows. To the rear end of each bar is attached a jointed lever B, by which means each series of plows can be raised or lowered while all the plows can be lifted by wheel A. The front plow is firmly secured by a shield C, and side bars D are provided to keep the side plows from swinging under the boat. It is claimed that by the adjustment, being at the bow of the boat, if the boat is stopped before it gets through a sand-bar or other obstructions, the plows can be raised, the boat backed, the plows lowered again, and the work resumed. As the plows enter the sand-bar, the sand is raised, and the current, acting upon the loosened sand, will remove the same. If there is not sufficient natural current, or swell of water produced by the boat to remove the suspended sand or mud, then by means of a centrifugal pump G, placed in the centre of the boat, the sand suspended in the water can be raised and discharged into tank flats; or by means of troughs on each side of the boat, can be discharged from thirty to forty feet from each side of the same, thus making a channel from sixty to eighty feet wide. The gate F can be opened or closed by lever on deck and the troughs can be raised to the mast when not in use.

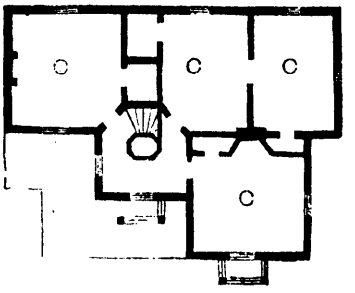
EXAMPLES OF COTTAGE ARCHITECTURE.



DESIGN FOR COTTAGE IN GOTHIC STYLE.




FIRST FLOOR.




SECOND FLOOR.

The cottage shown in the engraving is frame and the roof is of slate or shingles as desired. The estimated cost is in the neighbourhood of $3,500. The following explains the lettering on the floor plans, and gives the dimensions of the rooms :

First floor—H. hall, 10 by 10 feet ; P. parlour, 14 by 14 feet ; K. kitchen, 14 by 15 feet. Pantries and closets are also shown on the diagram.

Second floor—C. chamber over parlor, 12 by 14 feet ; C. chamber over dining room, 14 by 14 feet ; C. C. chambers over kitchen, 10 by 14 feet. Closets are also shown.

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A PRIZE of $80,000 is offered by the Prussian Government for some substance suitable for making accurate casts of celebrated works of art. It must flow into moulds easily, without injuring the moulds more than plaster, and the substances must undergo repeated cleansing without previous treatment. Applications, accompanied by samples in the crude and finished state, must be presented to the Government before December 1st, 1878.

FALLING HAIR.—A correspondent of the *Medical and Surgical Reporter* asks : "What will prevent the falling of hair?" I have used for the past ten years, in my own case, and prescribed frequently for others, the following with complete satisfaction : Glycerin and tincture capsicum, each 2 ozs., oil of bergamot, 1 drachm ; mix and perfume to suit. This is to be the only dressing for the hair. Wash the head occasionally with soft water and fine soap.

## ESTIMATING MEASURES.

It is often useful to have a few approximate data to deduce weights and measures from. A table for this purpose is going the rounds of the press, in which however several serious misstatements occur ; for instance, that "a box 4 by 4 inches square and 4½ inches deep will contain a pint." This is wrong. We give here a corrected table, which however does not aim at great accuracy, but may serve to make a rough estimate when it is necessary to reduce measures :

A pint of water weighs nearly 1 pound, and is equal to about 27 cubic inches, or a square box 3 inches long, 3 inches wide, and 3 inches deep.

A quart of water weighs nearly 2 pounds, and is equal to a square box of about 4 by 4 inches, and 3½ inches deep.

A gallon of water weighs from 9 to 10 pounds according to the size of the gallon, and is equal to a box 6 by 6 inches square, and 6, 7, or 7½ inches deep.

A cubic foot of water weighs nearly 64 pounds (more correctly 62½ pounds), and contains from 7 to 8 gallons, according to the kind of gallons used.

A peck is equal to a box 8 inches square and 8 inches deep.

A bushel almost fills a box 12 by 12 inches square and 24 inches deep, or 2 cubic feet.

A barrel of water almost fills a box 2 by 2 feet square and 1½ feet deep, or 6 cubic feet.

Petroleum barrels contain 40 gallons, or nearly 5 cubic feet.

## RESUSCITATING THE DROWNING.

Dr. Howard appears, as Medical Officer of New York harbor, to have much to do with the resuscitation of persons who had been apparently drowned, and his method has received the approval of the New York Academy of Medicine. It has already received the prize of the American Medical Association, and has been adopted by the Life Saving Society of New York. His method is described as follows:

1. To Pump and Drain Fluids from Lungs and Stomach.—This is done by placing the patient's face downward over a hard roll of clothing, so that the pit of the stomach is the highest point, while the mouth is the lowest. The operator supplements the pressure of his hands upon the back of the patient, above the roll, if necessary, with all the weight and force at his command.

