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HOW MECHANICS' INSTITUTES COULD BE MADE POPULAR SCHOOLS OF TECHNICAL INSTRUCTION.

THERE can be no doubt that if Mechanics' Institutes were properly conducted they might be made the means of supplying to those who have to leave school at an early age, and consequently with a deficient education, those missed studies—particularly of a technical character—so essential to their success in life. In fact, until technical education receives more attention in the public schools of the country, our mechanics—and the word mechanics has a very wide signification—cannot be expected to be equal in knowledge and skill to the mechanics of other countries under better training and enjoying special advantages; therefore, if Mechanics' Institutes, by properly applying the Government grant and other funds at their disposal, can fill up the blank in technical knowledge which exists in the education of children leaving public schools half educated, they will be performing a most meritorious task, and deserving of the assistance from the educational department of the country, in addition to the small annual sum voted by the Legislature.

The early age at which so many boys, of necessity, are compelled to leave school to assist, by their small earnings, their parents in providing for a large family, cuts them off from any opportunity, thereafter, of recovering that lost knowledge, which they would have received had they remained a few years more at school; and the only way by which it is possible for them to recover this loss is by self-culture, or by attending evening classes; and if evening classes can be so organized as to obtain teachers capable of teaching, practically, the simple elements of a technical education to those who have never received any at all, even that, followed up by self-culture and access to more advanced technical books, would be a great point gained, and ultimately lead to better results.

Before proceeding further with these remarks, it would be well to define who we understand to come under the denomination of mechanics, with the view of classifying those who would be qualified, under any new arrangement that might be adopted, to take an actual lead in the affairs of Mechanics' Institutes, as some difference of opinion appears to exist as to where the line of distinction should be drawn.

By the term mechanics, we generally understand that class who earn their livelihood in the present, or have done so in the past, altogether by the use of their hands—that is working mechanics, and it is to this class especially that technical education is so necessary, although to some trades it is more essentially requisite than to others.

For the sake, therefore, of distinction, we will assume that all those to whom the study of technics enter more or less into their profession or trades, may be classified as follows:—

CLASS I.—Consisting of those called professionals. Consisting of civil engineers, architects, astronomers, surgeons, chemists, dentists, &c. Mechanism of some sort or other is slightly connected with each of the above professions, and although the persons practising those professions may not be able to make the instruments they require (although some can), yet they can invent or direct the construction of many useful implements for mechanical appliances.

CLASS II.—May be presumed to comprise certain mechanical trades or lines of business, in which mechanism is an auxilliary only, but not an absolute necessity in all cases. Now to such as follow these trades technical education is not so absolutely necessary as to those of the third class. The second class we will suppose to consist of tailors, shoemakers, plasterers, paper-hangers, and other trades of a similar character.

CLASS III.—Which inlcudes a variety of trades—would then consist of such as mechanical engineers, working machinists, bridge-builders, carpenters, carriage-makers, painters, smiths, plumbers, metal-workers, agriculturists, &c. To this class the elements of a technical education are most essentially necessary.

Each of these classes, therefore, in any community, would be justly entitled to take part in Mechanics' Institutes. In our previous articles which appeared in this magazine during the past four years, on the necessity of technical education being taught in our public schools, we have particularly called upon the working mechanics to arouse themselves from their lethargy and take an interest in the support of these Institutes, which is not only their right but their duty, and the reason why we have made a distinction of grades among certain members of the community, to whom mechanism is more or less essential, is to show that all such are, to some extent, interested in the support of Mechanics' Institutes, and that no feeling of jealousy should arise if a prominent part in them is taken by any one of the above classes.

It has never been our desire, in advocating that mechanics should take the most prominent position in Institutes—which by their very title infer their object—that the benefit of such Institutes should not be equally conferred upon all such as desired to participate in the privilege of receiving instruction in the evening classes, or by lectures; in fact, the non-mechanical class, could by their support and attendance, give great impetus to these institutions. The main point of our argument has been that the mechanics themselves should take greater interest in them, and assert that position to which they are entitled, if not for their own sakes, at least for the children of those who have families. These institutions, therefore, to be a success, should be open not only to the classes before mentioned, but to every member of a community; but not controlled by the majority, should that majority consist of non-mechanics. We insist, as a matter most essential to their success, that those matters which purely and simply appertain to the foregoing classes, should be under the control and management of a representative of each class, and that part of the affairs relating to general literature, might be governed by representatives from those members who were non-mechanics.

To ensure success, however, to Mechanics' Institutes, unanimity among all the members is absolutely essential. They, in fact, should be considered as purely schools of technical instruction and for literary culture. No petty jealousies should be allowed to obtrude to discompose the laudable object for which these institutes are supposed to be created.

The first object to be obtained, therefore, in connection with them should be to endeavour to give technical instruction to those young mechanics whose education had been neglected, or, whose school life had been too short. In dealing with such, we must bear in mind that, from a deficiency in their education, many will grow indifferent from pure neglect, and taste for culture of the mind, if not lost, at least vitiated; and, therefore, not until the evidence of the value of education has forced itself upon the mind by a youth seeing himself outstripped by his juniors, will he begin to realize its value and lament his ignorance. To this class particular attention should be given; the better educated do not require it.

It has been a general complaint by working mechanics, and justly too, that too much money is expended by the Institutes on works of really no practical use to them; this mistake could be easily obviated if the purchase of certain classes of books were limited by rules.

The best way in which Mechanics' Institutes could be made schools of technical instruction, would be for each Institute to have a limited number of classes of real practical utility to that portion of their community needing technical instruction, and not to attempt too high a flight on higher subjects. We consider that the teaching of writing, arithmetic, English grammar, composition, book-keeping, geometry and penmanship, are subjects in which every boy, who has entered a public school at 8 years of age, ought to be well advanced in at 14 and that these studies particularly appertain to the Department of Education.

But as few of our common schools profess to teach drawing and designing, as relating especially to agricultural and textile fabrics; chemistry, and mineralogy, as relating to our mineral wealth, &c.; the principles and practice of mechanics, &c.—then, if it were possible for Mechanics' Institutes, instead of endeavouring to teach a multiplicity of subjects in their evening classes, to dovote their attention purely to the practical education of those neglected in our schools, but yet of the utmost importance to the country, they would really deserve the thanks and support, not only of the Government, but of the whole community. And, if the better educated class of school teachers, who are competent to teach pure science, could be induced to give, at least elementary lectures to the Institutes on science as applied to mechanics; astronomy, electricity, sound, sight, heat, &c., and illustrate their subjects by a few instructive and attractive experiments, it would be the means of making these studies delightful and instructive, and create a taste for study and a yearning after further knowledge. Such lectures have always been found to promote discipline, and to all such lectures the children of public schools, of an age to understand them, should have free access. It would afford an opportunity to bring all classes more closely in union, and create an early taste for scientific study. Such lectures should not, however, be expected to be given gratuitously, and it would be well if the Government would provide apparatus for the purpose, as a necessary adjunct to educational culture.

We have great hopes that now the Institutes are placed under the Educational Department it will have the means of affording more useful co-operation than heretofore.

The propriety of giving prizes to members of Mechanics' Institutes has been discussed by scientific bodies both in Great Britain and this country, as to how far the distribution of prizes has been of service, and the feeling at such discussions has not been as favourable as might have been expected. The great objection has been that too often judges are selected who are quite unqualified for the office, and when we see the crude and untutored exhibition of artistic taste exhibited so often by prominent members of society, it is no wonder that when such men are selected as judges, no matter how conscientiously they may have decided, how very unfair such decisions must be. Doubtless prizes are an incentive to industry and talent, but the success of the system must depend upon the competence and uprightness of the judges. We are not an advocate, however, of giving prizes of money or books; medals of merit that could be worn as a badge, if of ever so little intrinsic value, are more appreciated than a small sum of money—it is something to wear, keep, and be proud of in days thereafter.

There is another class of education that could be taught to both sexes in every town and village in the Dominion, and would prove of great advantage to many an artisan's family in the time of need, and that is the teaching of Home Industry. There is nothing that tends more to keep youth from falling into vicious and depraved habits, during days of unemployment, than the encouragement of Home Industry. It is a description of employment that may be made profitable as well as pleasing, and often when mechanics are thrown out of employment during times of depression, their idle hours could be turned to profitable account, and many a young man prevented, by the force of circumstances, from leaving his native town to become a citizen of a foreign land.

Few mechanics, when unemployed, know how to employ their time, and frequently, in consequence, grow into the evil habit of loafing around taverns; but through an industrial society, or through classes formed by mechanics, teaching how to manufacture various articles of use or ornament, which could be sold, sooner or later, and realize money, such as articles of furniture, carving, decoration, knicknacks, and a hundred different things, in the construction of which the material costs but little, it would help to keep a household in bread and butter until better times turned up.

Nor should the children of wealthy families feel above learning many of the useful arts. Sons and daughters of the noblest and wealthiest in Great Britain take a pleasure in many of these mechanical and industrial pursuits. Ladies excel in the lighter class of art work, such as carving, fret work, modelling and painting.

Although the object of this article is to show how Mechanics' Institutes could be made schools of technical instruction, a few words on the importance of technical education in our public schools will not be out of place.

When we consider that the great mass of the people of the Dominion is composed of agriculturists, and mechanics, and when we reflect that the world owes to the latter class some of the greatest and most important revolutions which have almost changed the surface of the globe; civilized nations that for centuries would have remained in barbarism, have been increased in riches a thousand fold, and added to their personal comfort and hea th; and that many of these important inventions have been the conceptions of men who were mere working mechanics; surely the class of education suitable to develop the latent talent of youth should be a matter of grave consideration to the educational departments of the country. While we appreciate most highly the rapid advance made of late years in the education of the masses, particularly in the Province of Ontario, and the superior attainments of the teachers, we cannot but feel that the education of the working-classes, such as are destined to become mechanics and agriculturists, is of too superficial a nature. We want a different education for the masses than that which qualifies them simply to be clerks, of which we already have too many for the country's good. We want more children instructed in the elements of chemistry for agriculturists, and in technics for mechanics; we want more practical teaching and practical training. When we see so much importance attached to practical training in Great Britain, France and Germany, and other advanced civilized powers of the world; countries which owe their present greatness over others to the perfection to which they have arrived in arts, science, manufactures and mechanical inventions, we should strain every nerve to take such steps as will be most conducive to produce similar results in this young country.

It is not long since that the Guilds of London appointed an executive committee to prepare a grand scheme and report for the technical training of artisans. In one portion of this report the committee recommend that the teaching of artisans should be confined to imparting a knowledge of the principles of science and art, to familiarise them with the great facts and theories upon which the industry a boy is to pursue is based. To illustrate instances, they would not propose to instruct an iron-worker in the actual manufacture of his tools and appliances, but they would endeavour to impart such instruction as would enable him to understand why, in spite of his manual skill, his puddle bar is occasionally bad, or his pig iron of inferior quality. Chemistry, as applied to iron-work, would, therefore, be the most important subject in the curriculum of technical education for iron-workers. Similarly with regard to textile manufactures. It would be unwise to establish model factories, as has been done on the continent, with the view of enabling the operator to acquire extra dexterity; but it is essential to improvement that the pick of the workmen should have such an acquaintance with chemistry, as to appreciate the effects of different kinds of water, and to estimate the properties of dyes and their effects upon materials. While then artistic taste should be trained to avoid those combinations which offend against the accepted canons, applied chemistry is what is required, and not theoretical. What the iron-worker, and the worker of textile fabrics and the agriculturist require, is a knowledge of chemistry as it affects the industry in which he is engaged, or about to follow. Its further deep study must be left to his own inclination; for no institution or school for practical training can afford to devote more time than is absolutely necessary to its students, the aim being, we take it, to spread a knowledge of principles among the mass of workers rather than to turn out a limited number of specially skilled and highly instructed artisans. The principle object in the education of mechanics is to convey as much practical information as possible in the shortest period of time, and not to waste a pupil's time in the study of classics or abstruse science, particularly as so many are withdrawn from school, to enter the workshops, at an early age; further deep study should be left to their own inclinations; but the first consideration should be to ground him thoroughly in what concerns his own particular line of art or trade, so as to make him a perfect workman. The ordinary course of a plain English education is of the first consideration, and in which a youth should be thoroughly grounded before entering on higher studies; and then if a boy has to leave his school at an early age; let him be, at least, sufficiently educated in his own language. In advocating a change in the usual course of common school education, we by no means ignore the higher studies if there is time to learn them, but even then, we give a preference to German and French, over classics. Nor do we altogether object to theoretical teaching—simply preferring plain practical training. Above all, it is far preferable that a boy should leave school perfect in those studies essential to his future following, than to have his mind blurred with a merely superficial knowledge of a multitude of abstruse studies, so evanescently learned as to be lost to memory in a few months after leaving school.

Too much attention has been paid to the study of Latin and Greek, but of late years the public are awakening to the fallacy of this course of education.

At the recent opening of the "Mason Scientific College" at Birmingham, in which there are to be no classes for classical education, Professsor Huxley, who delivered the inaugural address, declared that for all those who meant to make science their serious occupation, or intended to follow certain professions, classical teaching is a mistake, although he said, "he was the last person to question the importance of genuine literary education, or to suppose that intellectural culture would be complete without it." "If," he remarked, "an Englishmen could not get literary culture out of his Bible, his Shakespeare, or Milton, neither in his belief, would the profoundest study of Homer and Sophocles, Virgil and Horace, give it to him."

The subject of study in our public schools has to be considered from two aspects :—

1st. What branches are absolutely necessary, and what others are merely desirable ; and which can, without harm, be entirely discontinued under the present requirements of our population.

2nd. What subjects of study have the least influence in developing practical judgment, and in general the minds of the pupils.

This is a very important point, for most branches of study, as taught in our public schools, are merely exercises of the memory, and what is worse, a mere mechanical memory for words and names.

Too much importance is attached by nearly all teachers to the study of Greek and Latin. It should be remembered that in former days, when the communication between countries was difficult, and they intermingled but little with each other, the study of these languages was an absolute necessity, as they were the only languages by which ambassadors and churchmen could hold conversation with each other. It is different, however, in these days, when the communication between nations is rapid and common, and one can find his native language spoken by thousands in every foreign land. The necessity for the study of Latin and Greek is, therefore, no longer so essential as instruction in English, German and French, which are absolutely indespensable to those who desire full knowledge in any department of science. We are, therefore, forced to the conclusion that, the teaching and occupation of a youth's time at school, if he is destined for a profession, should be of such a kind as suitable to that end ; but, that the youth destined to be a mechanic, and whose parents can only afford to keep him a few years at school, should not be wasted in acquiring a mere smattering of studies useless in his trade, but he should be thoroughly grounded in those particular studies necessary for trades.

Industrial drawing is a branch of tuition of the utmost importance to young mechanics. It is receiving the greatest consideration in the public schools in the United States and in European nations, and unfortunately it is a branch of study almost totally neglected in our public schools. The study of this industrial art must form, for the future, one of the essential elements of the new education called forth by the rapid and radical changes of our condition in life. It is essential for success in all industrial pursuits ; neither architecture, sculpture, engineering or mechanics, can get on without drawing, and it is conceded the first place in industrial and technical education ; and it has a most beneficial influence on the development of the mental faculties. A pupil who has learned to draw has always a better developed mind than another, with equal education in other respects, who is ignorant of art.

It has been urged by some that for a school teacher to give instruction in drawing he should have an artist's taste for it. This is not essentially necessary. Every pupil can be taught to draw, although every pupil will not make an artist. A knowledge of forms is an important agent in all industrial education, and this can only be learned by the study of drawing. It is a branch of art most essential as a training both to eye and hand. Every workman ought to know, at least, enough of the principles in which drawings are made, to be able to work from them understandingly without supervision. In almost every trade, decorative art makes its presence felt, and some cases in a marked degree.

In concluding these remarks, which have been extended to considerable length, it is the writer's sincere hope that, for the future, the mechanics of the country will take a greater interest in the Institutes and in self-culture, and that the Institutes, when better organized and supported, will become, to a great extent, technical schools of instruction to all those who have had neither time nor opportunity to perfect themselves in those studies appertaining, particularly, to their respective trades.

It has been the writer's fervent desire, during the past four years that he has edited this Magazine, to endeavour to impart practical knowledge, and give good advice to the industrial classes. He regrets that circumstances render it necessary for him to retire from the editorship at the end of the present year ; those circumstances it is unnecessary here to mention, more than to say that he has not that control over its management essentially requisite for its success. In some other sphere he hopes, in the coming year, to be able to do more for the mechanics of Canada than in his present circumscribed position.

Science.

SIR JOSIAH MASON'S SCIENCE COLLEGE AT BIRMINGHAM.

The gothic buildings erected by Sir Josiah Mason's trustees as a science college for Birmingham and the district, are now very nearly complete in all their internal arrangements, and the institution is to be opened on the 1st of October, with an introductory address by Professor Huxley, the winter term commencing on Monday, the 4th of October. The buildings have a frontage of nearly 150 ft. to Edmund street, just in the rear of the Town Hall and the site upon which the Free Library is being rebuilt. The elevation, which is divided into four parts, rises in the centre to a considerable height, the walls of the upper floor seceding sufficiently to allow of a passage guarded by a pierced parapet. On the ground floor in the centre is the large entrance gateway, and on each side, a pair of windows lighting the janitor rooms and clerks' offices. There is a projecting stone balcony over this gateway, and on the next floor are the six large and lofty pointed windows, which will light the chemical lecture-room. From this floor rises a large bay window, resting on a series of corbels, and above it, dividing the attic story, a small gable, terminating with a turreted niche, the point of which is 122 ft. above the level of the street. Portions recede from the predominant central block, at the extremities of each of which are projecting wings terminating in lofty turreted gables. These projecting wings reach a height of 90 ft., and have three windows grouped together on each floor. The intermediate portions between the gables and central block are lower, being about 55 ft. in height. About 2,400 square yards are occupied by the present building, but when the original plans are fully executed, the edifice will occupy nearly double that area, the extension being made in the rear. At right angles to the block front Edmund street, three parallel blocks recede upon the sides of two open courts, and are joined at the south-west by a wing parallel to the front block. The buildings are, therefore, arranged almost in the shape of a double parallelogram, the central block, which extends from Edmund street towards Great Charles street, forming one of the sides for each. The ground floor is entered from Edmund street by a large and lofty gateway with deeply-recessed shafted jambs and moulded arch, and the main corridor, in which the visitor finds himself, will be eventually continued into Great Charles street in the rear. The groined arches and moulded rib rest on dwarf columns, carved capitals and spandrels, and geometrical tracery. The landing on the ground floor, which is reached from this point by ascending a broad flight of steps, is 6 ft. above the level of the street, and from it runs the wide central corridor, another corridor extending in a transverse direction along Edmund street frontage, having at each end a staircase leading from the basement to the top of the building. Further down the central corridor, the main staircase is situated, opening to the right, with an arcade of four arches on granite columns, and communicating with every story. Beyond this, the corridor passes into the back range of buildings, the doors on one side opening to a library and reading-room, and on the other to the physical laboratory. The first floor contains the chemical lecture-room, three other large lecture-rooms, chemical preparation-rooms, professors' apartments, class-rooms for magnetism, rooms for chemical collections, models, and apparatus, the lecture-rooms being exceedingly handsome and commodious. In the south-west block at the back are several large rooms for drawing. The floors above are entirely devoted to chemistry. In the front block a spacious apartment is set aside as the professors' laboratory, and there are also rooms for the study of organic chemistry, and for gas, water, and spectrum analysis. A large room, formed principally in the roof of the central front block, will be used as a museum for collections of specimens in connection with the chemical department. There are, in addition to those already mentioned, about twenty-four smaller rooms for professors' assistants, classes, &c., and on each floor opposite the principal staircase are the necessary class-rooms and lavatories. The college contains in all nearly a hundred rooms. The several laboratories will be plentifully fitted with small and large evaporations niche for the removal of injurious vapours and gases, and with the fittings necessary for the various studies. The architect, Mr. J. A. Cossins has had the valuable assistance of Mr. Hodgkiss as manager; the stonework has been executed by Mr. Prothero; the carving is by Mr. J. Smith; Messrs. Camm Brothers have supplied the ornamental glass, which is excellent in design and quality; Mr. Pearce has furnished the other glass; the gas-fittings are by Messrs. R. W. Winfield & Co.; the plumbing by Mr. Cook; the wrought-iron entrance gate (a remarkable fine specimen of iron working) is by Messrs. C. Smith & Sons, Deritend; Messrs. Hart, Son & Peard supplied the ornamental iron-work on the roof of the college, the balustrades, and the iron windows; the painting is by Mr. Potter; and some of the movable fittings by the Midland Joinery Company, the rest, including the fittings of the lecture theatres and laboratories, having been made in the college workshops, under the superintendence of the architect.—*Ibid.*

SCIENCE COLLEGES.

That England is still the first manufacturing country of the world is undoubtedly true, but it is equally true that each year sees our supremacy more closely challenged by foreign competitors. It is constantly argued that, inasmuch as our old supremacy was won, and for long maintained by men who had no scientific training, therefore, the rule of thumb method is the best. As well might it be argued that, because the Zulus with assegais fought for and obtained their undisputed position of military supremacy amongst all the South African nations, therefore the assegai represented all that was needful in arms. As the times progress so must each one of us endeavour to move along in his own path, at least so far as may be necessary to keep pace with the world around us. It is, however, chiefly to the rising generation that the brunt of the battle with foreign competition must fall, and it is their preparation for the fight that is perhaps the most pressing national question of the times. The English manufacturer and workman have never been deficient in such skill as could be got by the daily practice of the particular art to which each might be devoted; but they have generally been lamentably ignorant of all general principles. In fact, it has been easy to find eminent engineers who were destitute of a scientific knowledge of first principles. It is true that a sort of lucky instinct often preserves these men from making fatal mistakes; but it is not safe to depend on the possession of this guiding faculty by those of less mental calibre. No one will dispute that a civilised man of very moderate mental capacity is in many things more than a match for the most intelligent savage. This is not from any superiority of his own, but because he has the benefit of the knowledge accumulated by his race. In fact, his training has given him an advantage over a man mentally his superior. No amount of mental capacity can entirely make up for want of acquired knowledge. Now in England we have not anything like sufficient means for enabling our manufacturers and workmen to acquire a thorough technical training. Workhouses and jails are plentiful enough, but science colleges only too scarce. It is true that we have plenty of colleges for teaching dead languages, and antiquated systems of logic, but of scientific institutions devoted to useful knowledge we have scarcely any.

About the time that these lines issue from the press, the people of Birmingham will be witnessing the opening of the great college of science, founded and endowed by Sir Josiah Mason. This college is to be emphatically a college of science, and the science is to be practical. Professors of eminent capability have been appointed to the chairs of mathematics, physics, chemistry, and biology, and the programme of the first session of 1880-1881 is already issued.