FIG 1

FIG. 2


For Artificial Breathing.—The patient, whose clothing is ripped open from the waist, is laid upon his back, and the pit of the stomach is made the highest point by a hard roll of clothing beneath the back, while the head is the lowest part. The wrists are crossed behind the head: these a second person, if present, pins to the ground with one hand, while with the other the tongue is held forward with a piece of dry rag. The greatest possible expansion of the chest is thus obtained. The operator kneeling astride the patient, grasps the most compressionable part of the chest, on each side of the pit of the stomach, and using his knees as a pivot, throws forward, slowly and steadily, his whole weight until his mouth nearly touches the face of the patient. Then, by a final push, he throws himself back to his first erect kneeling position. By the sudden removal of the compressing force, the elastic ribs spring back to their original position, and by this bellows action the air rushes into and is forced out of the chest alternately, as in natural breathing. Success may attend this process in a few minutes, but hope of a favorable result ought not to be given up under an hour.

In addition to its apparently superior effectiveness, Dr. Howard claims for this method the conspicuous advantage of unequalled simplicity. When he had the medical surveillance of such matters in New York, he found that one of the most noted facts connected with cases of suffocation and drowning was the probable absence of medical aid at the critical moment. Now, experience has shown that this method can easily be understood by the most illiterate persons, and may be carried into execution anywhere, with or without a doctor.

## THE IMPORTANCE OF DIPPING VERTICALLY IN TEMPERING.

In his articles on the cooling of steel during hardening, in the *Polytechnic Review*, Mr. Joshua Rose calls attention to the importance of dipping vertically and not otherwise. He says: "The splitting or cracking of steel occurs during the cooling part of the hardening process, and is to be easily avoided even with the most unfavorable of steels, if the conditions of cooling are made to conform to the form and size of the article. The cooling is, in a large majority of cases, performed by dipping the heated steel in water; and the manner in which the dipping is performed may be made at will to crack, warp, or straighten the article.

The instant the surface of a piece of red hot steel enters the water, a rapid contraction of the submerged portion takes place, and unless the contraction is kept equalized to suit the shape of the article, the side or the part most contracted will bend hollow, causing the diametrically opposite metal to bend to accommodate the inner curve. Suppose, for example, we heat a piece of steel, an inch square and 12 inches long, to a red-heat, and dip it *slowly* in water so that one side of the square will strike the surface flat and evenly; then that surface will contract while the diametrically opposite or upper surface will remain expanded; the lower face will curve to a concave, the upper one to a convex. If, then, such a bar were curved during the heating process, we may help to straighten it by dipping if slowly in the water with its convex side downward. If it was bent at one end only, we may dip it at that end first, diagonally and with the convex side downward. If, however, we dip it with its length lying either diagonally or horizontally, we are apt to warp it, no matter how quickly it may be dipped.

From these considerations we may perceive how important a matter the dipping is, especially when it is remembered that the expansion which accompanies the heating is a slow process compared to the contraction which accompanies the cooling (although their amounts are of course precisely equal), and that while unequal expansion can only warp the article, unequal contraction will, in a great many, or, indeed, in most cases, cause it to crack or split.

ANTI-FUNGUS PAINT.—The *Thon-Iuductrie Zeitung* states that a M. Reissig has patented a paint for walls, ceiling and the like, that renders the penetration of fluids or vapors impossible and prevents the formation of fungi, and is of such stability that it can be washed down with boiling water without injury. This paint or varnish is, essentially, a solution of stearate of soda in spirit, in the proportion of about 50 grammes of the stearate to 1,000 of sp. gr. 66. Spirituous solutions of soap of all kinds and strengths can be applied in a similar manner, but where cost is no particular object, the stearate of soda is far to be preferred, as it forms a very hard and firm coat, which can be thoroughly cleansed without the application of moisture. The solution may be tinted as desired with dragon's blood, aniline dyes, etc,, or by the direct admixture of ordinary colors that are not subject to decomposition, such as ocher, ultramarine and the like. The paints are said to present an especially handsome appearance, and in the sick wards of hospitals, or in cattle sheds where disease is prevalent, can readily be mixed with disinfecting materials. They do not readily adhere over oil paint, but lie well on wood, plaster and cement.

THE PERFECTNESS OF NATURE.—Upon examining the edge of the sharpest razor with a microscope, it will appear fully as broad as the back of a knife—rough, uneven, and full of notches and furrows. An exceedingly small needle resembles an iron bar. But the sting of a bee seen through the same instrument exhibits everywhere the most beautiful polish, without a flaw, blemish, or inequality, and ends in a point too fine to be discerned. The threads of a fine lawn are coarser than the yarn with which ropes are made for anchors. But a silkworm's web appears smooth and shining, and everywhere equal. The smallest dot that is made with a pen appears irregular and uneven. But the little specks on the wings of bodies of insects are found to be an accurate circle. How magnificent are the works of Nature!

## INTERESTING ITEMS.

THE average annual production of lamp-chimneys in Pittsburgh is about 1,600,000 dozen.

THE total production of rosin in the United States last year amounted to 420,000,000 pounds.

THE highest prices paid in the Egyptian market for young Nubian women is $500, and for fair Circassians $5,000.

TO MAKE CAMPHOR ICE.—Melt one drachm of spermaceti with one ounce of almond oil, and add one drachm of camphor.

IRON wire conducts electricity four hundred million times better than water, and four million times better than sea water.

To preserve gum solutions, a few drops of oil of cloves, alcohol, or acid will preserve a quart of the mucilage of gum arabic or gum tragacanth from turning sour. A small quantity of dissolved alum will preserve flour paste.

IMITATION diamonds have lately been advertised which are said to be made by coating glass with transparent carbon. It is a very transparent falsehood, as no such process is possible with our present knowledge of that element.

LONDON covers 700 square miles and contains 4,000,000 of inhabitants. It contains more Jews than the whole of Palestine, more Roman Catholic than Rome itself, more Irish than Dublin, more Scotchmen than Edinburgh.

ONE hundred thousand pounds at the equator would weigh 100,315 pounds at London, since the same pendulum which vibrates 86,400 times a day at the equator vibrates 86,535 in latitude 51 degrees and 32 seconds, and the effect is at their squares.

EXCELLENT imitations of diamonds, rubbies, and other precious stones are manufactured in Europe, not to be distinguished by the eye, unless of an expert, from the genuine jewels. They are made of a very lustrous glass, but unfortunately is so soft that it will endure very little wear.

THE *Société d'Hygiène* of Paris is making arrangements to establish in the cities and towns of France chemical laboratories for the purpose of examining articles of food and detecting adulterations of unhealthful constituents. In England the value of public analysts has long since been satisfactorily demonstrated.

IT is estimated that 1,033,000 acres of the best land in India are devoted to the production of opium, and the Indian famine has been attributed to this fact. Yet there would be little or no opium raised in India except to meet the demands of the English market. And the same thing holds true of China.

A BIG LOT OF QUICKSILVER.—The Virginia *Enterprise* says that 11 carloads of quicksilver have arrived from the bonanza mines. Nine carloads, or 2,050 flasks, were brought to Virginia City, andfour carloads, or 450 flasks, were left at mills on the Carson river. The purchase of 2,500 flasks of quicksilver looks like business.

A FLORENTINE friar has constructed a watch only a quarter of an inch in diameter. It has not only a third hand to mark the seconds, but a microscopic dial which indicates the days of the week and month and the proper dates. It also contains an alarm, and on its front cover an ingeniously cut figure of St. Francis of Assisi. On the back cover two verses of the *Te Deum* are distinctly cut.

A SINKING ISLAND.—The Island of Heligoland is reported to be gradually disappearing. It is now, says *Iron*, less than a mile in superficial extent; but in 1649 it was four miles in circumference, in 1,300 forty-five miles, and, in 800, a hundred and twenty miles. The encroachment of the sea is effected almost entirely from the north-east, owing to the set of the currents and the direction of the prevailing winds.

HALL'S *Journal of Health* advises over-stout people not to seek to reduce flesh by drinking vinegar or smoking, but to maintain as perfect a digestion as possible and avoid fat-making foods, such as starch in the shape of potatoes, flour bread, and rice. Spirits, malt liquors, and sweets are to be abjured. The gluten of wheat is the best food. It will sustain life in full vigor, but it will not add one ounce of fat to the body.

BLEACHING COMPOUND.—Stir 5 pounds chlorid of lime into two pailsful of water, dissolve 10 pounds glauber salt (sulphate soda) in 1 pail of water, also 4 pounds sal soda in 1 pail of water. The contents of the 4 pails can be poured together and kept in any suitable tight vessel. Such a quantity as the above ought to last for a long time, as a dipperful of it will bleach a large quantity of linen or other goods.

## HINTS TO THE USERS OF BELTING.

The following hints on the use of belting are drawn from recent writers on the subject. Many of the hints will be found familiar to experienced shop men and will serve as verification of their practice:

Belts stuffed with tanner's dubbin on the flesh side will become as smooth as the hair side, and will outlast six belts which are run on the hair side exclusively.

Three times the adhesiveness is gained by softness and pliableness of belting leather over those which are dry and husky.

Long belts are preferred to short ones, but care must be taken that the length be not too great.

Horizontal, inclined, and long belts give a much better effect than vertical and short ones, and those that have the driving side below than otherwise.

Belts of coarse, loose leather will do better service in dry, warm places; for wet or moist situations the finest and firmest leather should be used.

Experience says the hair side of a belt put next to the pulley will drive 34% more than the flesh side.

The strongest part of belt leather is near the flesh side, about one-third the way through from that side.

Leather belts must be well protected against water, and even moisture.

Short belts require to be tighter than long ones. A long belt, working horizontally, increases the tension by its own weight, acting in the curve formed between the pulleys.

Sufficient care is seldom taken to let belts run free and easy, and it has been one of the greatest errors, more or less prevalent in all cotton or woolen mills, to run the belts so tense as greatly to injure the belts and rapidly increase the wear of the bearings.

In many instances the tearing out of lace holes is often unjustly attributed to poor belting, when, in reality, the fault lies in having a belt too short, and trying to force it together by lacing, and the more the leather has been stretched while being manufactured, the more liable it is to be complained of.

To obtain the greatest amount of power from belts, the pulleys should be covered with leather; this will allow the belts to run very slack, and give 25% more durability.

A careful attendant will make a belt last five years, which, through neglect, might not last one.

It has been found in practice that belts must not run faster than 30 feet per second, nor have a tension of above 300 pounds per square inch of section.

The friction of a belt is double on wood what it is on cast iron.

Long belts are less liable to slip than short ones.