No other town in the world carries on such a diversity of industries as Birmingham, and to no other could the value of a college of science be more evident. Truly in a year or two's time the Birmingham youth will have every facility for becoming highly trained. Within a stone's throw of each other will be found the Mason College for Science, the restored Free Libraries, the School of Art, the Queen's College, and probably a new Art Gallery. May the rising generation of Birmingham, while retaining the skill and energy of their fathers as workmen, add the mental culture which they will have the means of obtaining; and may every large centre of population sooner or later produce its Mason to found and endow a College of science.—*Martineau and Smith's Hardware Trade Journal.*

PHYSICAL EDUCATION.—Absolute health is only attained when the body is equally developed in all its organs and members. The man with muscles of steel and a diseased heart cannot be said said to be in good health, and diseases of stomach, heart and nervous system are often—it may even be said usually – produced by that system of developement known as training. At a recent rowing match in Philadelphia, two plucky lads in contesting boats fainted as soon as the race was over. Their condition, which was apparently good, was actually adnormal, and their systems gave way because the strain which their muscles met was too great for their vital functions. Recently a similar but more serious calamity occurred at Sag Harbor. A Brooklyn lad who had taken part in a pedestrian contest, when removed from the track fell down dead. He had prepared himself for walking and running, and depleted his vital organs to build up his limbs. When the strain came the impoverished and most important part gave way. The severe muscular exercise of college athletes has carried off many fine young men by confumption, heart disease and other disorders, directly traceable to the absurd overwork required of their bodies. There is a limit of human endurance. That limit is reached when the body is impaired in one quarter to benefit special organs. The severity of the test by which athle etprizes are won seems designed rather to award the laurels to him is the least healthy, because more unevenly developed, than to the really best man. —*Brooklyn Eagle.*

PUDDLING OF IRON.—Mr. E. Harris, the President of the South Staffordshire Mill and Forge Managers' Association, in a paper which he had just read before the institute on the puddling of iron, said that the schemes tried to prevent smoke, save fuel, etc., might be counted by scores, but none of the recipes had been so effectual as to secure a general adoption. It was a mistaken theory to suppose that because iron was fibrous in the puddled bar it would be fibrous in the finished bar. Often enough the puddled bar was crystallized, and no matter how many times this class of iron was worked over again, fibres could not be developed. The "hot short" iron was as much to be guarded against as the "cold short," for whilst the engineer in constructing a bridge or building a vessel dreaded the "cold short" iron, the blacksmith and the boiler-maker equally feared the "hot short."

WHERE ELEPHANTS GO TO DIE.—The elephant hunters of Ceylon and India corroborate Sinbad's story that elephants, when they feel the approach of death, retire to a solitary and inaccessible valley, and there die in peace. Mr. Sanderson, superintendent of elephants to the government of India, admits that no living man has come across the corpse of a wild elephant that has died a natural death.

New Publications.

THE STEEL SQUARE AND ITS USES.

The above is the title of an excellent and much needed little work just published by F. T. Hodson, editor of the *Builder and Woodworker*, New York. Industrial Publication Company, 14 Dey street, or through the Editor, 243 St. Denis St., Montreal.

This work gives a very complete description of the square, and its uses in obtaining the length and bevels of all kinds of rafters, hips, groins, braces, brackets, purlins, collar-beams and jack-rafters. Also, its application in obtaining the bevels and cuts for hoppers, spring mouldings, octagons, stairs, diminished stiles, etc., etc. The book is illustrated by over fifty wood-cuts. Cloth, gilt, 75 cents. No carpenter should be without it.

AMERICAN HEALTH PRIMERS. SCHOOL AND INDUSTRIAL HYGIENE. By D. F. Lincoln, M.D., Chairman Department of Health, Social Science Association, Philadelphia: Presley Blakiston, 1880. Square 12mo, 152 pages. (Index.) Price, 50 cents. Remittances can be sent to the Editor, 243 St. Denis St., Montreal.

The first part of Dr. Lincoln's wise little book is given to School Hygiene, and occupies about one hundred pages divided into fourteen chapters, short but closely thought out. Culture or development is assumed to be the proper air of life, and culture is to come from power and self-control. "It is preposterous," the author says, "to educate all children in all branches of knowledge. We are already trying to do too much in that direction; but it is equally preposterous to omit from culture the development of physical endurance, moral soundness, and a good practical judgment. In the case of myriads of poor children, who leave school at the ages of ten or twelve, the opportunities for doing this are indeed limited; but the state should never lose from mind the object of training these children up to *men and women*." Those whose education is superior and protracted have full opportunity for developing power and self-control. "How do we give a young man *power* to fight his way in the world? We put him into a school which teaches only the brain, and only a corner of that. When he is thirty years old, he will assuredly not be groaning that his tutors gave him but too imperfect an acquaintance with the Greek lyrists; he will probably be wondering (if an American) whethêr it pays to know all that; and at forty, he will have discovered that the one thing which *does* pay in this life is life itself; that vital force and endurance and a good digestion are what are needed, as much as anything from books, to ensure success in life." Self-control is quite as much a moral as an intellectual element. While taught to control his hand in writing, his voice in speaking, his organ of language in literary composition, the boy is not so taught in regard to his affections, motions and passions; "nor is he shown how a want of self-control, whether in the form of caprice, indolence, good-nature, affection, or ambition, or even when veiled under the aspect of duty, may take away half of the value of his talents and knowledge." These statements are expanded and illustrated in the following chapters, the titles of which are, Emotional and Mental Strain, Food and Sleep, Bodily Growth, Amount of Study, Exercise, Care of the Eyes, School-Desks and Seats, A Model School-Room, Ventilation and Heating, Site, Drainage, etc., Private Schools, Colleges, Contagious Diseases. In his closing paragraph under Colleges, Dr. Lincoln says: "The public have been recently excited at the fatal epidemic at Princeton College. There is nothing at all new in such an event; and if instructive, it is so only in one point, namely, that filth generates disease in seminaries of learning as readily as in New York tenement-houses."

The second part of the sermon of one hundred and fifty pages on Juvenal's text, "A sound mind in a healthy body," is devoted to Industrial Hygiene. The chapters treat of Injurious Effects of Inhaling Dusty and Poisonous Substances, Injuries from Atmospheric Changes, Injuries from Over-use of Certain Organs, Injuries from Accidents, Regulation of Hours of Labor, Duration of Life in Various Occupations. Under these respective heads, the author has grouped a great number of important facts; and in this part, as in the first, has given, whenever it was possible, a safeguard against every danger and a remedy for every evil. We quote the following paragraphs from the chapter on Injuries from Atmospheric Changes:

"MINERS.—The health of a miner is exposed to special causes of injury. In addition to the danger of being blown up, or knocked down by falling stones, he is constantly at work in the presence of great masses of minerals which generate noxious gases—not to mention the effluvia which arises from his own person, the flame of his candle and the burning of powder. To this is added, in many cases, an excessive heat, often a steaming, sultry heat, or else a continual cloud of dust proceeding from the coal or rock under the blows of his pick. And if we further consider the confined position in which he often works, the excessive exertion, the exposure to draught, and the total deprivation of sunlight, we shall be ready to admit that his life is an unnatural one, and full of singular risk.

"But man can adapt himself to almost anything. With proper precautions, it is said that the life of a miner is almost as safe, and his health quite as good, as those of other classes in general; better, in fact, than those of his own family. If this be so, it is certainly a great triumph of the hygienic art.

"The precautions to be taken relate first and foremost to ventilation.

"'Fire-damp' is a name given to light carburreted hydrogen, which is given off abundantly in the carboniferous strata, and in enormous quantities from the Pennsylvania gas-wells. In the English coal mines, it is much more abundant than it is at present with us. When mixed with seven or eight times its own volume of common air, it is highly explosive. After an explosion. the passages are filled with the irrespirable mixture of nitrogen, carbonic acid, and the vapor of water, resulting from its combustion.

"'Choke-damp,' or 'black-damp,' is a name for carbonic acid, a common product of most combustions, and of respiration. It abounds in badly-ventilated mines. Nitrogen is not a poison by itself. Carbonic oxide, however, is one of the most dangerous of poisons, and so is sulphureted hydrogen, when present in any considerable quantity. Both the latter are called 'white-damp.'

"The heated flue, as a means of exhausting air from mines, has obvious dangers in coal mines; and its special disadvantage lies in the variations which different atmospheric conditions produce in its working.

"The steam-fan, driven by a small engine, may be used either for drawing air from the mouth of a mine or for forcing it through tubes to the places where it is most needed. It is altogether the best means of ventilating mines.

"Another reason for supplying abundance of fresh air to mines is furnished by the great heat which is found underground. In the Cornish mines, the temperatue is said to increase regularly about one degree Fahrenheit in every fifty feet in the upper parts, and one in every eighty-five feet in the lower parts; and this is, with local exceptions, nearly the rate at which the temperature rises in other mines. Some of the exceptions, however, are very remarkable. The deep levels of the mines on the Comstock lode in Nevada have temperatures varying from 105° to 130° Fah.; and this excessive heat is mitigated by blowing upon the men fresh air at 90° or 95°, which seems to be most conducive to comfort. The men, under these circumstances, work with great vigor, but have to be frequently relieved.

"This great heat is said to be very productive of heart-disease. There is no doubt that this effect is intensified by excessive barometric pressure and by dampness of the air, preventing evaporation from the body. It is affirmed that the system in use at the Comstock is so thorough as to do away with most of the danger from all these sources.

"To spare the men a needless and wasteful expenditure of bodily force, it has been found best to use cages worked by engines, to raise and lower those who are going to and from work.

"The excessive quantity of coal-dust which chokes the air of badly-ventilated mines has been previously alluded to as affecting the lungs. But there are other causes of pulmonary trouble, quite obvious in their nature, such as sudden changes from heat to cold, and deliberately sitting down in draughts to cool off while working in the high temperatures mentioned. On the whole, the principal diseases are miners' asthma, consumption and rheumatism, and, among those who have worked long in badly-ventilated places, dyspepsia, tremors, vertigo, and other troubles arising from blood-poisoning.

"As regards accidents, they are due to a great many various causes; but more than one half of them in the Pennsylvania coal mines, are caused by falls of rock, coal, or slate. It is the opinion of good judges that a very large number of these casualties could be avoided by sufficient timbering of the roofs and sides. One and a quarter in every hundred, or 12½ men in every 1,000, employed in these mines, are killed or wounded every year by accidents, and it seems that here is a distinct and obvious field for a humane reform, either by legislation or private effort."

Apart from the self-restraint which the author has imposed on himself in the treatment of a theme of which he is full, there is throughout the work a remarkably moderate, conservative tone, combined with a disposition to accept what is good from any source, that impels us again to characterize this as a wise little book. The typographical appearance is remarkably neat, the paper excellent, and the Index is preceded by a short bibliography.

A NEW USE FOR STEEL SCALE.

Messrs. Henry Porter, of the Bowesfield Boiler Works, Stockton, and John Thomas, late of the Acklam Ironworks, Middlesbrough, have recently introduced into the market an invention which is worthy of notice on account of its utility. They have established works at Bowesfield for the manufacture of paint from steel scale, for the protection of steel and iron, in any position and in any climate. The paint is finding much favour. having been applied by such firms as Messrs. Bolckow, Vaughan, and Co., the Carlton Iron Company, Messrs. Pease and Co., the Tees Conservancy Commissioners, Messrs. Kirk Brothers, Workington; and others. The invention affords another illustration that nothing need be allowed to waste. Mill scale was certainly not altogether wasted before, but it can now be made much more valuable. Messrs. Porter and Thomas obtain from the steelworks in the locality the scale that falls from the steel as it is passing through the rolls, and this, by their special machinery, they grind until it becomes as free from grit as flour and it is mixed with boiled oil and colouring matter. Thus we have steel structures painted with steel. Two kinds of paint are manufactured, the first for use above water, to prevent the structures from rusting, and this is named the anti-corrosive paint; the second is for use under water, to prevent fouling, and is termed the anti-fouling paint. We may mention that a portion of Redcar pier is painted with the anti-fouling paint, and there it has given great satisfaction after several months' trial. The anti-corrosive paint answers admirably for iron bridges, railway rolling stock, coal, and iron plant, iron houses, &c., ships above water-line, boilers, engines, &c. Ordinary paints when applied to iron and steel structures soon begin to crack and scale off, and do not prevent the formation of rust, which is so destructive to the stability of metallic structures. The anti-fouling paint answers well for ships' bottoms, where it will prevent animal or vegetable life adhering, and the inventors say that if painted with two coats of the composition a vessel may go to India, China, or on other long voyages, and come home with a clean bottom. Barnacles, glasses, &c., cannot fasten on the bottom and live, for the ingredients of the paint destroy them. This is of the utmost importance to ship owners, who have much trouble with the fouling of their vessels' bottoms. For blast furnaces the anti-corrosive paint will in the long run, it is said, be even more economical than gas tar; it will certainly more effectually prevent rust, and form an excellent protection to the metallic surface.

POPULATION OF CITIES IN 1880 AND 1870.

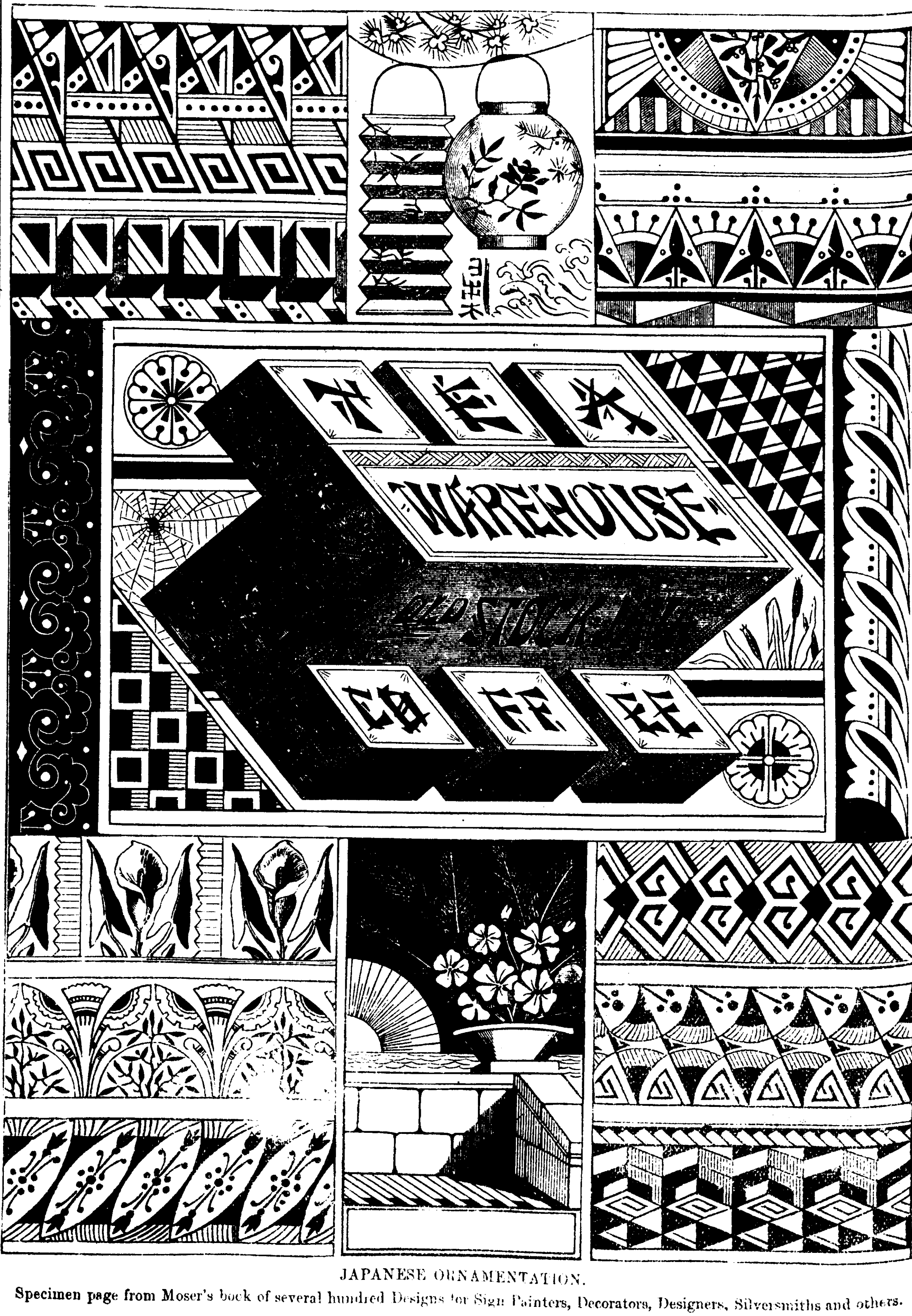
In the following we give the present population of the leading American cities, as compared with the census of 1870:

Cities.	1880.	1870.
New York	1,208,471	942,252
Philadelphia	843,000	674,022
Brooklyn	554,693	395,099
Chicago	502,940	298,977
St. Louis	395,000	310,864
Boston	352,345	250,526
Baltimore	350,000	267,364
San Francisco	280,000	219,473
Cincinnati	246,153	216,239
New Orleans	215,239	191,418
Washington	160,000	109,204
Cleveland	156,946	92,829
Newark	136,983	105,059
Milwaukee	130,000	71,440
Detroit	119,000	79,577
Louisville	112,000	100,753
Jersey City	105,000	81,744
Providence	104,500	68,904

Hot Polished Shafting.—Since the early part of 1876 the Akron Iron Co., of Ohio, have given much attention to the manufacture of hot polished shafting by a process which, while it yields a product possessing important advantages, is such that only the best raw material can be employed. This fact is in itself a guarantee against any inferiority in the shafting turned out, and has contributed to its growing popularity with the manufacturers of agricultural implement, in the construction of which light—and, therefore strong—parts are eminently a necessary factor. The process of the manufacture of hot polished shafting affords special facilities for turning out true work, and for making it to the gauge desired without having recourse to the lathe. A circumstance which makes the product of the improved process particularly suitable for lime and counter shafting is that it does not spring or warp in key seating. The well-known effect of polishing iron at an elevated temperature—that which gives Russia sheet iron its peculiar blue finish—is produced by the process adopted in this case. A magnetic oxide, adhering firmly, is superficially formed, affording protection against the formation of rust. We have had occasion to examine specimens of the shafting referred to, which shows in a characteristic manner the presence of the coating thus obtained, and which in conjunction with the other peculiarities noticed, render it worthy of the attention of those interested.

A New Screw.—It is a well-known fact that the great bulk of the screws used are driven in with the hammer, and given a turn or two with a screw-driver, to bring them flush. Recognizing this fact, an ingenious inventor, for many years somewhat prominently identified with the business, has brought out a new screw, which is adapted for driving, and which enters the wood without tearing the grain. The gimlet point is dispensed with, and a cone point substituted. The thread has such a pitch that it drives in barb fashion, offering no resistance in entering, but firmly resisting all attempts to withdraw it except by turning it out with the screw-driver. The head is flat, but in setting it up two nipples, or square-shouldered projections, are raised in it by the one operation. The screw-driver takes hold of them more easily than it does of the customary nick, and holds quite as firmly, and when driven flush the projections on the head are not in the way, and do not disfigure it. It is claimed that this screw can be made one-third cheaper than ordinary screws, the principal saving being effected in the doing away with the necessity of sawing the nick in the head.—*Design and Work.*

A Novel Horseshoe.—A Berlin manufacturer is making a horseshoe of iron and hemp that is receiving considerable favor among the Germans. The shoe is of malleable iron, carrying a deep wide groove, into which tarred hemp rope is firmly wedged. The rope is so thick that it protrudes beyond the rim of iron. The shoe is very light, and is said to be serviceable.



JAPANESE ORNAMENTATION.

Specimen page from Moser's book of several hundred Designs for Sign Painters, Decorators, Designers, Silversmiths and others.

JAPANESE ORNAMENTATION.

Specimen page from Moser's book of several hundred Designs for Sign Painters, Decorators, Designers, Silversmiths and others.

Sanitation.

TRAPS ON MAIN DRAINS.

LONDON, ENG., August, 1880.

The discussion in the columns of the *Sanitary Engineer* as to the desirability of utilizing the soil pipes of houses for the purpose of ventilating the main sewers, prompts me to enter my protest against such a rule being permitted to be introduced in any but exceptional systems of sewerage and of house sanitation. The practical difficulty of carrying out extensive sewerage works, without, at certain points, introducing such changes of gradient as to involve changes of flow with risk of deposit, leads to the conclusion that the arterial drains must of necessity be subject to a greater change of evolving dangerous gasses than subsidiary causes, such as house drains, in which there ought to be no difficulty in effecting a prompt removal of the reiuse of the house. Where there occurs, as is stated to be the case with some of your correspondents, a serious obstruction to the flow of the house drainage, it arises from the inherent defects of the closets employed. If a deficient flushing power is used it is obvious that the more solid parts of the refuse do not receive the necessary impetus to affect their removal, and by this means a trap may be stopped, although it very rarely then happens. Mischief could be produced, not so much by the closing of the trap as by the retardation of the current and consequent deposition and decomposition of solids. This, however, need not occur, and should not be regarded as a factor of sufficient importance as to give weight to a contention in favor of the traps being dispensed with. In my own experience I have found that house drains and soil pipes become foul through the neglect either to have sufficient water flush in the closet, or to provide an air flush from the house side of the trap. Without this, and the corresponding continuation of the soil pipe as an upcast, no current of air is induced, and the gases evolved in the surroundings of the house remain almost stagnant, until they find a means of escape into the house through the closets (when used), or otherwise.

The gases that are produced in a properly-constructed main sewer need only be a source of danger when the refuse from patients suffering from typhoid, or other similarly contagious diseases, passes into it. In that case the exclusion of the exhalations from the house drains, by means of traps, prevents the spread of the disease, and to introduce a current of air from the sewer into the surroundings of the house would be attended with danger, as the occasional and unavoidable holes and leaks, such as from rats, would, until discovered and repaired, tend to disseminate disease. I have recently had an example of the ill effects which arise from direct communication between a building and a main sewer in the city of London. One of the principal banks asked my opinion as to the sanitary condition of the establishment, and the result of an inspection showed that owing to the absence of a trap the sewer gas from the main sewer had free access to the building, and a chronic state of sore throat and other conditions of blood poisoning had been the result. This, of course, indicated a bad state of the main sewer. But how is a householder to know that the main sewer is perfect? He is only safe when his house is entirely cut off from the sewer. By properly trapping the building I refer to, the foul gases and smells disappeard; a healthy condition was established, and many valuable lives rendered more useful than previously. I advise the introduction of street ventilators at more frequent intervals than they are generally placed, and rely on the natural pulsation which occurs by the rise and fall of the flued in the sewer during the twenty-four hours to force out the sewer gas. In its diluted form, mixed with the air in the open, it is less likely to produce mischief than if it is drawn in the direction of the houses, as is advocated by those who would abolish traps. I say confidently that the experience of sanitary engineers in England points to the necessity for effectually trapping every building from the main sewer, and of providing a sufficient air flush on the house side of the trap, for the purpose of purifying the air in the drains and soil pipes, by maintaining a constant current of air from the house drain to the highest part of the house.