The softer woods are better for pulleys than the harder kinds, but pear-wood and nut-tree are best for cord-wheels. Grease must not be put on wooden wheels on which belts run.

Tightness by tightening pulleys must be applied to the slack side of belts.

The belts should be cut from the center of the skin.

Thickness of belts does not always give strength.

If too great a distance is attempted, the weight of the belt will produce a very heavy sag, drawing so hard on the shaft as to produce great friction in the bearings, while at the same time the belt will have an unsteady, flapping motion, which will destroy both the belt and the machinery.

The connected shafts should never, if possible, be placed one directly over the other, as in such case the belt must be kept very tight to do the work.

It is also desirable to locate the shafting and machinery so that belts shall run off from each other in opposite directions, as this arrangement will relieve the bearings from the friction that would result where the belts all pull one way on the shaft.

If possible the machinery should be so planned that the direction of the belt motion shall be from the top of the driving to the top of the driven pulley.

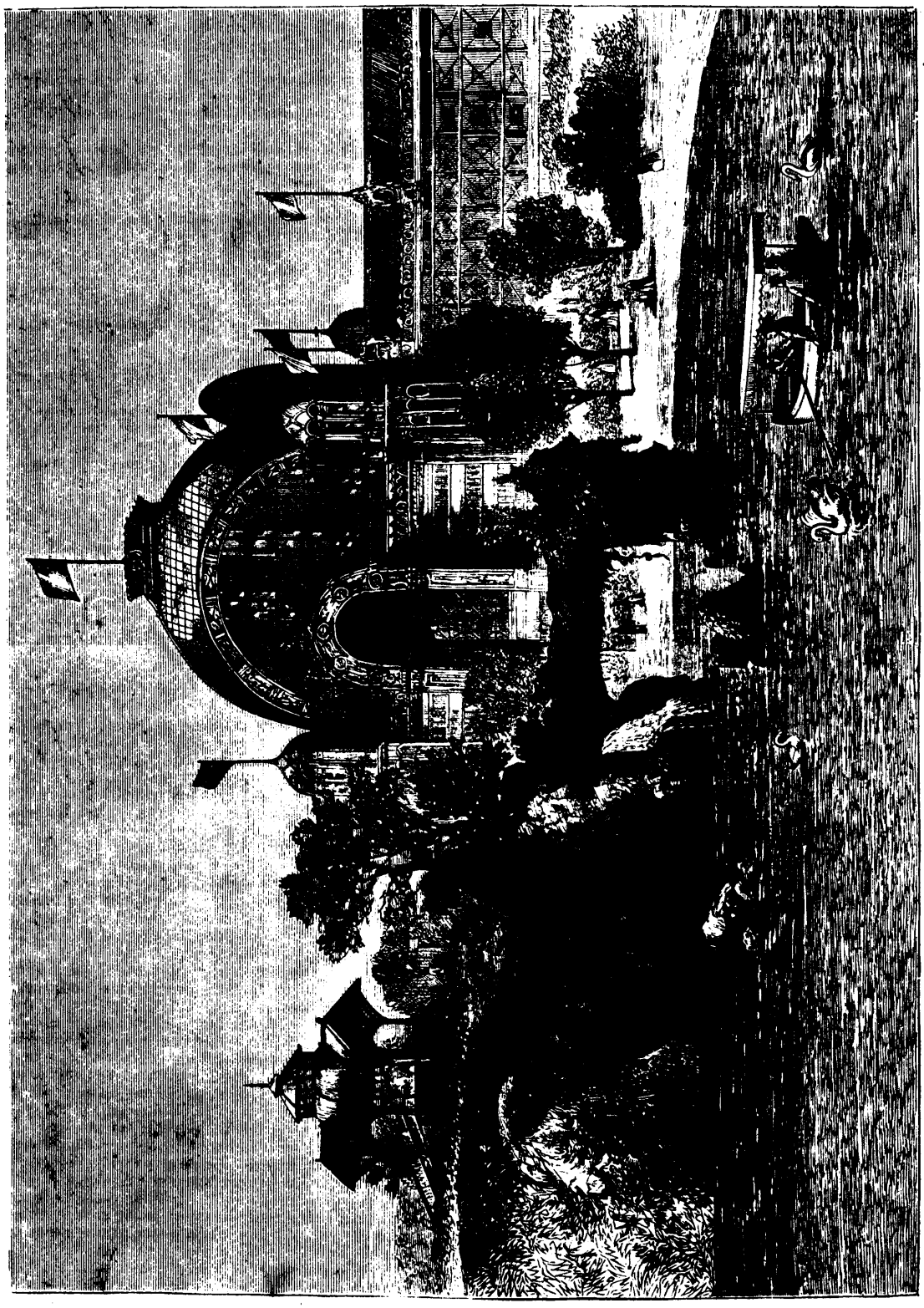
The diameter of the pulleys should be as large as can be admitted, provided they will not produce a speed of more than 3,000 feet of belt motion per minute.

In punching a belt for lacing, it is desirable to use an oval punch, the longer diameter of the punch being parallel with the belt, so as to cut out as little of the effective section of the leather as possible.

Begin to lace in the center of the belt, and take much care to keep the end exactly in line, and to lace both sides with equal tightness. The lacing should not be crossed on the side of the belt that runs next to the pulley.

Never add to the work of the belt so much as to overload it.

A good leather belt, one inch wide, has sufficient strength to lift 1,000 pounds.



THE PARIS EXHIBITION.—A SKETCH IN THE PARK.

## THE PARIS EXHIBITION.—A SKETCH IN THE PARK.

Our engraving, which represents a portion of the park at the Paris Exhibition grounds, needs little mention beyond that it is one of those delightful retreats so refreshing to the weary visitor, who, tired out with tramping about the buildings and grounds, is only too pleased to refresh his eyes with some of that exquisite miniature water scenery which is scattered about the grounds. We take our illustration from the London *Graphic*.

### The Natural History of the Eel.

According to the reports of shad fishermen, the chief enemy of the shad is the eel, which not only follows that fish up the streams and devours the spawn, but often attacks the shad after they are caught in the nets. Entering the shad at the gill openings the eels suck out the spawn and entrails, and leave the fish perfectly clean. The finest and fattest shad are the ones selected. It is a curious circumstance that of a fish so well known as the eel so many of its life habits should be in dispute. An animated discussion has been going on in Germany quite recently with regard to the natural history of this fish, and in a late number of a scientific journal the following points are set down as pretty well substantiated. Though a fresh water fish which passes the greater part of its life in rivers, the eel spawns in the sea. That it is viviparous is extremely improbable. The eel found in the upper waters of rivers is almost always female. At the age of four years it goes down to the sea to spawn and never returns to fresh water. The spawning process is somehow dangerous to the eel, thousands being found dead near the mouths of rivers, with their ovaries empty. The descent of the fish to the sea does not appear to take place at any definite period, but is probably dependent on the season for spawning. The male is always much smaller than the female, and never exceeds half a yard in length. The males never ascend to the head waters of rivers, but keep continually in the sea or in the lower reaches of the river. Nothing is definitely known about the spawning season, though it is probable that the eggs are deposited in the sea not far from the mouths of rivers.

## ICES AND ICE CREAMS.

What are termed ices consist simply of the juices of fruits sweetened with sugar sirup and then frozen, like ice cream. It is stated that the best ices are made by first cooking the sugar into the form of a sirup, having a strength of 30°. The fruit juices are strained through a sieve and then added, with a little water and the whites of a few eggs, to the prepared sirup. The final mixture should have a consistence of 22°. It is then frozen in the usual way.

To make the best ice cream it is necessary that the cream should be of the best quality; and the utensils in which it is made must be absolutely clean.

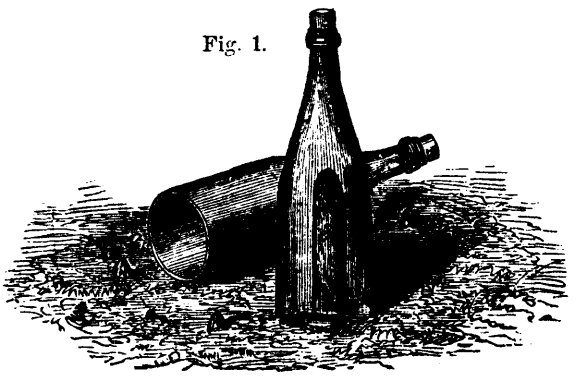
With every quart of the cream mix six ounces best pulverized white sugar, a very little vanilla bean, and the white of one egg. The latter imparts a smoothness and delicacy to the cream that cannot otherwise be obtained. The prepared mixture is then to be stirred in the freezer until it is entirely congealed.

Those who desire first rate ices or cream should follow these directions carefully, and avoid the use of corn starch or other thickeners. Instead of vanilla as a flavor for the cream, a trifling amount of any desired flavoring sirup or juice may be used, as strawberry, pineapple, orange, lemon, etc.

## ASPARAGUS IN WINTER.

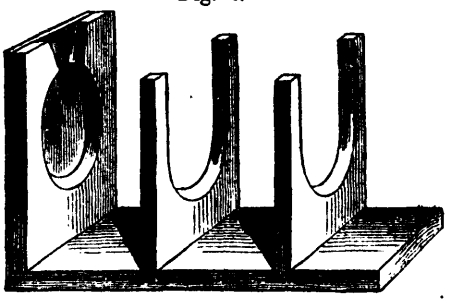
There is probably no vegetable that repays the trouble of artificial cultivation better than asparagus. It grows rapidly and attains great size when properly cared for; and it may be made a source of great profit, large quantities of it being grown under glass in France, and sold in winter at high prices. M. Jacquisson, of Chalons, France, a well known horticulturist, has introduced a plan of forcing asparagus, so simple that our engraving (Fig. 1) is sufficient to explain it. He uses an ordinary wine bottle with the bottom cut off. These bottomless bottles, when well corked, are placed over the asparagus head just as it is beginning to rise above the ground.

Fig. 1.