HENRY ROBINSON, C.E.

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11 ARGYIL STREET, LONDON,
August 27th, 1880.

I will briefly state my opinion as to how a house should be drained into a sewer. First of all, it should be taken for granted that the sewer in the road properly belongs to the town authorities, and should not be ventilated by means of pipes run up, against or through the houses. Effective sewer ventilation can be got by means of openings in the crown of the sewer, etc. I hold that the house should be disconnected from the sewer by means of a disconnected trap or chamber, placed as close to the house as possible, such contrivance taking in a body of fresh air at an inlet between the trap of the chamber of the house. To provide an outlet for this air the soil pipe should be carried up the full diameter to the roof of the house, and where it is necessary, especially at the ends of the drains, further ventilating pipes should be provided. In all cases where it is possible I recommend the severance of the rain water pipes from the drain, and their delivery over a trap at the foot of the pipe. In like manner I disconnect the wastes of baths, lavatories, and clean waste sinks, keeping the pipe open at the top, so as to preserve a current of air in the pipe, and to prevent the effluvium of decomposing soap, etc., from entering the house. The only waste which I allow to enter the soil pipe is from the bed-room urinal slop sink, and in some cases I provide a disconnection even for this. It is more difficult to deal with scullery sinks, but I find it better to deliver the waste pipes of these ints a grease-collecting arrangement, taking the wasts first of all into a small gully where possible. I do not see why the same general rules should not be practised in America, and I believe that disconnection of this kind would be preferable to anything else which can be devised. In very cold weather I would protect the traps from freezing by temporarily covering them over, as suggested by your correspondent, Mr. Anderson, C.E. I am, sir, yours faithfully.

W. EASSIE, C.E.

LONDON, ENG., Aug., 26, 1880.

The question of retaining the trap placed on the line of the "house drains," between the house and the public sewer, is very important, and under the existing systems of sewers cannot be dispensed with. Even with the most perfect system of sewers, as carried out by the best modern experience, I could not recommend the rejection of the trap. It may of course be argued that every trap is a direct loss of scouring power, and so it is; but we must be satisfied to accept this compromise. It is the safe principle, I believe, to lay down all modern house drainage work so as to cut off, "disconnect," and ventilate, that the house may be harmless from sewer air, even should the sewerage system into which you drain be bad, as it mostly is in the older cities and towns. The theory that sewer air should not be found in properly constructed sewerage systems is not borne out in actual practice, and until it is we cannot do away with the trap in question. If the trap on the line of house drains be done away with, you will ventilate the public sewers through the soil pipe, and other ventilating pipes of house drainage systems, and form a ready means of carrying contagion from house to house. I am, sir, your obedient servant.

J. WALLACE PEGGS.

SAN FRANCISCO, CAL., Aug., 28, 1880.

In answer to your inquiry as to my views of the "Trap on Main Drain" question, I have to say that in the present unventilated condition of main street sewers, I consider it an absolute necessity. Of course, there is no difference of opinion as to the desirability of getting rid of our house sewage as quickly as possible, and with that end in view to avoid all bends. Still, the argument used by some parties that the trap is such an impediment to the flow of sewage as to warrant it being left out entirely, is not borne out by my experience. Even if all they say against the trap should happen, viz., that it should choke up and thus retard the flow of sewage, the trouble and expense of cleaning it is far more than compensated for by the protection it affords the house inmates while it has been in use; but I do not admit there is any danger of its becoming stopped up if ordinary care is taken in the setting of it. Of course, with a long line of pipe and a very little fall, not only the trap, but the whole line of pipe will be clogged. A remedy I apply in the latter case is to carry the waste of the kitchen and pantry sinks into a "grease trap," properly vented, before it enters the house drain pipes. As an illustration of the efficacy of such traps, one placed in the underground drain pipe of the Palace Hotel in this city, which runs over four-hundred feet on a fall of "one-eighth of an inch per foot," has been running nearly five years, and the pipe has never yet being stopped up. I always put in a trap.

"properly vented" on the main house drain pipe, and consider any one "criminally" negligent who does not do so.

DAVID BUSH.

CHICAGO, ILL., Aug., 26, 1880.

The question as to whether a trap, with a fresh air pipe above house-side of seal, should or should not be put in the main line of private sewer at or near the curb wall, for intercepting the gases from public sewers, is a very important one, and the verdict, in my opinion, should not be incorporated into the code of sanitary science of plumbing without giving it a very careful study. I will endeavor to discuss the objections raised to a trap thus placed in the sewer.

Objection 1. "They obstruct the flow of drainage, and cause accumulations of foulness in house drains." The flow of sewage is just as rapid to and from (for all practical purposes) the trap with it in or out. It is true, that when there is a small quantity of sewage flowing it will be retarded a trifle while passing under divisions wall of trap, but if there be a large quantity sufficient to fill, or nearly fill, the sewer there will be no retardation, because the air will be forced out of a fresh air pipe, and part of water in trap be pushed through by the momentum given to the air at the introduction of the water, and when the water passes beyond the trap there will be a suction action that will clean out any sediment that may be in it; and were it not for the slow draining of the water on the inside of sewer the trap would be left without a seal. The sewage of a trap is constantly being changed, either by the use of leaking of plumbing fixtures, or by the drainage of the soil; and if it is true, as has been stated, that matter entering into sewers repuires about six hours before the dangerous gases are generated, they will not often be found in sewer on account of trap. The trap will not be choked by anything that will pass under the division wall of the smaller traps that should be placed in the waste pipes, near the plumbing fixtures. Roof water-pipes should not be connected direct with a sewer without an intervening catch basin, having a partition so constructed that it will prevent floating articles from flowing into sewer, and at the same time admit of a current of air to and from the roof to fresh air pipe. No trap will be choked with grease that has the soil and water from water closet in daily use passing through it. The amount of foulness accumulating would be at the trap, if at all, and the gases generated from it would be so small that the air of the sewer would be but slightly deteriorated by it. If the specific gravity of the air on the public sewer end of trap was lighter than that of air on house end the gases would be slowly passing through that way and *vice versa*; now, if the air entering through fresh air pipe is not sufficient to oxidize the impurities of gases thrown off the area of a six-inch circle (for it is only at the house end of trap that the foulness will effect the sewer odors, and this is an evil that can be remedied by suitable flushing arrangements), the air from each junction's proportionate part of public sewer and an additional length of twenty-five feet of private sewer, being foul itself, will never accomplish the oxidation of gases in the balance of house sewer.

Objection 2. "Air admitted by ventilation above the seal, and passed all through a trapped house drain, is found by experience to be fouler than air drawn from a sewer." It seems to me that this assertion cannot be maintained, for how is any mortal able to determine the proportion of foul matter that enters each sewer, causing the generation of the two separate compounds of sewer gas? Again, how is he to know what condition the air currents were in when he took his samples of gas to test? I have known the air currents to be down the vent pipe through the roof, when water would be thrown into a branch of vent pipe, or after water had flowed past the junction of vent pipe with sewer, or if the wind were blowing towards the side of a house higher than the vent pipe, also when there was a break in the sewer under house, or from the subsiding of the waters of a public sewer after a rain storm. The air currents are sometimes out of vent pipe, as when the waters of public sewer are above the outlet of private sewer, the flowing of water in any of the branches of private sewer will cause it, or when the outlets of public sewer is filled, and large bodies of water flowing from a section of higher grade; or if the outlet is not filled, and wind blowing towards it; or if the wind were blowing towards the front of the house, and a trap with fresh air pipe was in sewer, the air would be forced down the fresh air pipe and out the vent on roof. Again, there may be no perceptible current, but simply an oozing out of air by the expansion of the gases by fermentation. This is when the outlet of private sewer is covered with water, or if there be a trap in without fresh air pipe.

I have worked in situations where there would be a current of air coming out of a soil pipe, and yet the odor would hardly be perceptible, but I invariably had very sick headaches when at such jobs. My men and I have less inconvenience when the odors from their offensiveness appear to be more dangerous, and I am inclined to the opinion that it is the unknown and unheralded foe we have the most to fear from. At one job we were altering I found a trap at foot of soil pipe, and the ordinary bath room fixtures on second floor, and a two-inch iron pipe extended from soil pipe through roof; before we disturbed the work I snuffed the air about a foot from the vent pipe on roof and noticed no odor; yet when I snuffed close to open end of pipe I noticed a very faint odor. I applied a lighted match to it, and instantly a bluish flame burned down the inside of pipe for about five minutes. I then made a small hole in the sewer above the trap, and snuffed at the vent pipe on roof, and there was a very strong, perceptible odor about three feet from pipe. So I think, although the odors escaping from vent pipe when there is a trap with fresh air pipe are more disagreeable to the sense of smell than those from the pipe without trap, it does not prove that it would be safer to do without it, for there are many causes wherein there would be a difference in the quality and quantity of the two gases.

Objection 3. "The trap does not offer any effectual resistance to air from sewers when there is a pressure." It is true that a column of water two or three inches high will not offer sufficient resistance to keep back all the air that may be forced up private sewer under heavy pressure, but I think it is a very rare occurrence, if at all, that all of the water in a trap would be forced back so as to admit of a volume of air equal to the size of pipe; and this would be diluted with the air from (or forced out of) fresh air pipe at curb wall, and if found to be troublesome there it could be arranged to go to roof of house. Where public sewers have a low grade, and consequently a sluggish stream of sewage, and a large percentage of junctions connected with occupied buildings, the outlet of private sewer will be partly, if not wholly, covered with water. Therefore, dependence upon private sewer ventilation for ventilating the public sewer would not be reliable. Public sewers should be ventilated in many cases by a separate system of their own; yet there are situations where the public and private sewer ventilation can be in unison.

Objection 4. "That the danger of disseminating contagion orginating with them, through tenement and apartment houses, is probably greater with a trapped house drain than it would be from an open connection with the sewer." Suppose a contagious disease germ is present in the line of private sewer; will it not propagate faster where it is nurtured by pure sewer air than by sewer air diluted with fresh air? We are taught that in order to purify sewer air it must be freely mixed with fresh air. Without a trap every pipe is filled with the impure gases from the public sewer, together with what other gases as are generated within the waste system of house, and every motion communicated to the air of public sewer (when the circumstances are favorable) exerts an evil influence upon all traps at plumbing fixtures in house; and no matter how expensive a system of sewer ventilation a party may have in their house, their waste water pipes will be filled with gas of the same quality as may be in the public sewer. The gases arising at curb wall (except in severe storms) can be prevented by extending the vent pipe of soil pipe up within and two feet above the kitchen chimney flue.

The benefits of trap arranged, as explained in the beginning of this letter, are:

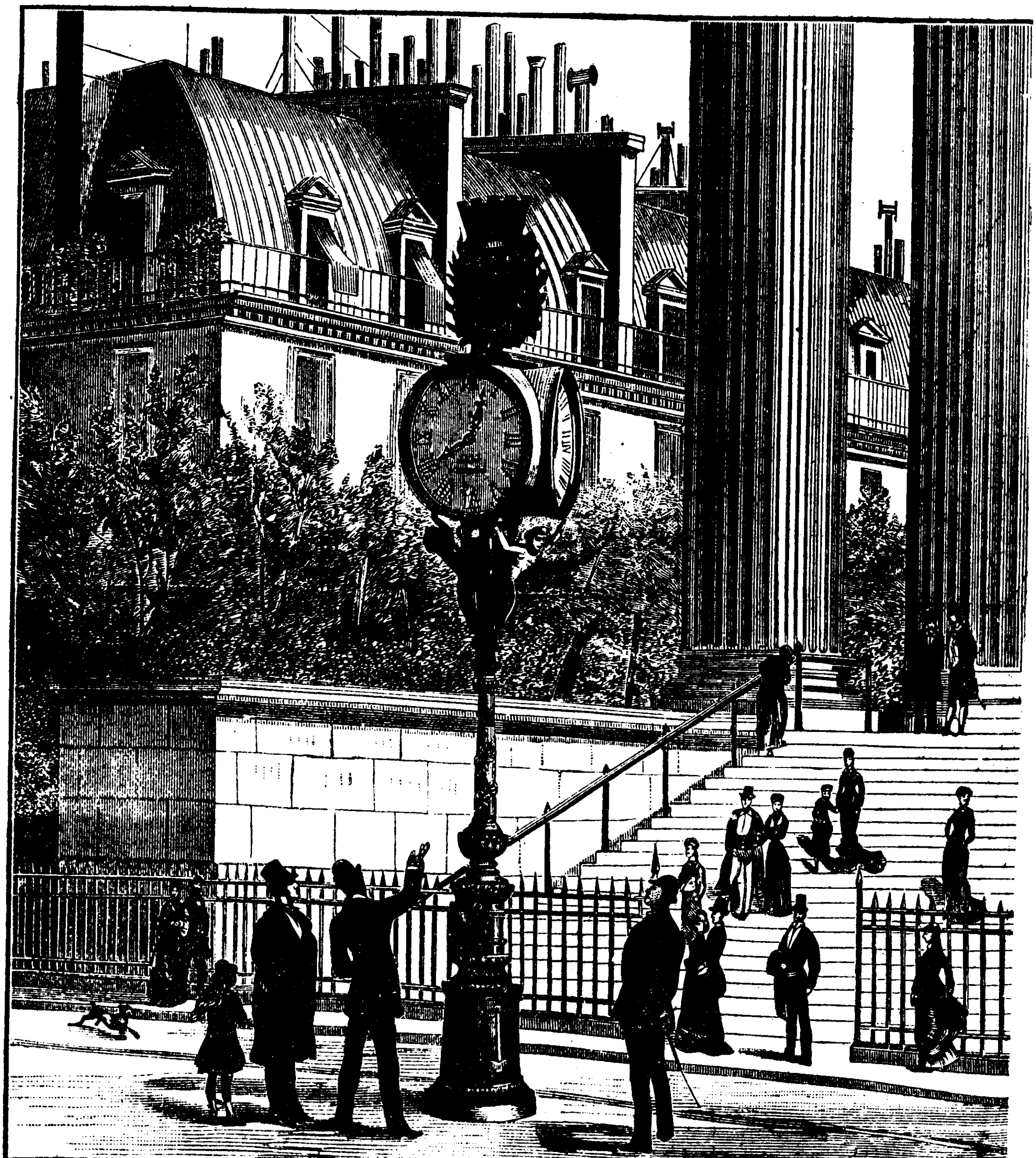
It to a great extent separates the gases of public sewer from those of private sewer, thereby lessening the chances of contagion from epidemic districts.

Each building can carry out its own system of sewer ventilation. In case of break in house sewer it lessens the liability of house being filled with sewer air of full strength. The fresh air pipe is an additional escape to pressure in private pipes, and admits of an oxidation of the impure air within sewer. It is a safeguard against the private citizen impeding the flow of public sewer by being careless with his own sewer. I have never found a trap choked up that could not be charged to the faulty construction of some part of the sewer, or when the catch basins from some cause had the water level lowered down below its trap, and floating substances had got into sewer, and then into the trap; but even this can be prevented by properly arranged catch basin. I would have to know all about the sewerage of a city before I would say a trap should be put in or left out, as described in the beginning of this letter, in the private sewer. If all cities' sewerage were arranged as those of Chicago, I would insist upon a trap being put in. If I have thrown any light upon this important subject my time has not been spent in vain.

Hoping that you will go on in the herculean task you have undertaken, (that is, to educate the public to what is best for their own interest, and have them appreciate your efforts,) I am truly yours.
ALEX. W. MURRAY.

PNEUMATIC CLOCKS.

The accompanying illustration gives a representation of a street clock operated on the pneumatic principle, a convenient system which has been largely adopted in Paris and other cities of continental Europe. Compressed air in this plan is made use of to operate all the clocks of a city or district simultaneously, precisely as electricity is similarly employed. The parts of the pneumatic clock system are, the central clock, the receiving clocks, and the tubes and intermediate mechanism for conveying compressed air to the receiving clocks. At the central station a reservoir of compressed air is provided containing about 25 cubic feet at about five atmosphere pressure. From this reservoir the compressed air is conducted to a second reservoir, in which its pressure is regulated at seven-tenths (7·10) of an atmosphere. Every minute the distributing reservoir is placed in communication with the distributing tubes by the action of the mechanism of the central or distributing clock. The central station is provided with several of these clocks, so that if one should become disordered another can be set in operation within a few seconds. A distributing tube connects with the several mains which convey the compressed air into the various districts where pneumatic clocks are provided. The mains are of wrought iron, 1 1-16 inches in diameter, and are connected with lead tubes three-5ths of an inch in diameter, for conveying the air into the houses when necessary. With a pressure of seven-10ths of an atmosphere, it is found that any required number of clocks can be operated at a distance of from one to two miles from the central station.



PNEUMATIC CLOCK IN PARIS.

The action of the receiving clock is about as follows: A small bellows, resembling that used in pneumatic call-bells, is in communication with the tubes conducting the compressed air from the central office. Every minute the pressure of the air raises the bellows, and a rod attached to the upper bellows-head actuates a lever which engages with a wheel provided with 60 teeth, which is rigidly secured to the minute-hand arbor. The wheel rotates the distance of one tooth every minute, and a weighted pawl on the other side of the dial checks this movement. The hour-hand is rotated by means of the usual dial wheels. By means of a second bellows the clock may be arranged to strike. The ordinary spring and weight clocks can be easily transformed into pneumatic receiving clocks.

THE STUDY OF DRAWING.

The *Saturday Review* says:—

It may seem presumptuous in these days, when South Kensington has extended its paternal despotism over the length and breadth of the land, to assert that drawing is, as a rule, very badly taught in England. But we do assert this most distinctly, and we are encouraged in this temerity by the example of M. Viollet-le-Duc, who, shortly before his death, wrote an elaborate work with the express purpose of establishing a similar proposition with regard to France. This work, the *Historie d'un dessinateur*, is cast in that abominable narrative form—which has fortunately ceased to flourish in England,—besides bein burdened by the introduction of a French version of Mr. Barlow, with an incredibly good little boy, who is almost more insufferable than Harry Sandford; but to any one who has the patience to disentangle the important ideas so elaborately wrapped up in the entirely uninteresting personal history of Monsieur Majorin and *petit* Jean, the work cannot fail to be instructive.

We all know how drawing is generally taught. The lowest depth is to be found in the system of the fashionable drawing-master. In this, the greatest stress is laid on the management of the pencil. Trees are to be represented by a particular touch, rocks by another, water by another; shadows are rendered by parallel lines; lights can be advantageously put in with white chalk, etc. In a word, everything turns on manipulation. Until very recently, the system pursued in the great schools of art was little better. There was an elaborate method of stippling by which the shadows were worked up to an exquisite velvety texture, whilst correct outline or modelling were regarded as quite secondary matters. There used to be harrowing stories told of pet pupils at South Kensington, who spent six months on the shading of a single figure, and entrance to the schools of the Royal Academy is still barred to those whose accuracy of drawing is not equalled by the smoothness of their execution. At South Kensington there has been a great change for the better since Mr. Poynter has been placed in authority, but routine is still powerful, and art is still taught as if it had no relation to the life around us. And this brings us to the question, What is drawing? Drawing is the art of seeing correctly. There is no difficulty in putting down what one sees, provided one sees it clearly and rightly. Execution is a mere affair of practice, a dexterity which any hand will attain with time and use. The greater masters have used the most varied means of recording their impressions of nature. No two ever draw alike as regards mere execution; but all succeed in conveying to others a correct impression of the image that was before their eyes. In the *Histoire d'un dessinateur*, the artistic capacities of *petit* Jean are first discovered by a rude drawing that he has made of a cat, in which the animal is represented as seen from the front with only two legs and a tail sticking out of his head. When it is pointed out to him that this cannot be like a cat, because a cat has four legs and a tail that does not grow out of the top of his head, he only replies that he saw it so. Whereupon Mr. Barlow—we mean Monsieur Majorin—embraces him tenderly, and adopts him on the spot. And, indeed, *petit* Jean was quite right; he had drawn what he saw, and nothing else, and that is the task that all draughtsmen have set before them. This is the capital problem not only of draughtsmanship, but of many other things. To state what one has observed without telling lies about it is the most difficult thing in the world, but on this depends all progress in the whole domain of science.

When *petit* Jean had been adopted by M. Majorin, he is encouraged to draw anything and everything that he sees around him. These drawings are duly corrected, and, when it is practicable, they are made an excuse for instructive explanations which would seem to belong rather to general education, but which are useful also to drawing by impressing the objects more firmly on the mind. And here we come to the important truth that drawing, although it must always chiefly depend on the direct observation of nature, can nevertheless be greatly indebted to various indirect aids. A little elementary geometry is of great service, as giving certain typical forms by which the forms of nature can be classified and remembered. The mutual relations of these forms are given by geometry in their simplest aspects, and disentangled from the complications which are met with in real life. When familiarized with these abstract types, the pupil may proceed to perspective, the study of which is hopeless until he has a clear understanding of what is meant by a straight line, a plane, an angle, etc., knowledge which oddly enough does not come by nature or even by definitions, but, like most other knowledge, by familiarity. The study of perspective is a very important aid to drawing—so important that the conventional teaching has been compelled to recognize it—but with characteristic perversity has always begun with it at the wrong end. As in the study of grammar, a number of rules are given before the pupil has the least conception of the subject matter to which they are applicable—in neither case are the results very encouraging. And yet the proper way of teaching perspective is very simple. Very soon in the course of his drawing, the beginner stumbles across certain difficulties, owing to the discrepancy between what he really sees and what he thinks he ought to see. For instance, he is drawing a cart. Knowing that the two wheels of a cart are of equal size, he draws the further wheel as large as the near one, and then his drawing looks wrong. His teacher takes the opportunity of explaining that things decrease in apparent size as they are farther away from the spectator, and that apparent size is all that he has to trouble himself about. When the pupil has got this clearly into his head he has mastered the fundamental principle of perspective. The teacher now informs him that there are certain rules founded on this principle which will enable him to draw simple figures with great facility and correctness. Having learned these rules, the pupil is taught to connect them with practice by some such simple device as tracing a building, a piece of furniture, or any real object of sufficient simplicity, on a pane of glass, and then seeing that the rules of perspective are merely an account of how such objects look. It is this conception that is so essential to a vital knowledge of perspective, and which the ordinary teaching so entirely neglects—namely, that everything in nature is seen in perspective, and that for the simplest cases there are definite rules which can be applied in aid of observation. For complex cases, such as the forms of clouds, or trees, or mountains, or the human face, no definite rules can be given beyond the fundamental one that the apparent size of an object decreases as the square of its distance; so that perspective can never be more than a slight help to that direct observation which is the foundation of all drawing.