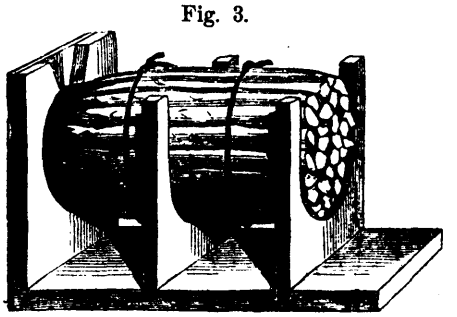
Numerous simple devices for holding the heads of asparagus while they are being tied in bunches are in use; and they are useful to the gardener, as carefully put up bunches are far more salable than irregular bundles of unevenly arranged heads. Fig. 2 shows an implement of this kind,

Fig. 2.



called the Sartrouville buncher. When filled, the tips of the heads are brought close together, the diameter of the space for the tips being less than that of the other openings in the

Fig. 3.



upright boards. When the frame is nearly full, the shoots are passed in through the wedge-shaped opening shown. Fig. 3 shows the same buncher when filled.

## HE WANTED TO SELL A PATENT MACHINE.

Soon after dinner yesterday a pleasant-faced man, having something wrapped up in a paper under his arm, called at a Detroit hotel, and requested a few minutes' conversation with the landlord. When they were seated, the stranger began: "I am an old landlord myself. I kept hotel in St. Louis for twenty-eight years."

"Yes," was the non-committal reply of the landlord.

"And of course I know all about the inconveniences of hotel keeping," responded the man. "There were bugs around the beds in my hotel, and there are bugs around the beds in any hotel, I suppose. Of course I used to lie to the guests, but the bugs were there, and I knew it."

"What do you mean?" demanded the landlord growing red clear round to his neck.

"Just keep right still," replied the man, "for now I'm coming down to biz. This is the summer season, isn't it, and the only season when bugs bite. In the winter they are dormant, and unless there's a fire in the room they don't care to get in their work on the weary traveller. Well, the summer season is the season for the mosquito also. All hotels and houses have mosquitos, and nothing is thought of it. They seem to be a sort of necessity. Travelers will raise a howl over bugs, but they never grumble at anyone about mosquitos."

"Sir! do you think I keep a junk shop?" roared the landlord.

"No, sir; I don't. This is a regular hotel, and a very good one. As I was going to remark, I have invented and patented a machine, operated by a boy and a crank, which you and all other landlords want and will have. It is a machine to imitate the hum of the mosquitos. Its notes can be heard all over each floor, and with a good boy at the crank there can be no failure. The traveler, just dozing off to sleep, hears the hum. At the same time a bug works out from under cover. Then more hums and more bugs. Actually, sir, without any lying or exaggerating, men will strike and claw the air all night long to kill imaginary mosquitos, while the bugs go unmolested and grow fat. The hum is a perfect imitation, and has even deceived Yale College professors. Without it your guests will blow around about bugs. With it no traveler will mention bugs at all, but will rip and tear at the mosquitos."

"Do you mean to insult me?" shouted the landlord.

"No, Sir."

"But you talk as if I had bugs in my house."

"I'll tell you what I'll do, landlord. I'll examine five beds and if I do not find bugs in at least three of them I'll give you a machine for nothing."

It would have been a nip and tuck fight if the great big porter hadn't jumped in and hit the stranger with an iron boot jack. The inventor still lived, however, and within an hour was seen bearing down for another hotel under full sail.—*Detroit Free Press.*

## FARMING IN CALIFORNIA.

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: "Plowing in unbroken furrows six miles long can be seen in Fargo, California. The teams start in the morning and make one trip across the entire township and back before dinner, and the same in the afternoon, making 24 miles' travel every day." It would seem that the steam plow ought to find a place in such a region.

CEMENT.—In stopping holes in castings, or for covering scars a cement may be made of equal parts of gum arabic, plaster of Paris and iron filings, and if a little finely pulverized white glass be added to the mixture, it will make it still harder. This mixture forms a very hard cement that will resist the action of fire and water. It should be kept in its dry state and mixed with a little water when wanted for use. A cement for making joints in water and steam pipe, or in any work where two pieces of metal are joined together and it is desirable to make a perfectly tight joint, may be made of iron filings or turnings mixed with sal-ammonia. The proportion of sal-ammonia is very small; only about a half pound is used to 50 pounds of filings. This cement is mixed when wanted for use, and is driven into the joint with a cold chisel or other tool.

TO ATTACH TIN TO METALLIC SUBSTANCES.—Mucilage tragacanth, 10 ozs.; honey of roses, 10 ozs; flour, 1 oz. Mix.

## SOME WELL KNOWN BRITISH MOTHS.

Our engraving shows three specimens of moths, which resemble each other somewhat in the marking and color of the wings, but differ in size. The large one in the centre is the privet hawk moth (*sphinx Ligustri*) which is nearly as common al the eyed hawk moth; its wings are brown, streaked or rather clouded with darker shades of brown, the hind are of a pinkly color, with three black bands across them; the body is marked with brown and black in the center, and the sides marked with pink and black. The caterpillar is green, with seven pink stripes down the sides; the horn is black and green; it feeds on the privet or lilac bushes. The chrysilis is brown and has a beak in front. The privet hawk moth appears about midsummer, and frequents woods and lanes. Sugaring is a good way of obtaining this moth.