Drawing is aided in a somewhat similar way by an elementary knowledge of various sciences, such as anatomy, morphological botany, and geology. These enable the draughtsman to avoid errors, and direct observation to the important points of the object to be portrayed. Again, they increase the interest with which he looks at forms, and are an immense help in enabling him to remember them; but they have their dangers, in tempting him to substitute what he thinks he ought to see for what is really visible. For instance, superficial knowledge of this kind might have made *petit* Jean draw his cat with four legs when he saw only two; and in no case should the importance of these studies to the draughtsman be exaggerated. They can enlarge his mind, and they can aid his observation, but they can never stand in the place of it. It is certain that the Greek artists of the best period were unacquainted with anatomy, but their knowledge of the human form has never been equalled. It will be objected when we have got so far that our draughtsman is always supposed to be drawing something that he sees before him; is he never to draw out of his own head? Certainly he should be trained to draw from memory, especially if he afterwards compares his drawing with the original to keep up his standard of correctness. But is he never to imagine anything? As much as he likes; but that is no part of his education. No one can teach imagination. If he has it, all the better—if he has not, he may still be an excellent draughtsman. He may be taught to combine the elements of things he has seen so as to make new things that he has not seen, and for this any scientific training will be of good use; but the creative touch that will put something new into the combination, something that did not exist in any of the elements, is a matter of genius, and as such unteachable. We must teach our draughtsmen to see things as they are, and to so portray them as to give a correct idea of their appearance to other people—with that the duty of the teacher ends.

It will here be objected that all this will never make an artist; that, in all the genuine artistic work, there is an element of taste, of refinement that such training will not give. Granted; but then our draughtsman need not become an artist. This is precisely the question that is feared by M. Viollet-le-Duc. After *petit* Jean has learned to draw, M. Majorin makes various experiments to see if nature has destined his pupil to be a painter or a sculptor. Having decided in the negative, he is not a bit discouraged, being of opinion that knowing how to draw cannot fail to be useful to a man in any position of life. And, indeed, if our definition is correct, it is obvious that a draughtsman must have had his faculties of observation sharpened far beyond those of his fellows. *Petit* Jean gets apprenticed to a cabinet-maker, and of course makes his own fortune and that of his family, with that fine regard for consistency in which books are so much superior to real life. But we may readily grant the extreme value of good draughtsmanship in all pursuits where knowledge of form is at all essential. Indeed, in no other way is that familiarity with form obtained which is essential to dealing with it successfully. But, supposing *petit* Jean had had the artistic sense, would his training have been of benefit to him as an artist? Undoubtedly. It has never yet been held, even by the most refined of art critics, that a painter can draw too well. But will not this extreme accuracy have deadened his artistic sense? Will he not sink into vulgar realism? That depends on *petit* Jean himself; if he has imagination it will come out in his pictures, and all the more freely in that he has fewer technical difficulties to contend with. Indeed, there is nothing sadder than to see high imaginative gifts cramped and spoilt by the insufficient means of expression at the command of the artist. But supposing that he has no imagination? Then he had better be content with realism; if he has the true artistic taste, we may be sure it will not be vulgar; realism, after all means nothing worse than truth to nature. There is an art which teaches and inspires, and an art which records.

Of artists who are qualified to teach the world, there are but few. Of those who can do good service in recording the beauties of nature, there are fortunately many, and there would be more were not so many eager to teach who have nothing to say, and to inspire who have no inspiration. If we wish to be freed from the false sentiment, sickly pathos, and forced tragedy of modern art, let us not be too hard on realism.

IS THE PREVALENT TASTE FOR "ART FURNITURE" AND BRIC-À-BRAC INDICATIVE OF A SOUND OR HEALTHY ÆSTHETIC CULTURE.

It appears to be generally assumed that there has been no little advance in English society of late years in regard to what is called "good taste," an expression often very vaguely used, but which we may take to imply the critical perception of the distinction between what is graceful and suitable in form and harmonious in colour in all the objects with which we surround our daily lives, and what is the reverse of all this.

This movement in the direction of good taste is, perhaps, hardly as general as is sometimes supposed. As far as we can judge, it has hardly reached the mass of the trading classes at all; and perhaps there are not a few among the professedly more cultured classes who are still sublimely indifferent to the designs of their tables and chairs, their carpets and wall-papers. But even these have to swim with the stream; and this indifference to the æsthetics of house furniture and decoration can hardly be openly professed by any who have the hope of social salvation before their eyes.

It would be very untrue to say that there is nothing to congratulate ourselves upon in regard to this recent outbreak of "taste." It is certainly a fact that we now not infrequently see rooms the *ensemble* of which is harmonious and grateful to our sense of colour, and in which there is no object which can be said to be in tawdry or vulgar taste, and this is wherefore to be thankful. It is when we come to consider these results not absolutely but relatively,—relatively to the principle from which they appear to spring, on the one hand, and to the ultimate ends of art on the other hand, that we seem to meet with that which must give us pause.

The theory underlying this movement, with those who think about reasons and principles at all, is what has become almost a "Shibboleth" among art-critics of the day, that art and artistic feeling are as much shown in the designs of furniture and other accessories as in what have been hitherto considered the higher or "fine" arts of sculpture and painting. The practical corollary to this is found in the existence of numerous establishments devoted especially to the production of what is termed "art-furniture."

Now this phrase alone, so familiar to us in print and in conversation constitutes in itself a begging of the whole question, an indication of a view of the subject radically false and unreal. A great Scotchman, John Stuart Mill, in his memorable address at St. Andrews (which suggests to us more about the true relation of art to our intellectual life than can be found in whole volumes of "art-criticism,") observed that art might from one point of view be regarded as the endeavor after the perfection of execution. The definition, at all events, precisely covers the section of the subject which we are just now considering. As far as relates to furniture—to the class of articles which are in the first instance for practical use, and only in a secondary sense ornamental,—that is truly artistic which is made, firstly, in the best possible way in the relation to the use for which it is intended, and the material of which it is constructed; and secondly, which expresses in the best and most graceful manner, in the shape and treatment of each portion, the motive and use of the whole and the special character of the material. We might say that when an object, a sofa, for instance, has the first of these qualities, it is workmanlike; when to these is superadded that of expression, or expressive execution, it may rightly be called artistic; but in fact, the two qualities can seldom be separated or divorced. What is truly workmanlike is almost always artistic; what is unworkmanlike is invariably inartistic—unsatisfactory to our sense of beauty and fitness.

There is not, therefore, and cannot be rightly speaking, any such thing as "art furniture," considered as a separate species of article: and to go into a cabinet-maker's and ask for art-furniture is as reasonable as it would be to go into a bootmaker's shop and ask for a pair of art-boots. The request in either case would in reality be for something made for another object than that for which it professes to be made—for show and not for use. In any sense in which the expression is worth anything, all furniture ought to be "art-furniture," and if it is not it is badly made. What is actually meant by art-furniture, as sold in the æsthetic warehouse, is furniture which is a copy of something else that was in fashion at some former period of our history. Much of what is now made as art-furniture, for instance, is in the style which has lately been distinguished as that of the "Queen Anne" period, which has superseded the Modern-Mediæval type, though there is combined with this a taste for furniture of a simpler (and, to my thinking, better) Old English Style. A good deal of the furniture of these types is far more artistic and tasteful than that which was in vogue in the last generation, so that the impression conveyed is of a more or less general improvement of taste. But that this is to a great extent a superficial appearance is shown by the fact that the bad is taken along with the good. Were there space here to go into details of criticism, it would be easy to show that while some of the furniture work referred to is good, some of it is as bad and vulgar in taste as it well could be; but it is all alike accepted by the public, and recommended not only by dealers, but by writers and critics who aspire to guide public taste.

Indolence of mind, coupled with a desire for show is at the root of all this. That which might be rightly called *artistic* furniture is precisely in proportion to the thought that has been put into it; every detail should bear the impress of having been thought out in reference to the material and the use to which it is to be put. If it were usual to have furniture and other accessories so designed as to represent the thought of the workman and the individual taste of the owner, it would have a real interest; but this involves too much trouble. The manufacturer is content to take a certain style and reproduce it, and say "this is artistic"; and the purchaser, instead of cultivating his individual taste, and endeavouring to gratify it considerately and thoughtfully, so as to make his dwelling-rooms a part, so to speak, of his own individuality, is content with the easier task of paying his money, and taking what is set before him, furnishing his rooms after a pattern of a hundred years back, and sitting down and flattering himself that he has succeeded in being artistic, even sometimes at the expense of common convenience. If, for instance, you drop in to afternoon tea at an "æsthetic" house, you have your tea in cups without handles. Supposing, for the sake of argument, that the tea were hot (which æsthetic tea seldom is), you burn your fingers and nearly drop the cup; and then you are told, for consolation, that it is an artistic cup. If it were it would have a handle, for the natural and proper way of making an object that is to be held in the hand is to give one something to hold it by. Even Macbeth, at a moment when his brain was in a very disordered and disturbed state, still preserved some sense enough to see his visionary dagger with

"The handle towards my hand";

but then Macbeth was not æsthetic.

Even supposing, however, that the prevalent taste in furniture were logical and real in itself, there is a more serious question suggested by the importance attached to this class of work in comparison with what used to be considered the more intellectual forms of art. As was observed just now, it is almost a commonplace at present to urge that art is not confined to sculpture and painting, but should be shown in all the objects collected in a room, and that we should aim at totality of effect. If this meant that we were to bring furniture and decoration up to the level of the phonetic arts, in intellectual interest, there could be nothing to be said against it, except that it is hardly possible to do so. But the theory seems practically to result in an attempt to bring down painting to the level of furniture. A painting is no longer, according to this school of critics, to be a separate creation of the imagination, having its own interest and embodying its own idea, but it is to be a means of filling a panel as part of a scheme of decoration. It is probably to this theory that we owe the existence of a peculiar school of painting which has arisen lately, in which the object seems to be to eliminate all distinctive idea or intellectual meaning from a picture, and all direct reference to Nature, and to make the whole a mere matter of decorative colouring. The most common development of this form of art is familiar to most of us in the shape of those long-limbed female figures of neo-Greek type, clad in semi-diaphanous drapery, whose handsome faces have all the same placid vacuity of expression, and by whose side always stands an "art-flowerpot," out of which grows a decorative plant. Very graceful are many of them (for, indeed, some of our finest draughtsmen have lent their talent to this style of painting); and very tired we get of their grace and their meaningless poses. Their faces are all alike; but their lack of distinctive character is compensated for by writing their names beside them, always remembering to jumble the letters about so as to make the reading of it as much of a puzzle as possible. They may be either the Months, or the Virtues, or anything else you like, they will do equally well for either and the same, figure may represent either "Chastity" or "November." But if we are inclined to feel bored at this repetition of a type, we are offered as a compensation any amount of old china. A lady who professes to be artistic is not happy till she has given her drawing-room the aspect of a crockery-shop. You feel afraid of moving about for fear of knocking over or shaking down something which you will be assured no money can replace. You go to the theatre to see a domestic comedy, and the actors seem scarcely able to find their way amid the collection of Japanese jars and screens, and blue china, with which the stage is crowded, and, to add insult to injury, if you do not like all this you are called a Philistine.

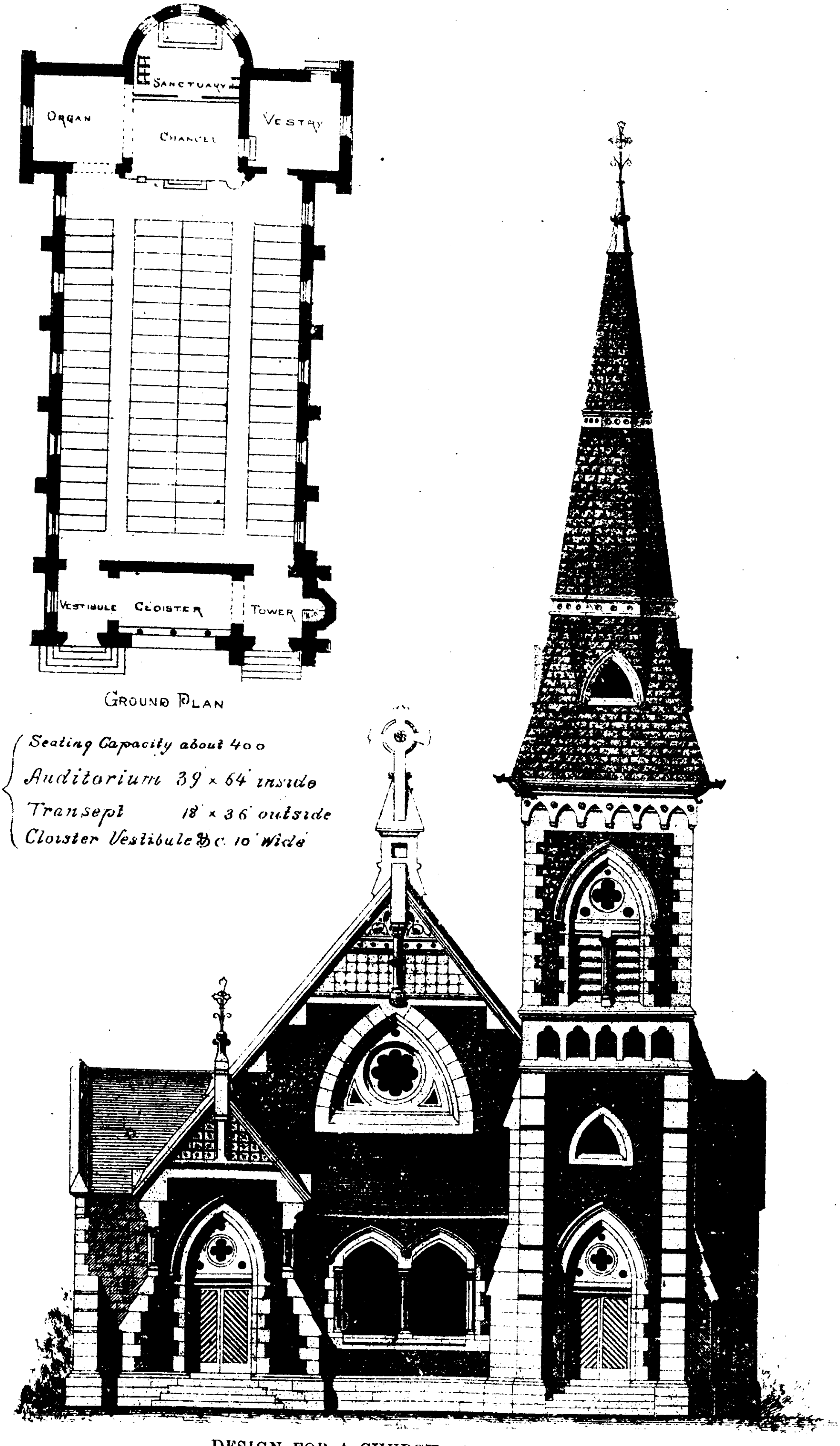
The nameless opprobrium conveyed in that phrase might seem more applicable to a man who follows a multitude to hunt *bric-à-brac* than to those who fail to find this a sufficient motive for living. But without calling names, and admitting that every one has a right to his own hobby, I protest against the assumption that this worship of furniture and china is an indication of an advanced perception in regard to art. As with furniture itself, so with art in its widest sense, the ultimate value to us is in proportion to the thought that is in it; and it is idle to pretend that the most piquant piece of china, the most artistically-designed cabinet or wall-paper, can by possibility have the same intellectual meaning and interest as the productions of an art which, like painting, can translate the poetry of Nature, can speak to us the language of the deepest human passion and emotion. To say that such an art as this is no more to us than a part of the furniture of our rooms; that upon some pretext of unity of effect our pictures are to be merely objects subordinate to a general scheme of decoration, is not to exalt art, but to degrade it, and is a view which could only be seriously held by those who have allowed their mental sympathies and perceptions to be narrowed and cramped to suit a conventional standard. One figure in which the passion or the hope, the joy or the grief, of the human soul is visibly symbolised, one landscape instinct with the light and air and the sentiment of Nature, does more to give interest and beauty to a room than all the sweepings of Wardour street that can be collected in it. A picture that is worth anything is not a piece of decoration, but a separate poem in itself; and it is better to have such works even in company with bad furniture, than to have a room filled with decorative furniture and piquant knick-knacks, but bare of anything that can appeal to our highest sympathies and aspirations as intellectual beings.

Yet this is what is actually set before us now as the theory of an artistic dwelling, and what it is actually becoming more and more the fashion to put in practice. And the fact has an important significance in relation to social science, so far as that concerns the moral and intellectual aspect of our national life. It is a sign of something very unsound in the artistic taste and sentiment of the day that we should be exhorted systematically and on principle to rank the lower and more material forms of art as equal to or even above those which appeal to our highest consciousness and perceptions. It seems a very false economical principle, so far as regards the encouragement of art, that people should be ready to give for an old jar, which may be ornamental, but which may as likely as not be ugly and grotesque in design, as much as would procure them a dozen drawings or etchings representing a far higher intellectual effort applied to a far higher end. But what is most serious is the moral aspect of the subject,—the falsity and pretentiousness of feeling which this artificial taste indicates. What was observed in regard to the art of the theatre is only a type of what we see in society. The act is so tame and unreal that it hardly deceives any one; but the play is admirably mounted, and the decorations got up regardless of expense. Only unfortunately the decorations themselves are a sham. We need by no means be indifferent to furniture; on the contrary, I would like, if it were possible, to see everything in a dwelling designed with a direct relation to its purpose, its position, the style of its accompaniments, and the special fancy of the inmates. But this is hardly attempted, for this would cost thought, and people wish to be artistic without thought, and at the cost of money only. What is really done is to fix upon a particular fashion of a past generation or of another country, to brand that as artistic, and to purchase as much of it as you can afford. The phenomenon is not new. There have been other periods in the history of our own and other societies when this imitation fashion has prevailed, and they have always been periods of pretence and hollowness, of an indifference to the highest and most serious ends of life. When people are much in earnest they do not care about tricking themselves out in borrowed decorations; it is an amusement for an idle hour; and the corollary to be drawn from the characteristics of the prevalent artistic taste of contemporary society is not a satisfactory one. It was the complaint of Wordsworth, at an early period of this cenutry, that,—

"Plain living and high thinking are no more."

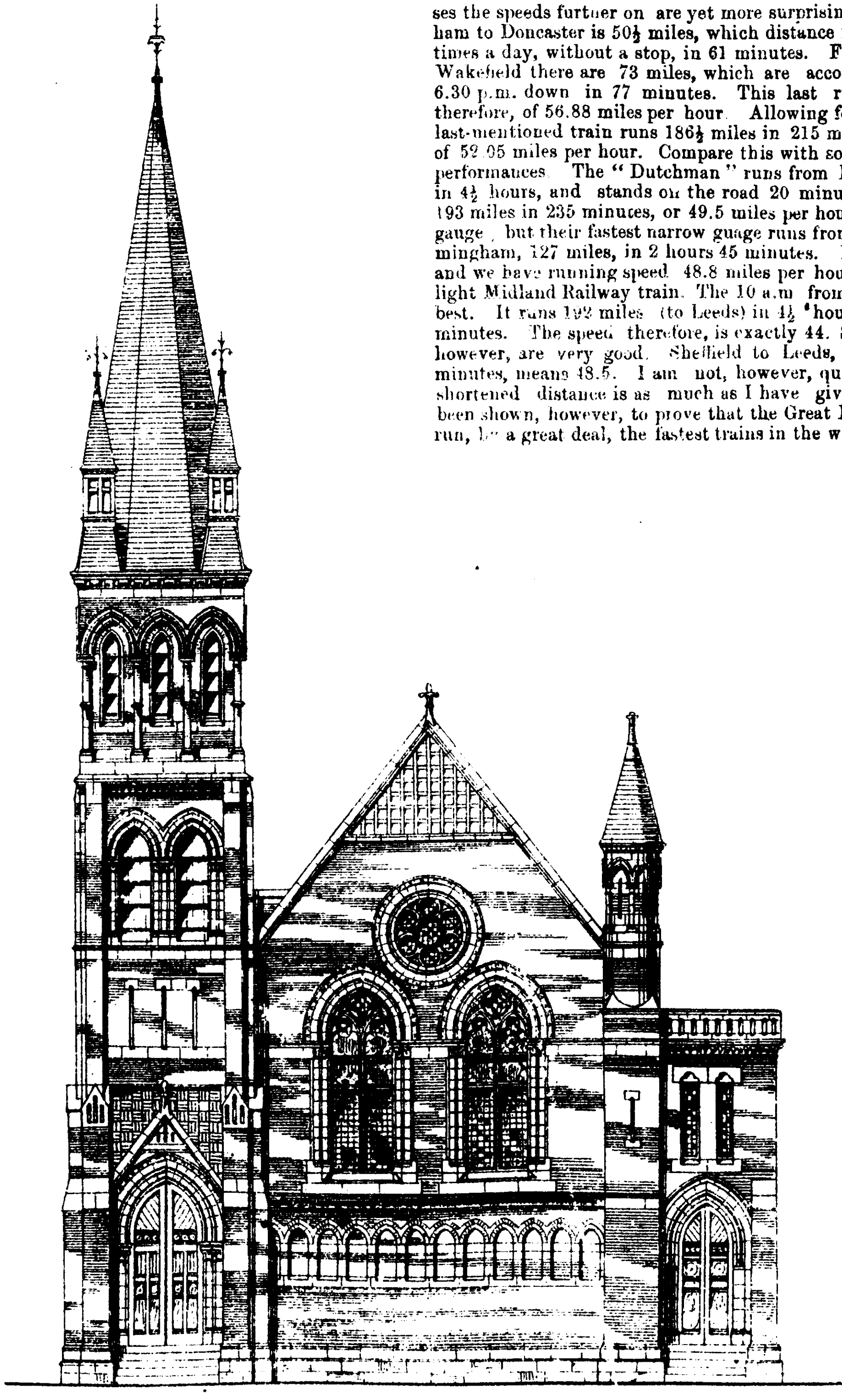
He would hardly have considered that matters were much improved in this respect at present, when Art, which should be the expression of the highest thought and aspiration of a people, is coming to mean a mere arbitrarily chosen form of costly luxury, having no connection with the serious thoughts and problems of life; when, as it has been remarked, you may break any moral law, but you must admire blue china; when English ladies can so far forget their traditions of trne dignity, so far mistake the accidentals for the essentials of refinement, as to masquerade in modern-antique costumes which draw every eye, not, indeed to the wearer, but to the costume. All this, done in the name of art, is evidence not of true artistic feeling, but of a show and pretence at variance with what is best and noblest in art, which, if it were a reality, should lead us, to quote again the words of Mill, to idealise not only every work we do, "but most of all our own characters and lives." This is hardly to be achieved by dressing out our life in a costume of borrowed finery, and dignifying it by the name of "art."—*Builder*

Spontaneous Ignition of Hydrogen.—Attention has recently been called to some peculiar cases of spontaneous ignition of hydrogen in air, the phenomenon having been noticed, it seems, in factories where quantities of zinc were being dissolved in hydrochloric acid for the preparation of zinc chloride. Violent explosions took place when no flame was near, and it was eventually ascertained that the gas took fire spontaneously. It is thought to be caused by fragments of very porous zinc, which, when lifted above the surface of the liquid, during the violent evolution of the gas, and so brought into contact with hydrogen and air, act just as spongy platinum would do under the same circumstances. The performance of such operations in the open air is recommended. The ignition can be shown, according to M. Hoffman, by treating a few kilograms of finely divided zinc with acid; the zinc dust, he says, may be ignited by contact with water.