At the lower part of the picture on the left hand is seen the bedstraw hawk moth (*deiliphila Galii*), which is only locally known, but in the south of England it is by no means uncommon. The fore wings are brown, with a white line across the middle; the hind wings are pinky white, with a red margin. The thorax and body are of a uniform brown, with the exception of a few white lines on the side of the thorax and the end of the body. The caterpillar is green with a pale line down the back, and a row of pale spots along the sides; the horn is a rusty red; it feeds on the bed straw. The chrysalis is brown. The perfect insect appears in June or July; it frequents lanes, and the downs near sea coasts.

The smallest of the three specimens, on the left hand in the engraving, is the small elephant hawk moth (*chærocampa porcellus*). The fore wings are of a greenish shade, banded with pink; the hind wings are pink, but black at the base. The caterpillar is brown, with two conspicuous eye-like marks on the fourth segment; the first three segments narrow suddenly; this, together with the eye-like marks, gives the caterpillar the appearance of a hog, hence the name *chærocampa*, or hog caterpillar. The caterpillar feeds on the willow hern or bedstraw. The perfect insect appears in June, and frequents lanes and the sides of brooks, especially where the willow herb is plentiful.

The reverse sides of the wings of the three specimens are shown by the flying moths in the upper part of the picture.

A STILL MORE POWERFUL EXPLOSIVE.—M. Nobel, the inventor of dynamite, has recently discovered a new explosive substance still more powerful than that. He has given it the name of "explosive gelatine," on account of its aspect, which closely resembles gelatine. The substance is composed of 94 to 95 per cent. of nitro-glycerine and 5 or 6 per cent. of collodion, mixed together. It is viscous, but can be easily cut with a knife or with scissors, and placed in cartridges or shells. Dynamite, it is well known, has the disadvantage of being altered by water; when it is moist the nitro-glycerine separates from the absorbent. The new substance, on the contrary, does not give the least symptom of exudation; it is impermeable to water, which does not at all affect its explosive properties. It is inflamed in the same way as dynamite, and its power its at least 50 per cent. greater. Several nations—notably Italy and Russia—have, it appears, already adopted this substance for charging bombs, torpedoes and mines. How far the new explosive is affected by frost is not stated, but it is probable that the collodion may lower the freezing point. Nitro-glycerine alone congeals at the freezing point of water.

## A SALMON'S ENDURANCE.

*Land and Water* relates the following concerning a remarkable battle lasting for sixteen hours, between a plucky sportsman and an obdurate salmon before the latter was conquered: "On Friday, at four P.M., Mr. A. Crawshay hooked a fish below Haughton Castle, but did not land him till Saturday morning the 24th inst., at eight A.M. Immediately after being hooked, the fish went down the river, taking out upwards of 100 yards of line. The water being strong and the fish determined, it was impossible to get him back. A wood by the water side made it equally impossible for Mr. Crawshay to follow his fish, and so things remained until a boat was brought at daylight next morning from some distance, by which means the wood was passed, and the fish at last landed on a gravel bed, in the presence of many spectators, some of whom had passed the night with the angler. The fish was a splendid male, forty inches long, and twenty-two inches girth; weight 25 lbs.

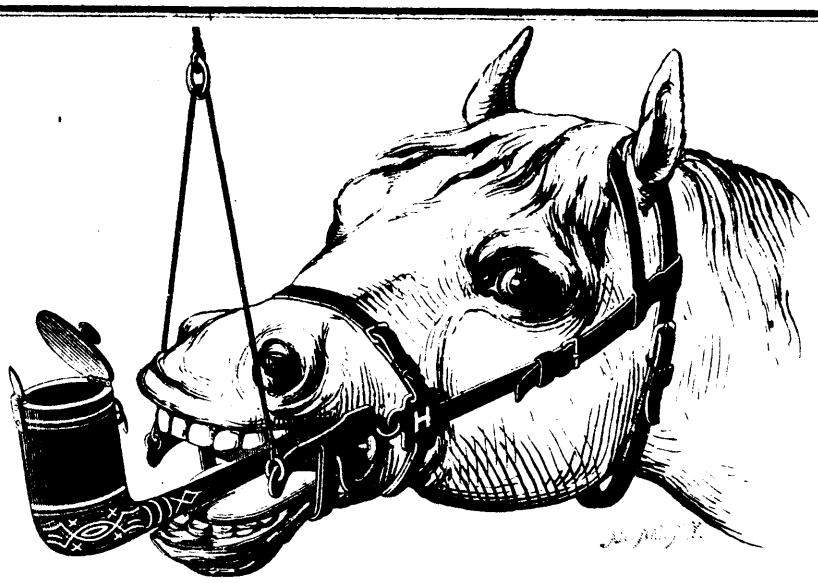
BRITISH MOTHS.

THE LEONA GOAT SUCKER.

## THE LEONA GOAT SUCKER.

The curious feature about this bird is the long and very elastic feather shafts which rise from the middle of the wing coverts and extend to a length of twenty-eight inches. They are totally destitute of barbs except at the extremity, where they suddenly give out a broad web of four or five inches in length. The object of these odd appendages is not known. They are found only on the male bird, and evidently bear an analogy to the train of the peacock and the long tail feathers of the pheasant among the birds, as well as to the beards, horns, tusks, manes, and similar masculine appendages of male quadrupeds.

The plumage of the Leona Goat Sucker is very prettily marked with spots and bars of rusty red and black upon the usual brown ground. Every primary feather possesses nine rusty red spots and as many of a black hue, and there are many other spots and bars scattered over the body and wings. The bird is not a long one, measuring only eight or ten inches in total length. It is a native of Western Africa. We take our illustration from Wood's "Natural History."



APPARATUS FOR ADMINISTERING MEDICINE TO HORSES.

## APPARATUS FOR ADMINISTERING MEDICINE TO HORSES.

As it is generally useless to attempt to persuade a horse to take medicine voluntarily, owing to his equine inability to appreciate its advantages, combined with its dislike for the taste, mechanical means are sometimes resorted to, and an ingenious contrivance for the purpose is represented in the accompanying engraving. It consists of a wooden gag-bit, which is placed in the horse's mouth and suitably attached to the headstall. By pulling the cord shown, the gag is turned by levers, compelling the animal to open its mouth. The stem of the medicine receptacle, which looks like an exaggerated tobacco pipe, is then inserted in a hole in the bit and clamped therein. Then by opening a valve in the receptacle, the medicine previously placed in the bowl runs down the horse's throat. Also in the stem is a kind of fork, which, when a pill is to be administered, holds the same until it is washed down by water poured into the bowl.

## A COLLEGE OF COOKERY.

At last a practical step has been taken towards emancipating the people from the evils of bad cookery. We know of no department in domestic economy which is so sadly in need of reform. Mr. William Emerson Baker, of the sewing machine firm of Grover and Baker, has given to the Governor of Massachusetts and to four other trustees a farm of 50 acres and $50,000, to form a college of cookery. Cookery is to be taught as an art—which it certainly is—and the pupils are to be instructed in the scientific principles which underlie wholesome cookery. The horrible pies, fried meats, hot breads and other dyspepsia generating compounds, together with the inexplicable concoctions produced by the verdant Milesian handmaid, let us hope are doomed to disappear; and instead, our kitchens are to be tenanted in future by culinary artists able to prepare, palatably and healthfully, the vast variety of food this country affords.

Applying to the elephant Flourens's mode of estimating the natural duration of an animal's life, viz., multiplying by five the number of years requisite to perfect its growth and development, Sir J. Emerson Tennent fixes the term of life for that great pachyderm at (thirty by five) a hundred and fifty years. Maturity is shown by the consolidation of the bones of the animal with the epiphyses, and in the elephant this consolidation is complete at the age of about thirty.

Cooling a Journal.—A very ingenious as well as simple method of cooling a journal, consists in placing an endless belt of loose water-absorbing texture on the shaft, as near the heated part as may be, and allowing the lower bight to run in cold water, which may be held in a vessel at a convenient distance below the shaft.

Lecture on Corns.—In a lecture at the St. Louis Hospital, Paris, on hypertrophy of the epidermis, M. Guibout observed that, while in callosities the hypertrophy takes place at the surface, in corns the hypertrophied part becomes pyramidal, and takes the form of a nail, with its point directed toward the deeper seated parts. This sharp point, lodged in a kind of cupola, which exactly boxes it in, has a tendency to penetrate into the substance of the dermis whenever the base of the corn is compressed. The portion of the dermis which is in permanent contact with the epidermic induration becomes inflamed and altered in character, its papillæ disappearing, so that at last it becomes a true matrix, destined to form deep, new, horny epidermic layers, in proportion as the more superficial layers are eliminated.

Changes of the weather often give rise to great pain in corns, which has been supposed to be due to their hygrometric nature, which by causing their enlargement, adds to the suffering. But in fact, the exacerbations are less severe during the time that it rains than they are for some days preceding; and they are also met with when the weather is about to change from wet to dry. These painful exacerbations are quite as remarkable and as inexplicable as are those of rheumatic pains. The sole efficacious treatment is excision, but care must be taken that this is complete. The summit of the cone must be cut down to, so as to entirely empty the dermic cupola. And then it is quite necessary to destroy, by cauterization, the inner surface of this cupola, namely the matrix of the corn, which will otherwise be reproduced.

The best caustic is sulphuric acid, of which we may deposit a drop, by a match or glass rod, on the excised part. If the corn recurs, the same processes of excision and cauterization must again be resorted to.

Another way to Cook Veal.—In England everybody goes to the races, and great preparations are made for the lunch on those occasions. Veal prepared in this manner is a favorite at the race lunch, but will be found useful at other times. Butter a good sized bowl, and line it with thin slices of hard-boiled eggs. Have veal and ham both in very thin slices; place in the bowl a layer of veal, with pepper and salt, then a layer of ham, omitting the salt; then a layer of veal, and so on alternating with veal and ham until the bowl is filled. Make a paste of flour and water, as stiff as it can be rolled out; cover the contents of the bowl with the paste, and over this tie a doubled cotton cloth. Put the bowl into a saucepan, or other vessel, with water just up to the rim of the bowl, and boil three hours; then take it from the fire, remove the cloth and paste, and let it stand until the next day, when it may be turned out and served in very thin slices.

A Deep Gas Well.—Operations on the Tarentum oil well, near Pittsburg, were lately stopped. The well is down some 2,300 feet, at which depth no oil was obtained, but a good supply of gas has been secured, sufficient to run any large manufacturing establishment.