DESIGN FOR A CHURCH.—Front Elevation.

A correspondent of the *English Mechanic* writes as follows: "A great stride seems to have been made, at the commencement of this half year, by our railway companies, in the matter of speed, notably by the Midland and Great Northern. Some of the results attained by the latter are wonderful. The "Scotchman" will be quite in the shade shortly. There are no less than eight trains daily, running from Kings-cross to Grantham, 105½ miles, without a stop, and without picking up water, in 123 and 128 minutes each. In the case of the Leeds expresses the speeds further on are yet more surprising. From Grantham to Doncaster is 50½ miles, which distance is covered several times a day, without a stop, in 61 minutes. From Grantham to Wakefield there are 73 miles, which are accomplished by the 6.30 p.m. down in 77 minutes. This last run is at a speed, therefore, of 56.88 miles per hour. Allowing for stoppages, this last-mentioned train runs 186½ miles in 215 minutes, at a speed of 52.05 miles per hour. Compare this with some other favorite performances. The "Dutchman" runs from London to Exeter in 4½ hours, and stands on the road 20 minutes, thus running 193 miles in 235 minutes, or 49.5 miles per hour. That is broad gauge, but their fastest narrow guage runs from London to Birmingham, 127 miles, in 2 hours 45 minutes. Deduct 6 minutes and we have running speed 48.8 miles per hour. Let us take a light Midland Railway train. The 10 a.m. from London in their best. It runs 192 miles (to Leeds) in 4½ hours, and stands 14 minutes. The speed, therefore, is exactly 44. Some of the runs, however, are very good. Sheffield to Leeds, 39½ miles in 49 minutes, means 48.5. I am not, however, quite sure that the shortened distance is as much as I have given. Enough has been shown, however, to prove that the Great Northern Railway run, by a great deal, the fastest trains in the world."



DESIGN FOR A CHURCH. FRONT ELEVATION.

Mechanics.

THE EFFECT OF HIGH SPEED OF ENGINES UPON CONDENSATION OF STEAM.

At the recent meeting of the Master Mechanics' Association, Mr. C. A. Smith, of St. Louis, reported the results of a series of experiments made to ascertain the temperature of steam cylinders during the working of the engine at varying speeds. The apparatus employed in these experiments consisted of a silver tube six inches long, 5 16 inches in diameter outside, and 1 32 inch thick, this tube being closed at one end, and having passed through it a rod connected by a cam and tooth gear to the index of an ordinary pressure gear, the arrangement being such that the expansion and contraction of the silver tube moved the index of the gauge, and so indicated the temperature. The necessary graduations were obtained by the comparison of the instrument with a good thermometer. In using the apparatus it was applied to the cylinder, so that the exterior of the silver tube was exposed to the steam in the cylinder, and when thus applied to the cylinder of an engine working slowly, the index of the instrument showed during each stroke nearly the whole range of temperature to be expected from the variation in the pressure of the steam. At higher speeds, however, the range of action of the index became less. Thus on the 24th of April last the apparatus was applied to a locomotive hauling a light passenger train, the steam being throttled except at the highest speed. The experiments were continued through a run of 33 miles, and it was found that whereas, when the engine was making but 50 revolutions per minute, the instrument indicated a change of temperature of 120° during each stroke; at 100 revolutions per minute the variation dropped to 60°; at 200 revolutions to 30°; and 300 revolutions to 20°, the amount of variation being thus inversely proportional to the speed.

IRON CLAD STEEL—A NEW MANUFACTURE.

The Norway iron works at their rolling mills in South Boston have been working a product of iron and steel lately which is somewhat of a curiosity to iron craftsmen. It is called, after working, iron-clad steel, and, although the process was invented and patented some years ago, it has never yet come into general use. It has always been considered rather difficult to work iron and steel together, to any great extent, on account of the difference between the two metals. Although steel and iron readily unite when they are brought to a proper degree of heat, yet it has always been found rather difficult to properly heat long bars of iron and steel so that they would become firmly welded together under the pressure of rollers. This invention of iron-clad steel, it is claimed, has surmounted the difficulty. The metals are united by a curious process before the rolling commences. A box is made of pig iron or muck bars, with sides, ends, top and bottom complete. Into this box the steel is put, the box is closed, the whole mass is brought to a high degree of heat, and the process of working begins. The iron box inclosing the steel, now in form of a solid mass with the iron and steel united, is worked into the form of a bar and is ready for rolling. This bar two or three inches square, it is claimed, costs three cents a pound. The process of rolling begins, and the steel with the iron outside of it can be rolled down into any size of rod or bar which may be desired. The most curious feature is that the iron and steel keep their places relatively, the iron still outside of the steel, no matter now much it may be worked.

Like the candy maker's plastic sugar when he puts in a lump of different color and draws and molds the two together, each color keeps its place and the stick of candy is produced with a red céntre; so the iron keeps its place outside of the steel in the process of rolling, and the steel is produced with a coating of iron around it varying in thickness according to the relative proportions of iron and steel that were used in making and filling the box at first. As stated above, the process is not a new invention, but from the fact that the invention has laid comparatively idle for some time, it is probable that people interested in the working of iron and steel may have forgotten it, even if ever aware of its existence. The process of manufacture is curious, and several advantages are claimed over the ordinary process of uniting iron and steel by welding. It is claimed that the iron box prevents the decarbonizing of the steel in the process of heating and working. The superintendent of the rolling mills also says that the steel, which fuses at a lower degree of temperature than the iron around it, often bursts out of the iron enclosure in a molten state. It is proposed to put the iron-clad steel to various uses. It is already being made into horse shoes and tested, and it is thought that it may be very useful and available for other purposes. The article is controlled by a patent, and the rolling mills at South Boston produce only a prescribed amount for the company controlling the invention.—*Boston Herald.*

DIRECTIONS FOR LACING RUBBER BELTS.

The belts should be placed on the pulleys as tight as possible. This can be best done by the use of belt clamps, except in the case of very narrow belts. In all cases the belt should be cut about one-eighth of an inch less than the distance around the pulleys with a tape line. The seam of the belt should always be on the outside. For narrow belts, butt the two ends together, make two rows of holes in each end (thus obtaining a double hold), and lace with lace-leather. For wide belts, put, in addition, on the back, a strong piece of leather or rubber, and sew or rivet it to the belt. If the belt should slip, it should be lightly moistened with boiled linseed oil—animal oil will ruin the belt. If one application does not produce the desired result, repeat until it does. The belts will be greatly improved and their durability increased by coating the surface lightly with a composition made of equal parts of black lead and litharge, mixed with boiled linseed oil and Japan enough to cause it to dry quickly; the effect of this will be to produce a finely polished surface.

REMARKABLE WELDING.—A correspondent of the *Blacksmith and Wheelwright* discourses as follows about welding:—"A great deal has been said about the welding of cast steel, and a great many different receipts for making welding preparations given, but for successful welding in my opinion there is nothing so good as the cherry heat welding compound. I have been a practical blacksmith and tool maker for over 40 years, and have used every receipt that I have seen printed and others that have not been printed, and I have yet to find its equal. If any there are who say to the contrary, I would respectfully say that they do not know how to use it. For the information of such, I desire to state that although it is called cherry heat welding compound and you can weld with it at a very low heat, still I would recommend a borax heat or a little higher, and am satisfied that all blacksmiths using it in this way will be surprised at the results. Some wonderful things have been done with this compound. I will mention one which was exhibited at the American Institute fair, and was pronounced by the *Iron Age*, *Scientific American*, and other papers here and in Europe a wonderful piece of welding. A bar of Bessemer steel, 2 x ½ inches was bent over on itself, some compound put between and welded. The second weld was a piece of cast steel, 2 x ½ inches, welded back of the first weld on the same bar. The third weld on the same bar was a piece of blister steel the same thickness and width. Next a piece of iron same size, and the fifth weld was a piece of cast iron of the same size, 2 x ½ inches. The edge of the bar was then ground and polished and the welds were perfect. Many other remarkable things might be said about the above compound, but I will not encroach on your valuable space further."

STEEL joists are being made at a few factories in England and on the continent, but certain difficulties attend the rolling, which as yet prevents their manufacture on a large scale. Steel plates for bridges also are not as yet used to the extent anticipated, and the long span bridges in which their utility is undoubted, do not often occur. In boiler plates the considerable advantages which steel offers are being availed of, and for flanging and other treatment, where high quality Yorkshire iron was used exclusively, steel is, says Messrs. Matheson & Grant in their half-yearly engineering trade report, found to be considerably cheaper, especially for plates of large dimensions.

ONE CAUSE OF INSANITY.—At a recent meeting of German doctors interested in the treatment of insane persons, a paper was read by the director of the Brunswick State Lunatic Asylum, in which he maintained that much of the increase of insanity in Germany is attributable to the excessive amount of work imposed upon pupils in the national schools.

AN EMETIC FOR INFANTS.—A correspondent of the *British Medical Journal* states it as his experience that half a teaspoonful of glycerine acts as a simple and efficient emetic for infants.

CEMENT FOR UNITING LEATHER AND METAL.—Wash the metal with hot gelatine; steep the leather in an infusion of nutgalls (hot) and bring the two together.

THE LONGEST TUNNEL IN THE WORLD.

The Joseph II. mining adit, at Schemnitz, Hungary, begun in 1872, and finished last October, is now the longest tunnel in the world, Its length is 16,538 meters, that of the St. Gothard tunnel being 14,620, and the Mont Cenis tunnel 12,233 meters.

The object of the adit is the drainage of the important gold and silver mines at Schemnitz. It furnishes a geological section more than ten miles in length, and gives not only valuable information as to the downward prolongation of the lodes known in the upper levels, but some new ones have been traversed, and the entire series of rocks, with their mutual limits as well as modification and occasional transitions, are disclosed without interruption. The entire cost of the tunnel was 4,566,000 florins —about $2,300,000: Its height is 3 meters; width, 1.6 meter.

TIN DISCOVERIES IN MAINE.

From Maine comes the report, and on very trust-worthy authority, of very promising discoveries of tin, which, if verified by subsequent developments, will prove to be of great importance. Thus far we have no tin mines in the United States; a few traces of this metal have been found here and there, but thus far the amount discovered has been trifling, and up to the present time all the tin that is consumed in this country by the immense industries employing tin and tinned iron, is imported from abroad—chiefly from England. The importance, therefore, to the whole country of the discovery of extensive deposits of tin-stone, can hardly be overestimated, since it would enable our domestic industries employing tin, to become independent of foreign supply, and in time perhaps to compete with England in the manufacture of tin-plate, which consumes a large proportion of the tin that is produced.

The tin discoveries here referred to, are reported to have been made near the town of Winslow, a few miles from the capital of the State, where a number of veins of rich tin ore (cassiterite) are said to have been found in a rock formation similar to that in which tin is known to occur elsewhere. Prof. Hitchcock, who has examined the location of the reputed discovery, speaks very favorably of it. He states that the inclosing rock is a micaceous schist, cut by numerous veins of granite, in which latter the tin occurs, associated with other minerals. To be more specific, within a width of thirty feet of this micaceous schist, there are reported to have been noticed twelve granite veins, from ½ inch to 3 inches in width. These granite veins are said to be full of crystals of tin ore, associated with fluorspar, margarite, mispickel, beryl, lepidolite and other minerals. Prof. Hitchcock pronounces the Winslow mine, in its mineralogical, geological and physical features, to be "identical with those common to the stanniferous districts of Europe;" and he adds that "the ore seems to be sufficiently abundant to remunerate quite extensive outlays for mining operations."

Prof. Forrest Shepherd, who has examined the Winslow mine, also reports very favorably upon it. He is reported as saying that the veins are very favorably situated for working, and what is particularly encouraging, that the Winslow deposits are at the surface, equal in quality to the best in Cornwall, while there and elsewhere the veins are rarely remunerative except at great depths.

We trust that the subsequent development of these deposits may justify the encouraging report of their surface indications. We shall not be long left in suspense, since the account from which we glean the foregoing statements adds the information that a company has been formed to develop the Winslow mine, and to extend the exploration for tin into other parts of the State.

THE TOPOPHONE.

Briefly described, the topophone consists of two resonators (or any other sound-receivers) attached to a connecting bar or shoulder rest. The sound receivers are joined by flexible tubes, which unite for part of their length and from which ear tubes proceed. One tube, carries a telescopic device by which its length can be varied. When the two resonators face the direction whence a sound comes, so as to receive simultaneously the same sonorous impulse, and are joined by tubes of equal length, the sound waves received from them will necessarily re-enforce each other, and the second will be augmented. If, on the contrary, the resonator tubes differ in length by half the wave-length of the second, the impulse from the one neutralizes that from the other, and the sound is obliterated.

CEMENTS FOR THE SHOP.

Iron Cement for Closing the Joints of Iron Pipes.—Take of coarsely powdered iron borings, 5 pounds; powdered sal-ammonic, 2 ounces; sulphur, 1 ounce; and water sufficient to moisten it. This composition hardens rapidly; but if time can be allowed, it sets more firmly without the sulphur. It must be used at soon as mixed, and rammed tightly into the joints.

2. Take sal-ammoniac, 2 ounces; sublimated sulphur, 1 ounce; cast-iron filings or fine turnings, 1 pound; mix in a mortar and keep the powder dry. When it is to be used, mix it with 20 times its weight of clean iron turnings or filings, and grind the whole in a mortar; then wet it with water until it becomes of convenient consistency, when it is to be applied to the joint. After a time it becomes as hard and strong as any part of the metal.

Turner Cement.—Melt one pound of resin in a pan over the fire, and when melted, add one quarter of a pound of pitch. While these are boiling, add brickdust until by dropping a little on a cold stone, you think it hard enough. In winter it may be necessary to add a little tallow. By means of this cement a piece of wood may be fastened to the chuck, which will hold when cool; and when the work is finished, it may be removed by a smart stroke with the tool. Any traces of the cement may be removed from the work by means of benzine.

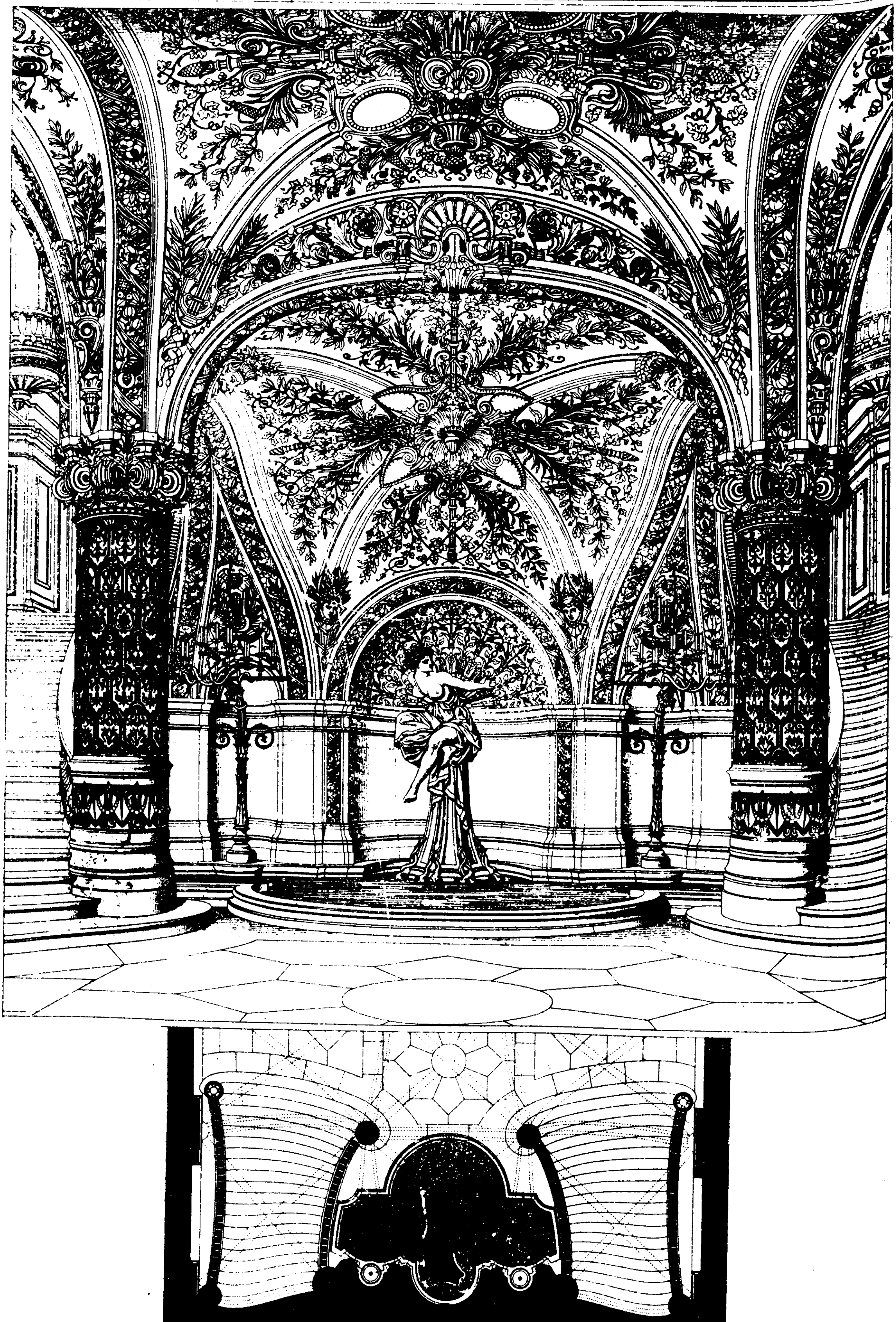
Cement for Leather Belting.—One who has tried everything, says that after an experience of fifteen years he has found nothing to equal the following: Common glue and isinglass, equal parts, soaked for ten hours in just enough water to cover them. Bring gradually to a boiling heat, and add pure tannin until the whole becomes ropy, or appears like the white of an egg. Buff off the surfaces to be joined, apply this cement warm, and clamp firmly.

Wollaston's White Cement for Large Objects.—Beeswax, 1 ounce; resin, 4 ounces; powdered plaster of Paris, 5 ounces. Melt together. To use, warm the edges of the specimen, and apply the cement warm.

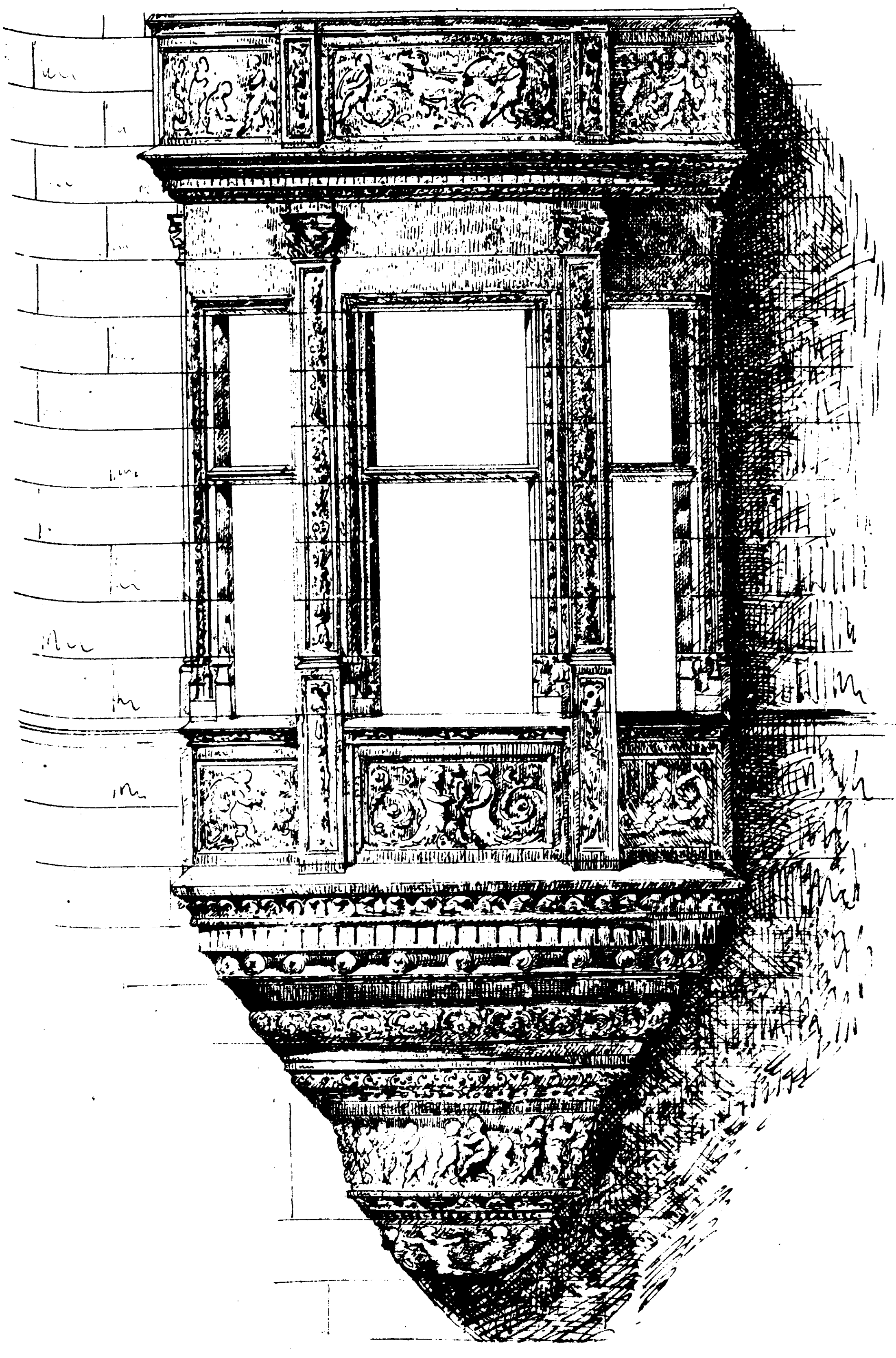
"New Registered" Hand Fret-Sawing Machine.—A real novelty, and one of a most useful kind, has just being brought out by the Britannia Company, Colchester, in the form of a hand fret-sawing machine, which combines the utmost simplicity of arrangement with the most complete efficiency for work. We give an engraving of the machine, which is a mere toy, but a real practical working tool. It measures 10 inches under the arm, will cut ½-inch thick stuff, is provided with a presser foot with roller to keep the wood firm while being cut, and also with a bright work plate. It is neatly japanned and ornamented in gold, and is fitted with drill and an emery wheel for grinding. We have tested the power of the machine at a tolerably rapid speed and found it capable of turning out admirable work. The saw has the approved true vertical motion of the Company's larger machines, obtained by the cam and disc, so much preferred to the radical movement of those having the saw attached to moving arms. These machines are made by machinery by the interchangeable principle, and can thus be put into the market at a low price, namely, 15s., which includes half-a-dozen saws, drill, emery wheel, turnscrew, and oil can. No better machine can be put into an amateur's workshop.

—The use of blowers under steam boilers is being gradually abandoned. The disadvantages are numerous. It requires a larger amount of power to run them, and unless the mill is situated away from other buildings causes great annoyance and danger from sparks and cinders. A planing mill at the South End, Boston, was set on fire five times in as many years by sparks. Another mill was set on fire, caused by back draft into the boiler-room. The action of the blast on the crown sheet of boilers is like a blow-pipe, always striking in the same spot, and it is safe to say boilers will last double the time running by natural draft. A mill near Boston started with blowers under six new boilers, and had to renew the crown sheets within two years' time.

Size of Governor Pulleys.—The *Manufacturer and Builder* gives the following rule for fixing the size of governor pulleys; To find the diameter of the governor shaft pulley, multiply the number of revolutions of the engine by the diameter of the engine shaft pulley, and divide the product by the number of revolutions of the governor. To find the diameter of the engine shaft pulley, multiply the number of revolutions of the governor by the diameter of the governor shaft pulley, and divide the product by the number of revolutions of the engine.



DESIGN AND PLAN OF PART OF THE NEW OPERA, PARIS.



ORIEL FOR THE HOUSE OF C. VANDERBILT, NEW YORK.

SIR HENRY BESSEMER.

On Wednesday, October 6th, a special meeting of the Court of Common Council was held at the Guildhall, London, under the presidency of the Lord Mayor, to present the freedom of the city to Sir Henry Bessemer, F.R.S., M. Inst. C.E. The Lady Mayoress and other ladies were present, besides a large number of the general public and members of the Court of Common Council. The master, past-master, and other members of the Turners' Company, of which Sir Henry is a member, occupied seats on the dais. The Town Clerk read the following resolution :—

"That the freedom of the city, in a suitable gold casket, be presented to Sir Henry Bessemer, F.R.S., M.I.C.E., in recognition of his valuable discoveries, which have so largely benefited the iron industries of this country, and of his scientific attainments, which are well known and appreciated throughout the world."

The gold casket presented, specially designed and manufactured, illustrates the process of the conversion from the raw material to the application of the steel. It is of solid English design, surmounted by a finely-modeled figure of Commerce, standing between a stack of pig-iron and the converter. She commends the invention on account of the impetus that cheap steel gives commercial enterprise. The overflowing cornucopia at the base signifies this success. On each side of the rounded cover are vignettes, in *repoussé* work, of a L. & N. W. Railway locomotive, entirely constructed of this steel, and standing on its steel rails, and of a steel-clad ship. The two curved ends contain the enamelled arms of the city, with the dragons modeled in high relief. On the centre panel is the medal which Sir Henry Bessemer gives annually to the Iron and Steel Institute. The inscription is on the reverse. Shields for the Bessemer arms and monogram complete the whole, which rests on a platform of Bessemer steel.

The following is the reply of Sir Henry Bessemer to the address of the City Chamberlain ; cheers and cries of "hear, hear !" being freely interspersed :—

"My Lord Mayor, Mr. Chamberlain, and Gentlemen : It would have been impossible for me to have listened to the very kind and complimentary address of the distinguished Chamberlain, and at the same time to have received at the hands of this honorable Court the high honor that has just been conferred upon me, without a deep feeling of gratitude ; for I am well aware that the honorary freedom of this, the greatest and wealthiest city in the world, has for generations been esteemed a fitting gift for princes, warriors, and statesmen, who have ever felt ennobled by the presentation. But this honorable Court, appreciating the importance of trade and commerce, has, on the present occasion, elected to pay this distinguished honor to one who can only claim to have devoted himself with some success to the study and improvement of one of the staple industries of this great commercial nation. Such a deviation from the beaten path, while it clearly shows that the intelligent appreciation of this honorable Court, adds, in my estimation, greatly, and I may say immeasurably, to the value of the honor thus exceptionally conferred, and also to the great pleasure it has given me. In the address of your honorable Chamberlain, some mention has been made of the advantages resulting from the employment of steel for railway and other construction purposes, and perhaps it would not be out of place if I were to explain to you as briefly as possible how it is that steel can be obtained in the short space of fifteen or twenty minutes, instead of requiring from two to three weeks, as formerly, and why it now costs only 6*l*. or 7*l*. per ton, instead of 50*l*. or 60*l*." After a technical description of the mode of manufacturing steel under the old system, the speaker continued : "Under the process which I have had the honor of inaugurating, we dispense with every one of the intermediate processes formerly employed. We have no smelting of pig-iron ; we have no puddling ; we have no converting furnaces. You will readily understand that with a process that is so rapid, and which is so entirely devoid of the use of expensive fuel and of all those various skilled manipulations which were necessary at every stage of the old process, the cost of manufacture is now so exceedingly small as it has proved to be. I have lately seen in the large works of Sir John Brown 20 tons of crude cast-iron converted into 20 tons of cast-steel in the small space of 23 minutes. The value of that material, taken at 4*l*. per ton, whould be 80*l*. at its commencement ; its value, after conversion, at that particular time, could not be less than 100*l*. per ton, or 2,000*l*. altogether. That is, of course, an exceptional case ; but it is a fact. At the time when my invention was introduced into Sheffield, the entire make of steel was 51,000 tons in the year. Last year, we had 830,000 tons of Bessemer steel, being sixteen times what was the produce twenty years ago. It is anticipated that on the continent of Europe, this year's make will reach 2,000,000 tons, and our own 1,000,000. The value of these 3,000,000 together may be taken at 10*l*. per ton, or 30,000,000*l*. sterling ; and if this metal had been made by the old process, it would have been impossible to have brought it into the market under 50*l*. a ton, or 150,000,000*l*. sterling. Gentlemen, I have again to thank you for the great kindness with which you have received me, and for the honor which you have conferred upon me this day."

In the evening, the Lord Mayor and Lady Mayoress entertained Sir Henry and Lady Bessemer and about 300 other guests at the Mansion House. The following is what Sir Henry Bessemer said :—

"When I reflect, gentlemen, on the events of the day, my mind is instinctively drawn to the contrast between my own lot and that of the great pioneers of old, whose labor and talent laid the foundation, and whose energy and perseverance reared the mighty fabric of the British iron trade. If we look back to the days of Queen Elizabeth, we find that Sussex was the chief seat of the iron manufacture of this country. Numerous small furnaces were scattered over Sussex, Kent, and Surrey, and, although the production at that period did not exceed 17,000 tons annually, the vast forests that previously existed had been cut down to supply fuel for these numerous furnaces. So great, indeed, was the destruction of timber that the government, in alarm lest the supply of oak for ship-building should become exhausted, passed the most stringent laws for its protection. No tree of over one foot in diameter was allowed to be cut down under severe penalties, and no timber of any kind whatever was allowed to be cut within twenty miles of the city of London. These and other restrictions greatly discouraged the manufacture and reduced the production of iron. While at this low ebb, a most important invention was made in 1640 by Dud Dudley, of Tipton, by means of which iron was successfully smelted with mineral fuel. It is impossible to over-estimate the advantages which the world has gained by that important discovery, but poor Dudley did not rest on a bed of roses. The whole trade rose up against him as their natural enemy, who they said was bringing ruin and destruction on their already declining industry. His works were pulled down by a riotous mob. His patents were evaded, while sums of money were expended in attempts to secure his rights, and he was at last cast into prison for debt. How many of the hundreds of intelligent and persevering mend, to whose inventions we owe the highly-developed state af the iron manufacture, have shared with Dudley the misfortunes of being an inventor, while comparatively few have reaped a rich reward for the services they have rendered to their country ! It has been my lot to come on the scene when the iron trade of this country had reached almost its highest attainable extent of production, and, as a system, a degree of perfection in its various branches which seemed to leave no room for any but the most trifling ameliorations. But this is just the condition when all great changes in the mechanical arts take place. Thus, it was not until the high-roads of this country and our mail-coach system had by degrees attained the highest state of perfection, and had become the admiration and envy of every other nation, that the iron road and the steam horse came and swept it away forever. So it has been with the hand-printing press, which was gradually and steadily improved, from the days of Caxton to those of Applegarth and Cowper, during which time it became so perfect an instrument that nothing more could be expected from it. Then came the steam printing-machine, with its type cylinder and miles of endless paper, before which the printing press quietly disappeared. It is ever thus with the advancing tide of scientific research and mechanical improvement, which inaugurates new systems as the old ones ripen and die out. It has been my good fortune to assist in one of these great and quiet revolutions, which is as surely inaugurating the age of steel, as that of iron succeeded to the age of bronze. I can only but congratulate myself, my Lord Mayor and gentlemen, on having in better times than poor Dud Dudley, when the intelligent sympathies of every citizen are with and not against those who devote their lives to scientific studies and the advancement of those manufactures to which this country is so greatly indebted for its wealth and position. My Lord Mayor and fellow-citizens, I cannot sit down without again thanking you most warmly and cordially for the great honor which has been conferred upon me by you. I have received so high a mark of your confidence and esteem to-day that it is to me the greatest pleasure which has ever fallen to my lot."

A SUCCESSFUL CASE OF TRANSFUSION OF BLOOD.

The following case, which exhibits in a marked degree the beneficial effects of transfusion of blood when performed in cases of impending death from hemorrhage, is reported in the New York *Medical Journal*, for August, 1880, by Joseph W. Howe, M.D.:

Mrs. B., aged twenty-two years, was delivered of a three months' fœtus, November 7, 1879. From that date until November 11, she had repeated and profuse hemorrhages from the uterus. On the 10th the bleeding was continuous. Drs. Reynolds and Comstock, who were first called in, succeeded in controlling the hemorrhage, but not before the patient had reached the stage of collapse. They remained with her all night, endeavoring, with the ordinary means of stimulation, to rouse her, but without avail. She continued to sink in spite of everything.

On the morning of the 11th I was sent for. The patient was then completely pulseless and partially unconscious. The extremities were cold and clammy, and it was evident that unless some fresh blood were introduced death would soon supervene. She was so far gone that I made up my mind not to spend any time in defibrinating the blood. I opened the median basilic vein in the right arm of the patient and introduced the closed cannula of Colin's instrument, and after passing some warm water through the cylinder of the instrument, attached it to the cannula in the patient's arm. The median cephalic vein in the right arm of the donor was then opened, and the blood was allowed to flow directly into the cylinder without defibrination. When a sufficient quantity had been obtained, and while the blood was still flowing, I injected, without any difficulty, between seven and eight ounces. The whole operation did not occupy more than five minutes in its performance.

Within half an hour the pulse returned at the wrist, the voice became clear and distinct, and she asked for something to eat, saying that she felt stronger and better in every way. One of the medical gentlemen who had been with her all night assisting in the attempts at resuscitation, and who left in the morning, believing that there was no hope of her recovery, came in an hour after the operation, and said it was "a perfect transformation scene"—that he had no idea that a few ounces of blood could restore lost vitality so rapidly.

From that time on the patient continued to improve, and when I last heard from her she was in the enjoyment of good health and attending to her household duties without any discomfort whatever.

NOTHING REMAINS AT REST.

It is a fallacy to suppose that there is any such thing as rest to matter. There is not a particle in the universe which is not on the move, and not a drop of fluid on the globe that is perfectly quiescent, not a fibre in the vegetable kingdom in a state of inactivity. In animal bodies, from monads to the complicated organism of man, every part and parcel, even in the solids, are incessantly moving among themselves, and their component elements never cease to act in accordance with that universal law till death stops the machinery. Even then a new series of movements commences at that culminating point. Chemical dissolution of organic structures is but a liberation of molecules, the aggregation of which was necessary for a corporeal beginning and subsequent growth; and then they disperse to enter into new relations and new forms, and thus one never-ending circle of activity characterizes the material universe.

Death is a dissolution of the union that existed for a limited period of what is called life with organized matter. How that union commenced is as much a mystery as their separation. They are distinct in nature and character, although one cannot manifest itself without the brain and nerves of the other.

Astronomy reveals the astounding intelligence that there are no fixed or stationary bodies in the unsurveyed regions of celestial space. Even the fixed stars, as they were once considered, permanent landmarks in the heavens, are coursing with undefined rapidity in the train of countless globes of shining glory, on a circuit too distant to be followed even by human imagination, in the boundless realms of space.

Everything, therefore, is moving. When motion ceases there will be a wreck of worlds and a crash of an entire universe. Life is motion; inertia, to our finite minds, is death. Nature, however, neither modifies nor repeals a law, and consequently, those now in force will operate with unerring certainty through the endless cycles of eternity.

Recent experiments by Piazzoli appear to establish the fact that the tenacity of iron increases on magnetization.

THE POSSIBILITIES OF THE ELECTRIC RAILWAY.

The highly interesting practical experiments of Dr. Werner Siemens, of Berlin, and of Mr. Edison, in constructing and operating a railway with electrical motors, have attracted universal attention by reason of the novelty of the idea to the present generation, and the apparent success of the experiments; and much speculation has been indulged in as to the possible future utility of this latest application of electricity. From the results that have been reached in the preliminary experiments of both the inventors above named, we risk very little in advancing the opinion that the practical success of the new method of propulsion has been demonstrated both from a technical and economical standpoint, and we may reasonably expect to see the system extensively introduced in the near future for mining and agricultural purposes, and in our cities for the transfer of passengers and goods. For the purpose above named, and doubtless for others that do not on the instant occur to us, the advantages of electricity as a motive power over steam and animals, is too pronounced to admit of question, and the economy of the new method having been once established (which we think may safely be assumed), the general introduction of the electric method of propulsion for the hauling of ores and minerals, for plowing and other agricultural work, and in cities for the transport of passengers and goods, and for postal and freight service, is simply a question of time. We anticipate that the electric railway will grow speedily into popularity on the strength of its introduction in a few prominent localities where its advantages over steam and horses in the absence of noise, freedom from liability to many forms of accident now unavoidable, and from the annoyances of flying sparks, cinders, grease and other dangerous and offensive accompaniments of our present elevated steam roads, would strikingly demonstrate themselves. And should the anticipations of the advocates of the electric railway for our cities, as a substitute for the surface passenger roads, and for the transaction of much of the package and freight traffic over thoroughfares now thronged with vehicles, be realized, the single advantage that would be gained in the improvement of the sanitary condition of our cities in ridding us of the vast bodies of filth with which our streets are daily littered, can hardly be overestimated.

The history of the electrical railway resembles that of the majority of important and revolutionary inventions, in that several abortive attempts at its realization are recorded before its actual success was assured. Nearly forty years ago, the idea occurred to Prof. Page, one of the pioneers of electrical invention, and some years later Mr. Silby and Dr. Colton essayed the problem. But these early experimenters lacked the means for the economical generation of electricity with which our inventors of to-day are provided, on which account they failed. The only source of electricity available at that time, was the galvanic battery, the inconvenience, uncertainty and costliness of which was an insuperable obstacle. The development of the dynamo-electric machine within the past few years, however, has removed this serious difficulty from the path of the inventors, and has given them what before was lacking, namely, a comparatively cheap means of generating and maintaining powerful electrical currents by the direct conversion of mechanical energy (no matter how generated, whether by steam, wind or water-fall) into electricity. In this form we can send our power to great distances over metallic conductors with comparatively little loss, drive electric locomotives or electric engines located at distant points, to do the work of the steam engine in our factories and workshops, or furnish light to towns and cities. Upon the development of the dynamo-electric machine, the electric railway has been made a possibility of the near future, and unless the signs of the times are most deceptive, we look for the most extensive adoption of the system in the course of the next decade.

Dr. Werner Siemens, of Berlin, whose name we mention at the outset of this article, is entitled to the credit of having revived in practical shape the forgotten efforts of Page and others of the past generation, by constructing and operating an experimental electrical railway in the grounds attached to the Berlin Exhibition of 1879. As this ingenious invention promises at no distant day to have an historical interest, we present herewith illustrations and a description of his apparatus and plans, together with some practical suggestions of the inventor that have grown out of the same.

The electric railway requires, first, a dynamo-electric machine at the terminus of the road, which is actuated by some source of power—say a stationary engine. The machine is placed in electric connection by metallic conductors with a second dynamo-electric machine, which, properly mounted on a vehicle, the wheels of which are set in motion by it, constitutes the electrical locomotive. Thus we have the first dynamo-electric machine set in motion by the steam engine at the terminus, the electricity generated by it is conveyed by the rails, or by some special conductor, to the second dynamo-electric machine, which it sets in motion, and actuates the locomotive. These are the essential parts of the electric railway. The details of Dr. Siemen's system are as follows: Fig. 1 represents a front view of his locomotive, and Fig. 2 a longitudinal section. The motion of the electrical machine is communicated by suitable gearing to the wheels of the vehicle on which it is mounted, and these are placed on rails of the ordinary construction. The electricity from the driving electrical machine at the station is conveyed to the locomotive through a special insulated central rail (seen in Fig. 1), the current being taken from the insulated rail by a metallic brush, and returned to the first machine through the ordinary uninsulated rails, thus completing the circuit. The stationary machine, it should have been stated, has one of its poles connected with the track rails and the other with the insulated centre rail. The current, therefore, comes through the insulated centre rail, traverses the metallic brushes in contact with the centre rail, passes through the wires of the locomotive, and returns through the wheels and track rails.

Fig. 3 shows a perspective view of the locomotive drawing three cars, each containing six passengers. The current is thrown on or off by the driver, who sits astride of the motor and controls its motion. The performance of the locomotive were described, and which was capable of developing 3½ horse-power, attained a maximum of 7½ miles per hour, carrying 18 passengers.

Dr. Siemens' novel experiment attracted so much attention, that the suggestion was subsequently made to construct an elevated electrical railway in the city of Berlin for the transfer of passengers, which, we are informed, has been received with favor by the municipal authorities. He also developed the idea of employing the same system as a substitute for the pneumatic postal service, in use in that and other European capitals, between central and outlying postal stations, to facilitate the collection and distribution of the mails.

We give below illustrations and a brief description of these suggestions, which seem to be in a fair way to be realized. It is proposed to construct the columns of the elevated electrical railway of wrought iron, placed on the edge of the sidewalks at distances of 10 meters apart. The longitudinal supports T T (Fig. 4), on which the rails S S (insulated from each other) rest on sleepers of hard wood, are firmly fastened to the columns. The passenger coaches are to be constructed as lightly as is compatible with safety, and are designed to seat 15 persons. Each wheel is carried on an independent axle, and the axle boxes of each side are electrically connected. The two driving-wheels R R receive their motion from the dynamo-electric machine, which is placed under the bottom of the vehicle. The central rail in this plan is dispensed with, and the track itself is made the conductor, the plan being similar if not identical with that of Mr Edison's, described in the June number of this journal.

Fig. 5 represents a special arrangement designed for postal service, by the same inventor. The road is purposed to be carried on short iron columns S. On these rest the wooden sleepers, to which are attached sheet metal pieces b_1 b_3, formimg the side walls of an inclosed railway. Between these sheets metal strips, at suitable distances apart, are placed light wooden crossties, on which rests the light rails a_1 a_2. Of these rails, one is placed at frequent intervals in electrical connection with the side sheets, which are covered above with a removable sheet-metal cover *d*, while the other is connected with all the iron columns. It is designed to run small four-wheeled wagons on this road by suitable electrical connections.

We are thus in a fair way to see this interesting branch of electrical invention speedily developed.

—The first engineer of the Rhenish railway, which has the longest experience in steel rails, and made a calculation, according to which the average duration of steel rails, when 24 trains pass over them every day, is 30 years, while that of iron rails, with a traffic of 17 trains, is 11 years. Steel rails, according to this calculation, lasts four times as long as iron rails, although they are but one-third more expensive.

Welding Horn.—Pieces of horn may be joined by heating the edges until they are quite soft, and pressing them together until they are cold.

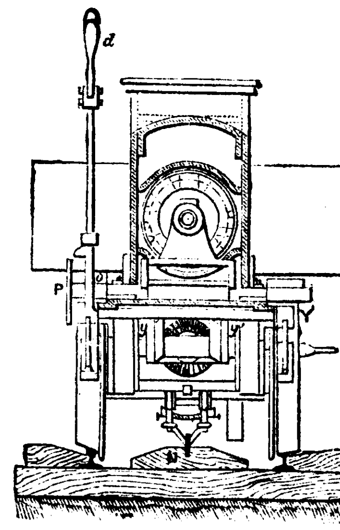


Fig. 1.—Front View of Motor

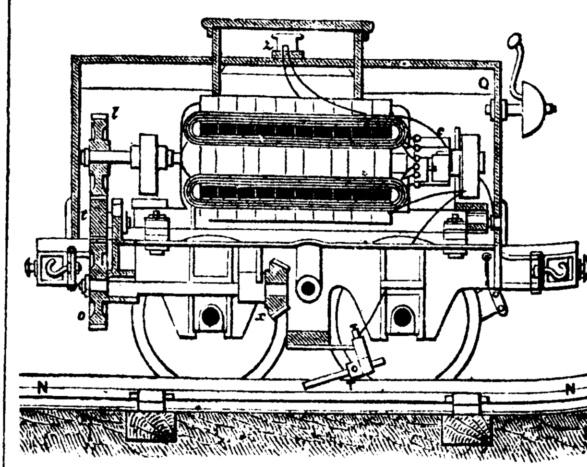


Fig. 2.—Longitudinal Section of Motor.

A Cape Cod Ship Canal.—A joint committee of the Massachusetts Legislature was appointed early in the spring of 1860 to consider the project of cutting through the Isthmus of Cape Cod, for the purpose of navigation, connecting Buzzard Bay with Barnstable bay by a ship canal. The matter was reported favorably, but nothing was done until the last few months, when A. G. Fisher a commission merchant and ship broker, of Boston, became interested in the scheme, and found little difficulty in enlisting New York capital. A company was formed, and $8,000,000 of capital subscribed, of which sum $1,500,000 has has already been paid in. The contract for building the canal has been given to Adam Drisbach and John Cameron, of New Jersey. The proposed route of the canal has already been surveyed and fixed by the engineer in chief, George H. Titcomb. The new company has secured a strip of land 1000 ft. in width along the whole distance through which the canal is to run. The starting point of the canal will be near the little village of Sandwich, and it is expected that 2,000 men will be put to work immediately. The canal will be 7¾ miles long. It will shorten the route between New York and Boston 90 miles, and will secure an in-shore route between these cities practicable for such passenger and freight boats as now ply on Long Island sound. It is estimated that there is an average annual loss of 6,066 tons of vessel property, and from 30 to 40 lives caused by ship-wrecks, occurring around Cape Cod. The canal will be 141 ft. wide at the top, and 6 ft. wide at the bottom. It will have an average depth of 30 ft.

—It is stated that R. Hoe & Co., the New York press builders, have paid the widow of William Bullock $2,000,000 for the patents he took out on printing machinery.

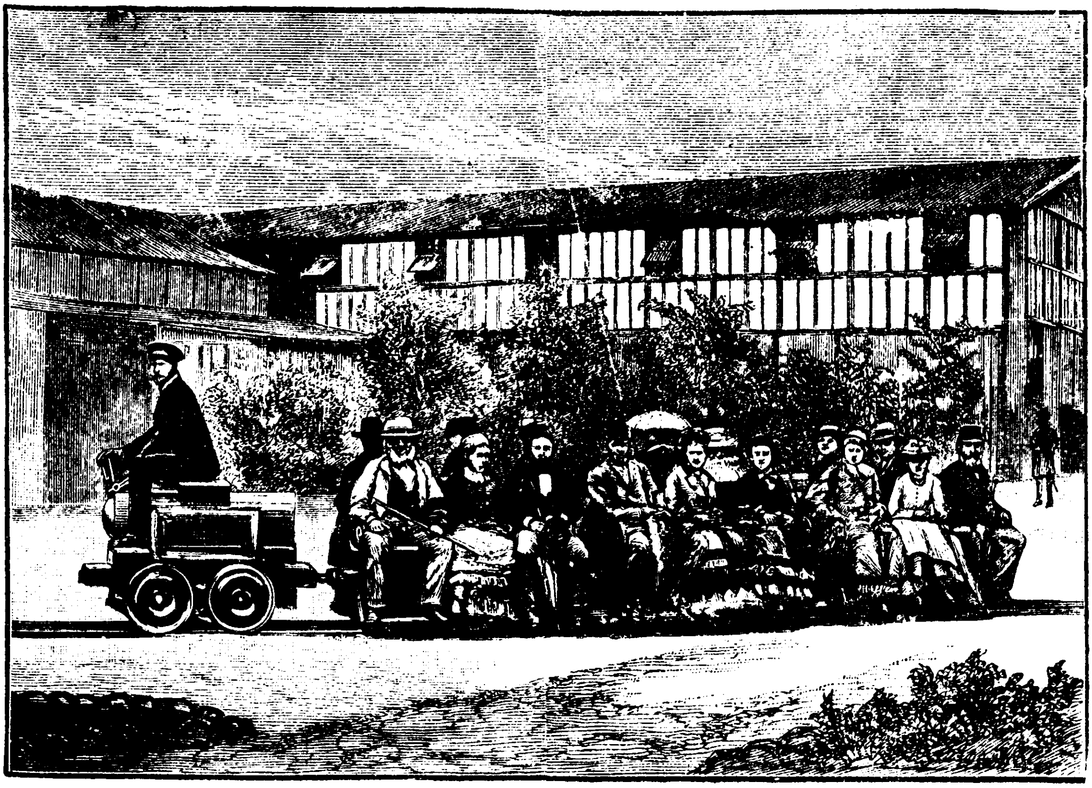


FIG. 3.—THE ELECTRIC LOCOMOTIVE.

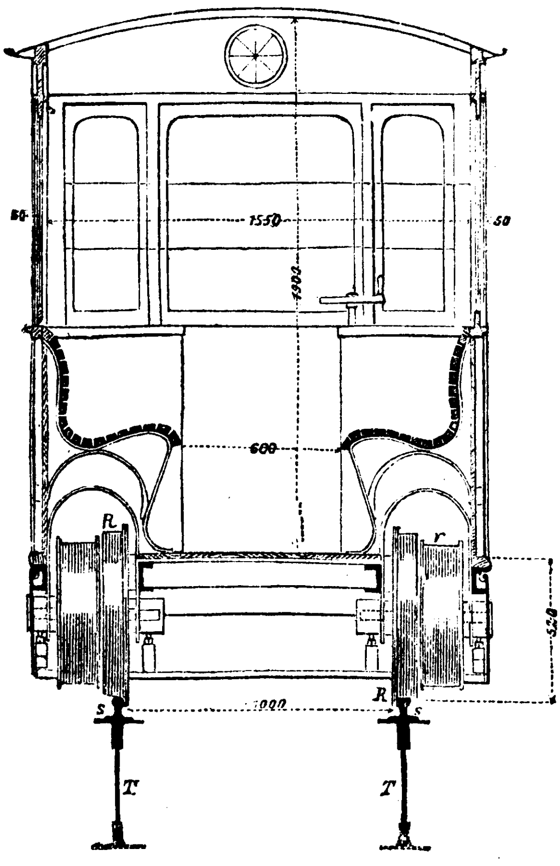


FIG. 4.—SIEMEN'S ELECTRICAL ELEVATED RAILWAY

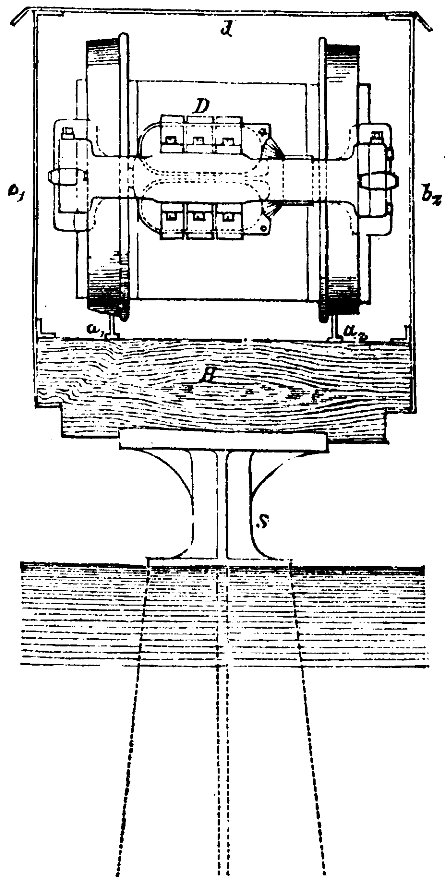


FIG. 5.—SIEMEN'S ELECTRICAL POSTAL SERVICE.

POPULAR FALLACIES.

It is not true that sugar and candies are of themselves injurious to the teeth or the health of those who use them; so far from it, they are less injurious than any of the ordinary forms of food when employed in moderation.

A scientific dentist will tell you that the parts of the teeth most liable to decay are those which afford lodgment to particles of food; such particles being decomposed by moisture and heat, give out an acid which will corrode steel as well as teeth; but pure sugar and pure candies are wholly dissolved, there is no remnant to be decomposed to yield this destructive acid; we remember now no item of food which is so perfectly dissolved in the mouth as sugar and candy. When visiting the sugar plantations of Cuba the attention was constantly arrested by the apparently white and solid teeth of the negroes who superintend the process of cane grinding; they drank the cane juice like water, there was no restraint as to its use, and the little urchins playing about would chew the sugar-yielding cane by the hour. It is much the same in Louisiana, where the shining faces and broad grins of the blacks are equally indicative of exuberant health and "splendid teeth."

How does it happen then that there should be "the prevalent belief" that sugar and sugar-candy destroy the teeth and undermine the health? Perhaps the most correct reply is *tradition*, the father of a progeny of errors in theory and practice; of errors in doctrine and example, "too tedious to mention."

One of the common faults of the times is an indisposition to investigate on the part of the masses. We take too much for granted. A very common answer to a demand for a reason for a time-honored custom is, "Why I have heard it all my life. Don't everybody say so?"

It would be a strange contradiction in the nature of things if sugar and candy in moderation should be hurtful to the human body in any way, for sugar is a constituent of every article of food we can name, there is not a vegetable out of which it cannot be made, not a ripe fruit in our orchards which does not yield it in large proportions, and it is the main constituent of that "*milk*" which is provided for the young of animals and men all over the world. Perhaps the child has never lived which did not love sweet things beyond all others; it is an instinct, a passion not less universal than the love of water. A very little child can be hired to do for a bit of sugar what nothing else would. The reason of this is, that without sugar no child could possibly live, it would freeze to death; it is the sugar in its food which keeps it warm, and warmth is the first necessity for a child.

But to use this information intelligently and profitably, it must be remembered that sugar is an artificial product, in a concentration, and that, if used in much larger proportions than would be found in our ordinary food, as provided by the beneficent Father of us all, we will suffer injury. We should never forget that the immediate use of anything is destructive to human health and life if perseverd in. The best general rules to be observed are two:

1st. Use concentrated sweets at meal times only. 2nd. Use them occasionally and in moderation.—*Hall's Journal of Health.*

PROGRESS IN SCIENCE AND THE ARTS.

TECHNICAL BREVITIES.—The art of diamond-cutting is reported to have been developed to a high state of excellence in this country. The report of the special Census Agent on this subject has the statement that our dealers are receiving the best Amsterdam-cut gens from abroad to be recut here and returned. ——Apropos of the recent newspaper statements to the effect that De Lesseps had succeeded in interesting a powerful syndicate in behalf of his canal scheme, and that large amounts had been subscribed, later information received indicates that neither of these statements is reliable. On the other hand, it appears at present as though De Lesseps would not be able to get a sufficient amount subscribed to warrant him in commencing operations. It is semi-officially stated that parties in this country who had agreed to participate in the scheme now decline to do so until they are assured that the larger portion of the funds required has been guaranteed.——Dieulafait has shown the presence of copper in the ashes of plants grown on primitive rocks. In many cases, the amount of copper found was considerable enough to give a distinct reaction with ammonia, from one grain of the ash.——It has been a favorite theory with some that the form of a lightning-rod had a decided influence on its electrical conductive capacity, the favorite notion being that, the greater the extent of surface, the better. This idea, though it never had any scientific supporters, has been effectually disposed of by the English electrician, Preece, who has lately made a series of experiments with a number of conductors of various shapes—ribbons, tubes, and solid cylinders—all of the same weight. He found no appreciable change in the resistance, and the fact was experimentally proved that the extent of surface does not affect the rapidity of neutralization of an electrical discharge, and that, whether in the form of a cylindrical rod, tube, or wire rope, a lightning-rod is equally effective.——It is reported that works for the manufacture of glass from slag have been started at Poughkeepsie, N.Y., though with what success we are not informed. The process has met with considerable success abroad, and there should be no difficulty in making it profitable here. ——The iron-clad *Italia*, 14,000 tons, covered throughout with armour plating three feet thick, and said to be the most powerful vessel ever constructed, was successfully launched a few days ago.——Our neighbor, the *Sanitary Engineer*, makes the astonishing statement that the city of Paterson, N.J., has increased by emigration 15,000 during the past six months. It would be interesting to know how long it would take, at that rate, to depopulate the town.——The town of Leeds, in England, it is reported, is supplied with gas at a cost of 1s. 10d. per 1,000 cubic feet. This is said to be the lowest price at which gas has ever been sold in Great Britain—and we may safely add —or elsewhere. The cheapening of price, it is added, has greatly stimulated the general use, in the borough, of gas for fuel and for running gas-engines.——At the Düsseldorf meeting of the British Iron and Steel Institute it was stated, as the result of experience, that, although the plant as yet introduced is imperfect and unsuitable, the average waste in dephosphorizing is under 16 per cent., and in some cases under 12 per cent. This is bringing the figures very close to those of the waste in the ordinary Bessemer operation.——One of the industries that, within the past few years, has attained a position of great importance in the Southern States is the manufacture and refining of cotton-seed oil. This product is so admirably manipulated that it is largely used as a substitute for olive-oil, not only in this country, but also in Italy. Of the six millions of gallons of cotton-seed oil exported from this country during last year, nearly all went to that country, and most of it doubtless found its way back again in the guise of genuine olive-oil.——The *Railroad Gazette* of October 8th, reports the construction of 3,938 miles of new railroad up to that date during the present year, as against 2,328 miles constructed for the same period of 1879, 1,320 miles in 1878, 1,505 miles in 1877, and 1,719 miles in 1876. At the rate indicated, the year 1880 will not fall far short of 5,000 miles of new railroad.——The same journal has an editorial on the traffic of the proposed Panama Canal, in the light of the figures lately presented by Mr. Nimmo, the Chief of the Bureau of Statistics. The *Gazette* places a high value on the figures and conclusions in questions, and expresses the opinion that all other so-called estimates of the traffic that would use the canal have been merely guesses in comparison with these carefully collected and detailed statistics, the preparation of which is a service to the world, by which it is likely to profit, and is extremely creditable to the Bureau. —The Women's Silk Association of the United States, with head-quarters in Philadelphia, shows signs of vigorous vitality. At the late State Agricultural Exhibition, held in the Main Building of the Centennial Exhibition, the Society had an admirable display of silk-worm, cocoons, and reeled silk, which attracted universal interest, and was properly acknowledged by the award of a number of prizes.——The London *Telegraphic Journal* editorially doubts the accuracy of the conclusions drawn by Professor Graham Bell, expressing the opinion that, while it is possible that Professor Bell may have made more numerous experiments than those described by him in his paper, those detailed are hardly conclusive on the point that the observed phenomena were due to the action of light-rays alone. The *Journal* is disposed to give Professor Bell the highest credit for the discoveries made, but at the same time remains doubtful of the accuracy of all the conclusions drawn from them. So far as we have examined Professor Bell's statements, the conclusions he draws from his experiments appear to be incontrovertible.——The use of the telephone in the collieries of the United Kingdom is extending. The latest issue of *Iron* contains an account of two collieries in which this instrument has been introduced as a means of ready communication to the miners.——The same journal conveys the information that Messrs. Bolckow, Vaughan & Co., who will be recalled by our readers as the first to test the practicability of the Thomas Gilchrist dephosphorizing process, have been very successful with the preliminary trials of their two new 15-ton converters, working on Cleveland iron. The quality of the steel produced has proved to be very satisfactory.——Mr. J. D. Weeks, Secretary of the Western Iron Association, who has just returned from an examination af the iron ore-beds in the vicinity of Lynchburg, Va., pronounces them to be the greatest he has ever seen, not even excepting the Iron Mountain or Lake Superior districts.——At present writing, nearly 400 men are reported to be at work on the Cape Cod Ship Canal. Its undertakers expect to have the work finished within two years. The length of the water-way will be about 8 miles ; the canal will have a width at bottom of 66 feet, and at top of 250 feet. The cost of building is estimated at $2,500,000.——The French patent of MM. Barbieux & Rosier, under the title of *Savon de Benzine*, describes a method of saponifying all the natural mineral oils, as well as those obtained from schist, asphalt, and similar sources, by adding to the oils in question about 15 per cent. of stearic acid, and then three parts of animal grease to two parts of the acidified petroleum. Such a process, if it works smoothly, should possess great practical value.

HOUSE DECORATION.

The rage for house decoration which now extends to every part of the country, and makes itself felt in every village and hamlet even, has created an extraordinary demand for stuffs rich in color, whether cheap or costly, with which home and foreign manufacturers are stocking the market. Perhaps the new fever will not last long, for already it is carried by some people to an absurd extreme which presages a reaction, and here, as in England, the danger is that a wholesome improvement in the taste for decoration will be replaced by a vulgar desire for display.

We see nowadays city and country houses which look rather like shops for the exhibition of bric-à-brac and rich hangings than homes in which people expect to get comfort. The rooms upon which some famous upholsterer has lavished the resources of his stock may remind one of the modern scenic sets on the stage of a theatre, and there seems to be little provision for the substantial enjoyment of their occupants. Everything in them is harmonious enough, perhaps, except the people. In color and composition they suggest a picture, but the inmates of the house are out of place as the living figures in it. They don't belong among such surroundings, and they can't be comfortable amid all this tasteful and splendid display.

But unquestionably people's houses are looking better than they formerly did, and particularly those of people of moderate means. For the happiest thing about the moderate decoration is that its effects are produced rather by colors than by materials, and very inexpensive fabrics will serve the purpose. Cotton stuffs, as, for instance, cotton flannel will take the most delicate dyes, and yield tints of remarkable beauty. And our own wall papers, which are now in unexampled demand, may be bought for a small price, and yet be of patterns and colors which will satisfy artistic taste.

This prevailing desire for house decoration is keeping upholsterers busy, and the work of refurnishing or freshening houses in town goes on so rapidly that all the trades concerned in it are now closely occupied.—*American Cabinet-Maker.*

SCREW-CUTTING MACHINERY.

The following arrangement of machinery has been designed by Mr. H. E. Russell, of London, and formerly New Britain, Conn., U.S.A., for holding a screw blank in the jaws of a screw-cutting machine, so as to prevent it from slipping in the jaws during the operation of cutting a thread upon it. This improvement is particularly applicable to machines used for making machines or fine threaded screws, and in which a die is employed instead of a chasing tool for cutting the thread. In the ordinary machines of this class, the holding pressure is applied to opposite sides of the screw head, and to the shank directly under the head in the line of the transverse axis. The result is that many heads are crushed, particularly those whose nicks happen to stand while held in a plane parallel, or nearly so, with the plane of the faces of the jaws. Again, if the metal of the blank is not of uniform density, or if the jaws do not exert an equal degree of pressure, the axis of the blank is liable to be thrown out of line with the axis of the cutting die. Moreover, the extreme pressure which is exerted upon the blanks frequently cause their adhesion to one of the jaws after they open to discharge a blank, thereby exposing the machine to injury when the feeding fingers come into action to introduce the succeeding blank to the spindle. In the new arrangement, the screw blank is held in the jaw spindle of the machine by pressure applied against the top surface of the blank head in the direction of its longitudinal axis, in combination with pressure applied nearly against the bevelled surface of the under side of the head. This is effected by means of two levers, somewhat similar to the ordinary jaws for holding blanks, which are mounted in the spindle head upon strong fulcrum pins, and work in recesses or slots. The rear ends of these levers are connected by links of equal length, having a common hinge pivot in a sliding central bar. This bar passes through a collar, and between the end of this collar and the face of a nut on the end of the bar is arranged a coiled spring, the tension of which can be increased by screwing up the nut, but which always tends to pull the central bar in a direction which will bring the links more nearly in a straight line, and consequently to set the rear ends of the levers further apart. The front ends of the levers are furnished with hook-shaped clamps of hardened steel. These clamps hold the screw blank by the under side of the head against a socket, in which the top side of the blank head is seated. For this purpose the inner edges of the clamp are so shaped as to conform to the bevelled or conical shape of the under side of the head, and each embraces a portion of the latter. This seat is set in a hollow cylindrical guide to keep it centrally in the spindle, and it is capable of a slight movement longitudinally. A spring may be applied in any convenient manner to give it an impulse forward, when the seat is released from the force which has pressed it backward. This seat serves a threefold purpose ; it forms one of the members of the clamp to hold the screw blanks ; its concave or recessed face acts in combination with these members to centralise the blanks ; and it serves by its movement forward under the impulse of the spring to eject the finished screw when the same is to be discharged from the spindle. In a machine provided with this invention, a forward movement is given at the proper time to the central bar by any suitable device. The effect will be that the ends of the longer arms of the levers will be brought nearer together, and the hooked clamps will open, The feeding mechanism now inserts a blank, so that its head will bear against the seat, and the sliding bar being thereupon moved rearward by the action of the spring, or by other suitable means, the jaws of the holding clamps are moved towards each other, and, engaging as above described with the bevelled under portions of the head, force the blank against the seat, and carry it and the seat backward until the seat comes to a solid bearing, The blank is by this means firmly kept from slipping in the spindle by pressure applied against the top surface of the head of the blank, in combination with pressure applied in the opposite direction against the under side of the head.

Dry Rot in Houses.—At the annual meeting of the Cryptogamic Society of Scotland, commenced in Glasgow recently, a paper by Mr. Young, architect, of Perth, was read by the Secretary, Dr. Buchanan White, on "Dry Rot Fungus in Houses, and the best Means of Eradicating it." The following were the conclusions at which Mr. Young arrived :—1. That wood is necessary for the root or first production of the fungus. 2. That the wood after a time gets exhausted of its nourishment for the fungus, and when this is the case the plant attached to it dies. 3. That if it has wood for its root its branches will luxuriate, where there is no wood, even in the heart of a well-built dry rubble wall ; but when the wood at the root is exhausted it dies in the wall. 4. That where the conditions are favorable free ventilation is not against its growth ; on the contrary, a draught aids in dispersing its spores. 5. The cure is to eradicate it as far as possible by burning the soil, applying a flame to the walls, and removing every particle of wood from its locality, and substituting stone, iron, or cement. 6. That upon perfectly dry and healthy wood it would not readily take root, but if it gets good root in dampish wood its growth will ramify over dry fresh wood and prey upon and destroy its tissues, thus ruining it for all structural purposes.

Cheap Gas.—Much attention has of late been directed to some new processes of producing a cheap gas by the decomposition of water, which, in the form of steam, is brought in contact with incandescent carbon. The reports made by the scientific press states that the experiments in this direction in Sweden and Russia have been attended with good results, and various scientific authorities, some of them government officials, declare that the gas has been employed for welding wrought iron, for smelting in crucibles, both pig iron and steel—the effect being very satisfactory in respect to the heating power of gas. For illumination, this kind of gas is claimed to possess some peculiar advantages. When used for this latter purpose, the gas is conducted through a vessel filled with cotton moistened with benzine.

MEAT BREAD.

An interesting observation which bids fair to receive an extensive practical application, is reported to have been made by M. Scheurer-Kestner. This savant discovered the noteworthy fact, that meat, when added to bread, during the process of fermentation, disappears entirely, its nutritive principles being incorporated with the bread. In this condition the meat appears to be capable of being preserved for a lengthened period, as the discoverer above named exhibited to the French Academy specimen loaves of meat bread made several years before, which showed no signs of either worms or mouldiness.

In the account given of his experiments, he states that at first he used raw meat, three parts of which, finely minced, he mixed with five parts of flour and the same quantity of yeast. Water was added in sufficient quantity to make a dough of proper consistency and the mass in due time underwent fermentation. In two or three hours the meat had disappeared, having undergone a species of digestion in the fermenting mass, and the bread was baked as usual. The taste of the meat thus prepared was disagreeable and sour, an objection that was subsequently obviated by first cooking the meat for about an hour with enough water to afterwards moisten the flour. The meat used for the purpose should be carefully freed from fat, and only enough salt added to give the necessary flavor, as the condition of too much would, by its property of absorbing atmospheric moisture, spoil the bread. The proportions recommended are one-half of meat to one of flour, in which quantities the meat will be thoroughly incorporated during fermentation. Meat bread prepared with a suitable quantity of veal, is asserted to make an excellent, nutritious soup for the sick and wounded.

SKIN GRAFTING FROM A SHEEP.

The Chicago *Times*, of September 4th, contained a full account of an operation in skin grafting which was performed at the County hospital. The patient was a young man, 23 years of age, named John Filas. A large cancer had been removed from the outside of his right leg near the hip, and the wound which resulted was about 10 inches long and nearly as wide. Nature was healing it so slowly that it was decided she should be assisted, and wisely, too, as the result shows. A previous operation of a similar nature on little Aggie Sheehy, was successful, but the vitality in her wasted frame become so nearly exhausted that her life went out like the light from a lamp exhausted from oil, but it was no fault of the skin transplantation. Filas' frame was strong, and if the experiment should fail he would be none the worse for it. A flap of skin was cut away from the hip of a young sheep, large enough to cover about two-thirds of the wound. It was sewed fast to the natural skin of the sheep on three sides and left attached to the patient on the fourth side. It was expected that while the circulation of the blood of the sheep would keep the flap alive, it would become attached to the exposed surface of the wound on which it rested, and in time be nourished by the blood of the patient. The flap was kept covered for 24 hours. At the end of that time the dressing was removed, and it was found that the tip of the flap, or two inches of it, had died.

Within a few days it became apparent that the remainder of the flap had become firmly attached, the cutting of it away from the sheep was commenced at once, and clippings were made each day. Finally, the sheep began to waste away, and sheep and patient both became very retsless. It was thought best to detach the flap from the sheep wholly, and one stroke of the surgeon's knife liberated the animal. It is assured that the skin will grow to the man's hip, though some portions of it may yet slough away. If a piece no larger than a silver dollar is finally attached, the fact is settled that skin grafting may be a success. It was not expected at first that less than three operations would be sufficient to supply the patient with all the skin he needed. As soon as the portion now transferred is properly fixed another operation will follow.

PROTECTION AND CULTIVATION OF FORESTS.

In our notice of the proceedings of the American Association for the Advancement of Science, we refer te the action of a committee that was appointed to memorialize Congress and the State Legislatures on the importance of taking requisite steps to preserve and cultivate the woodlands of the country. This subject, save in the case of a few of the newly settled Northwestern States, has been almost wholly neglected in this country, and for want of proper safeguards our forests are rapidly disappearing.

The action of the Association on this subject is very timely and sensible, for the evil effects of the denudation of the forests are known to most persons of average intelligence.

Abroad the importance of protecting woodlands is so keenly appreciated, that there is scarcely a country of Europe where stringent laws on the subject are not in force; while many lands of the older settled Orient, that once were the garden spots of the earth, have, within the historic period, through the destruction of their woodlands, been rendered almost uninhabitable by man, and are given over to drought and desolation.

A full abstract of the action of the Association committee on this important subject is worthy of being read, since its recommendations are highly judicious and sensible, and will be found in another part of this issue.

Glass in Egypt.—Egypt offers us the earliest positive evidences of glass-making. Sir Gardiner Wilkinson mentions that glass bottles containing wine are represented on monuments of the fourth dynasty, more than 4,000 years ago; and, in the tombs of the Beni Hassan, the process of glass-blowing is represented in an unmistakable manner. The earliest specimen of glass, bearing an inscription from which its date may be ascertained, which has as yet been met with, is the lion's head now in the Slade collection in the British Museum. This was found many years ago at Thebes by Signor Drovetti. It is formed of opaque blue glass of a very bright and beautiful colour (as may be seen from a fractured part), but time has changed it externally to an olive green. Dr. Birch has informed the writer that the hieroglyphics which are on the underside consist, on the right side, of an arceus wearing the "hut" or white crown of the upper world or upper Egypt, and representing the goddess Sati (Juno), on the left side an arceus wearing the tesh or red crown of the lower world or lower Egypt, and representing the goddess Nat or Neith (Minerva), while the central hieroglyphics form the prenomen of Nuantef IV. of the eleventh dynasty, whose date, according to Lepsius' chronology, was B.C. 2423–2389. A head found at Thebes bears the prenomen of Hatafu, a queen who is conjectured to have lived 1450 B.C.; this is of a dusky green glass, quite transparent, and is stated to have the specific gravity of bottle glass. It has been suggested that the material is not artificial glass, but obsidian, which abounds in Egypt, and is occasionally of a green tint. Many coloured fragments are found in the tombs of Thebes, and a vitrified coating, usually blue or green, was given to objects formed of earthenware, and even of stone or granite. A high value seems to have been attached to coloured glass at an early date; and vessels of fine opaque blue glass of Egyptian manufacture exist, edged with a tolerably thick plating of gold. Glass, if the Syrian, Greek, and Latin versions of the Old Testament are correct, is placed (in the book of Job) in the same category as gold; the English version renders the word crystal.

Aural Disturbances from Bathing.—The frequency of attacks of aural inflammation from bathing demands more than a mere mention, for complete deafness may result from the injuries to the ear from this cause, and partial impairment is frequent. The injuries from bathing are mainly due to the fact that man is not afforded the protection to the ear that amphibious animals possess, and hence the water may act injuriously in various ways. In surf bathing the mere force of contact, when the water flows into the ear, may injure the tympanic membrane, and when an incoming wave dashes against the face, water may freely enter the mouth or nose, and thus be driven into the ears through the eustachian tubes. The presence of cold water for a long time in the canal leading to the ear, as when much diving is done, may set up much inflammation in the canal or in the tympanic membrane, which may extend to the drum cavity itself. Ill effects may be produced by allowing the ears, head and body to dry in a current of air after coming out of the water. Sea water is probably more obnoxious than fresh, on account of its comparatively low temperature and the large quantity of salt in solution. A long continuance in the water should be avoided. The Russian bath should not be taken without protection to ears when the cold plunge is used. Diving is, however, the most dangerous practice connected with bathing, for it is difficult to keep water from entering the ears, or nose or mouth. In diving, the pressure of water on the tympanic membrane from without may cause vertigo. Even syringing the ears gently is known in some instances to occasion decided dizziness.—*Harper's Magazine*.

Eating for Health.—One of the most prolific causes of disease is improper eating, or taking food when the stomach is not prepared to digest it. If food is taken at the proper time, and in not too great a quantity, and is composed of perfect cell structure, the stomach will faithfully perform its duties, and the process of assimilation will build up the system with healthy material. But if food fails to digest, the heat of the stomach soon rots it. A portion of this putrid matter is absorbed by the lacteals, taken up by the circulation, and deposited in various portions of the system to rebuild torn down tissue. Can such a condition of the human organism be an index to perfect health? Yet such states exist. People often eat, sometimes heartily—not because they are hungry, but because it is meal-time; and unwittingly violate a hygienic law which will result, if continued, in impaired health with all its concomitant evils. Many children are fed to death by kind, indulgent mothers—actually crammed with pastry, candy and nuts until their entire system is diseased, a mass of putrescence made from decayed vegetable and animal matter. We need not say anything of the evil effects of stimulants and excitants. The thousands of slaves to this form of dissipation, the dreary homes, ruined constitutions, and physical wrecks speak more forcibly than words of the baneful effects of unnatural stimulation. Drinking and eating, in short, cause more ills than any two things in the world. And until people learn to govern their appetities these causes will breed disease and misery.

A preservative wrapping paper, adapted for apples, oranges or other fruit, may be prepared by dipping soft tissue paper in a bath of salicylic acid and hanging it in the air to dry. The bath should consist of a strong alcoholic solution of salicylic acid diluted with all the water it will bear without precipitation. This preservative paper may be wrapped about the fruit before packing, and when the fruit arrives at its destination, the paper may be taken off and used for the same purpose again. A wrapping paper to protect furs, cloths, etc., from moth and mildew is prepared by dipping manilla paper in a prepared bath, squeezing it and drying it over hot rollers. This bath consists of a mixture of 70 parts of the oil removed by the distillation of coal-tar naphtha, 5 parts of crude carbolic acid, containing at least 50 p.c. of phenola, 20 parts of thin coal tar at 160° Fah., and 5 parts of refined petroleum.

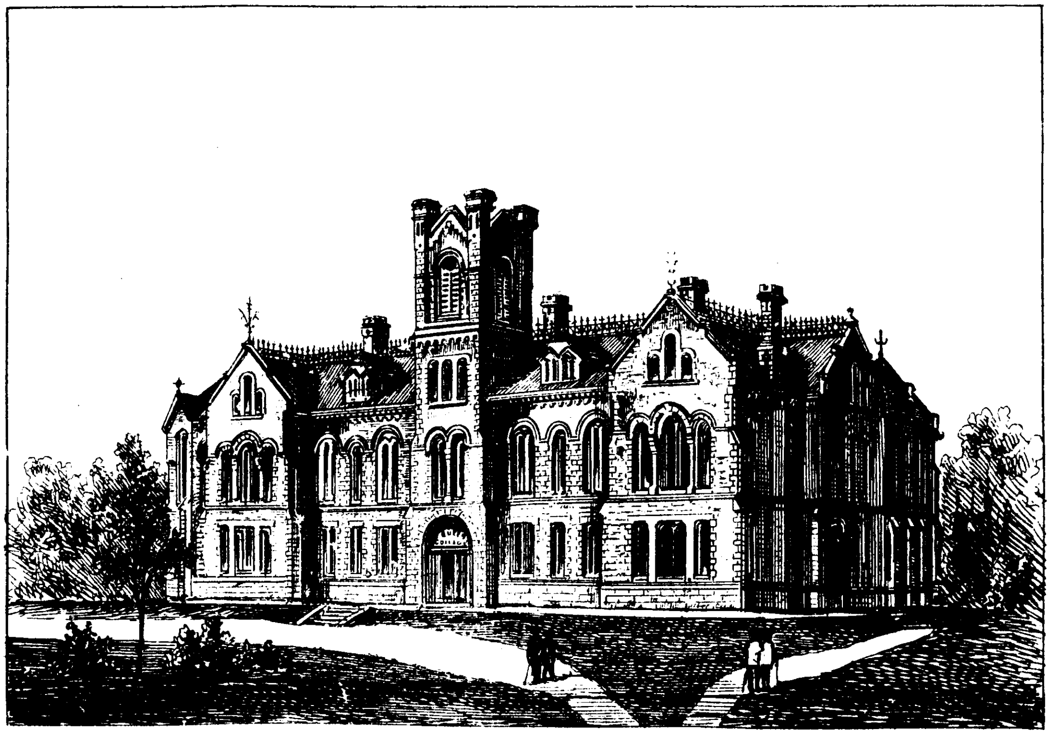
The Course of a Lightning Flash.—Prof. Tait, of Edinburgh, insists that when people think they see a lightning flash go upward or downward they must be mistaken. The duration of a lightning flash is less than the millionth part of a second, and the eye cannot possibly follow movements of such extraordinary rapidity. The origin of the mistake seems, he says, to be a subjective one, viz., that the central parts of the retina are more sensitive, by practice, than the rest, and therefore that the portion of the flash which is seen directly affects the brain sooner than the rest. Hence a spectator looking towards either end of a flash very naturally fancies that end to be its starting point.

Gutta Percha Cement.—This highly recommended cement is made by melting together, in an iron pan, two parts of common pitch and one of gutta-percha, stirring them well together until thoroughly incorporated, and then pouring the liquid into cold water. When cold, it is black, solid and elastic; but it softens with heat, and at 100° Fah. is a thin fluid. It may be used as a soft paste, or in the liquid state, and answers an excellent purpose in cementing metal, glass, porcelain, ivory, etc. It may be used instead of putty in glazing windows.

Steam Boiler Cement.—Mix two parts of finely powdered litharge with one part of very fine sand, and one part of quicklime which has been allowed to slake spontaneously by exposure to the air. This mixture may be kept for any length of time without injuring. In using it, a portion is mixed into paste with linseed oil; or, still, boiled linseed oil. In this state it must be quickly applied, as it soon becomes hard.

A Remarkable Casting.—The most novel exhibit shown at the Brussels national exhibition by the Seraing works is a certainly remarkable casting. It consists of what is practically the whole cast-iron work of a marine engine, with a pair of cylinders about 20 inches in diameter by 20 inches stroke, cast in one piece—bed-plate, condenser, air and feed and bilge pumps, standards, cylinders and exhaust pipe.

—A **French** inventor has devised an ingenious electrical low water signal for steam boilers, which indicates the existing water level at any distance from the generator, and when the water has sunk below a certain point rings a signal bell, while at the same time the sign "low water" appears on the indicating tablet.



THE NEW BUILDING OF QUEEN'S UNIVERSITY, KINGSTON, ONT., JUST INAUGURATED.

Furniture.

NEW QUEEN ANNE STYLE.

What people now call Queen Anne fashions, with a charming indifference to trammels of dates, are the fashions of the three Georges, the "Marie Antoinette style" (under that queen the Louis XV. furniture and decoration, whilst still sumptuous, became refined and moderate), and especially everything which came in during the Empire (Napoleon I.) Now, as Anne died in 1714, and Napoleon resigned his crown in 1815, there are just a hundred years of perhaps the most remarkable changes and developments in art which ever occurred in a century, all named after Anne, whose tastes, strictly speaking, belonged to her father's generation.

Chippendale, the elder, was a cabinet-maker who flourished about the middle of last century. He was the author of many of the most elaborate Louis XIV. patterns in England—frames, tables, commodes, pedestals, all of them ingenious, and contradicting every sense of purpose in frames tables, commodes, and pedestals; not a straight line anywhere, not a moment's rest for the eye, all wriggling curves like bewitched vegetation, giving birth in unexpected places to human heads, beasts and birds.

He also adapted his workshop to the prevailing taste when it turned pseudo-Greek, and manufactured many good, and as many bad, articles of furniture. His simulations of bronze stands, the impossible curves strengthened by internal wires, were turned out among his bureaus and chairs really well and durably constructed, with mere servility to the customer's purse. A fashion for plainness and simplicity in decoration is convenient in more ways than one. It is convenient to the new-made virtuoso; convenient to those born without taste, for it saves them *fiascos;* convenient to the impecunious, for it saves them money; convenient to decorators who have crept into notice by good luck, not merit. Hence the running popularity of the so-called "Queen Anne" furniture and scheme of decoration now attainable by every upholsterer.

We know that the keynote of all these "Queen Anne" rooms is quiet and mortally "severe;" the chairs are few, hard, square, and heavy, and covered with dingy stuffs laboriously made to look poor and imperfect in web, and recalling in color mud, mildew and ironmould. We know that there is not to be a low or easy chair in any room. We know we must expect only small bevelled mirrors in mean little frames, or convex ones which make our faces seem bloated with toothache or hollow with atrophy, our figures spent and wasted as with a sore disease. All this we know—the papers on the walls, the colors in the carpet, the inescapeable blue china, the one or two autotypes, photographs, and etchings alone permitted us—the bare, comfortless bedroom, the austere dining-room. We know this sort of thing is æsthetic, and let us be æsthetic, or we are nothing.

All these rooms resemble each other. The Queen Anne-mad decorators have but one idea, and drive it to death. We know without entering it what that house is like. There is not one original thought in it, from its inconvenient entrance to its last dark and æsthetic cranny. We know every chair—every tint—every brass knob—every wretched hard sofa and skewer-legged table—almost every "orthodox" work of art on those deadly-lively walls. These houses reflect no inmate's character, no natural need and requirement; they contain no thought, no sweet little surprise—no touch of genius, not even of ability.

Yet they are "æsthetic." Much labor and lucre are spent on making them so, and the inhabitants are duly "worked up" to their walls, with a garb and a language of their own. After all, what does æsthetic mean? If æsthetic means "discriminating," we only see that the æsthetic discriminate between vulgar comfort and select misery; if it means "eccentric," popularity is surely bringing the seeds of death, unless the eccentricity be of speech, and then we bow, baffled, before the "inescapeable and lordly" *nice*ness which results in "distinctly inevitable" obscurity. But though our unregenerate hearts may sigh for relief and sometimes neither blue-green nor green-blue, we must not be unjust. These rooms are so convenient, after all! They are less offensive than the cold red and gold business. You can move easily among the sparse furniture. The little joints and inlaid spots are very "nice," and the little skewer legs vibrate sympathetically at a touch, so slight are they. There is something weakly and feminine about this style which goes to our hearts. Yet the inoffensiveness, unwarmed by some character, some *chic*, is in itself sometimes an offence.—*American Cabinet-Maker.*

EARLY IRON MAKING IN ENGLAND.

In the reign of Edward III. iron was so scarce that the pots, spits and frying-pans of the royal kitchen were classed among the king's jewels. Up to the end of the fifteenth century, English iron was not only dearer but inferior to that manufactured on the continent. During the fifteenth century the manufacture of iron began to be extensive in Sussex, where the ore and timber for smelting it abounded, and iron mills soon became numerous in the country. The landed proprietors entered into the business eagerly and not only were many ancient houses enriched thereby, but several new men acquired wealth and founded families. In the forest of Dean also iron was largely smelted, but the land soon became denuded of trees in consequence of the exclusive use of charcoal for smelting; people became alarmed, and many edicts were fulminated restricting the manufacture of iron. Eventually the feeling became so strong, that from the time of the Restoration the iron manufacture of England rapidly declined. Coal as then used, injuriously affected the quality of the iron, and it was not till the beginning of the 18th century that steps were taken to overcome this difficulty.

Diphtheria and Milk.—In his last annual report on Bradford, Mr. Harris Butterfield records certain cases of diphtheria, which, with great show of probability, he attributes to the use of infected milk. The child of a milk dealer was taken ill with sore-throat on August 18th; the servant of a family living some way off, was attacked with diphtheria; and on September 9th, four cases, in three separate houses (one at the house where the servant was lying), were recognized. The houses were not in a bad sanitary condition, and there had been no communication between the families. The only circumstances common to all was that they obtained their milk supply from the dealer whose children were ill with the disease. Mr. Butterfield thinks it probable that, on two occasions, at least, the milk was infected with the poison of diphtheria. On the occasion of his visit, the milk cans (which were rather dirty) had not been cleansed at half-past eleven in the morning. They were kept in a scullery or wash-kitchen, in which was a sink with an untrapped pipe. Under this sink was a chamber utensil containing excreta. Near the milk cans was a wash-tub half full of dirty water, and resting on the milk cans were two bundles of dirty linen from the bed and person of a child found ill in bed with unmistakable diphtheria. The milk supply from the farm was, of course, at once stopped, but not before another child, who had partaken of the milk and occasionally visited the farm, had become infected. This last case died, as also did the mother, who contracted the infection while nursing the child.—*British Medical Journal.*

To Make a Strong Paste.—To make a strong paste for fastening bills in a file book, or for any purpose where a very strong paste is desired, the following recipe is recommended:—Rice or starch paste is the best. Four parts, by weight, of fine glue are allowed to soften in 15 parts of cold water, and then moderately heated until the solution becomes quite clear; 65 parts of boiling water are now added with constant stirring. In another vessel 30 parts of starch paste are stirred up with 20 parts of cold water, so that a thin milky fluid is obtained without lumps. Into this the boiling glue solution is gradually stirred, and the whole kept at a boiling temperature for a short time. After cooling, a few drops of carbolic acid are added to the paste. This paste is exceedingly adhesive, and may be used for leather as well as for paper and cardboard. It should be preserved in corked bottles to prevent evaporation, and in this way will keep good for years.

A New Screw for Driving.—A new screw, which is well adapted for driving, and which enters the wood without tearing the grain, has lately been patented. The gimlet point is dispensed with, and a cone point substituted. The thread has such an angle that it drives in barb fashion, offering no resistance in entering, but firmly resisting all attempts to withdraw it except by turning it out with the screwdriver. The head is flat, but in setting it up two studs or square-shouldered projections are raised in it by the one operation. The screwdriver takes hold of these instead of the customary nick, and holds quite as firmly, and when driven flush the projections on the head are not in the way, and do not disfigure it. It is said that this screw can be made one-third cheaper than ordinary screws, the principal saving being effected in doing away with the necessity of sawing the nick in the head.

ARTISTIC WOOD CARVING.

For several years Mr. Ben. Pittman, of Cincinnati, has conducted at Cincinnati an important class for instruetion in wood carving, in the School of Design of that city, Mr. Pittman is a gentleman of fine artistic culture and experience, and has been very successful in popularizing artistic work in wood carving. Those who saw the unique and remarkable exhibit of the work of the pupils of the class in the Normal Pavilion at the Centennial, will only need to be reminded of it to recall it with pleasure. We are indebted to Mr. Pittman for the copy of a letter, intended to give those interested some idea of the work undertaken by the students and how it is done, from which we extract the following concerning tools and methods of study. These facts have interest for all who, without opportunity for instruction, may desire to employ their leisure in artistic wood carving, either for pleasure or with a view to profit.

If we describe a pupil's first piece of carving, we shall readily find out what is necessary to be known to suitably decorate so simple a thing as a wall pocket—usually the first article on which a pupil commences. The front of a wall pocket is a rectangular piece of black walnut, seven-eighths of an inch thick, and eight by eleven inches square, with chamfered edges. To learn something of the nature and grain of the wood, and the use of the only tool that is first put into the pupil's hands, namely, a knife (called a hawk's bill, resembling a very small pruning knife), the panel is turned to its back, and on this a little experimental cutting is done. A few leaves are drawn with pencil by the teacher, and the pupil outlines them with the knife, first making a vertical cut over the pencil lines, and generally at first, passing over the line twice, to make it sufficiently deep ; then on the outside of the leaf a slanting cut is made, deep enough to cut out an angular shaving, leaving a little groove about one-sixteenth of an inch deep all around the leaf. A few leaves outlined in this way will prepare the pupil to treat the face of the panel with assured success.

For the first effort several suitable designs are offered, from which the pupil selects one. All subsequent designs are made by the pupil, of course assisted and corrected by the teacher. Designs are made on paper with pencil, and when pronounced satisfactory are transferred to the wood by tracing over the design, having a piece of blackened carbon paper placed underneath. The front of the wall pocket is treated as a vertical panel—that is, the decoration must be suitable to a vertical position. A fitting design might consist of a border having a rosette ai each corner, thus giving two horizontal and two vertical lines of ornament. Suitable lines of decoration for the top, bottom, sides and corners are shown, and the pupil selects the most inviting. The centre of the panel would admit of a choice from a great variety of designs. A natural or symmetrical floral design, or a shield, with the owner's monogram, with some encircling sprays, would be both simple and appropriate.

When the design has been outlined with the knife in the way described, the back-ground—that is, the space not covered by the design—is stamped or grained with a tool, the simplest form of which would be a tenpenny nail with its dull point grooved with a knife-edge file into rectangular cuts, two in the narrow and three in the other direction. This stamp, struck with a mallet, sinking the wood a bare sixteenth of an inch, gives the background a uniformly grained appearance, throwing the design into perceptible relief. If the pattern is then painted with dissolved shellac and the background oiled with clarified linseed oil, a simple but beautiful style of surface decoration is obtained, very suitable for all surfaces exposed to touch or wear, as the top or edges of tables, panels of doors, fronts of drawers, &c. The knife is the best tool for the pupil to commence with. It should be held firmly gripped with four fingers, the edge of the thumb resting on the wood. After a week or two of practice, the pupil will find that outlining may be more rapidly done with a parting or **V**-shaped tool, which cuts a groove at one stroke.

The pupil is not detained for theoretical teaching. He proceeds simultaneously with practical work. Students readily perceive that plant forms may be conveniently grouped for decorative uses, as (1) aspiring, (2) clustering, (3) climbing, creeping or drooping forms. The simplest natural elements of decoration are leaves, flowers, buds, sprays, fruit and geometrical forms. These elements may be decoratively employed by (1) repetition, (2) alteration, (3) inclosure (in geometrical forms), to produce lines of ornament, (4) by radiation, to form rosettes and panel decoration, (5) by inclosure to form diaper and all-over decoration. Good decoration is attained only when it is suitable for the position it occupies ; it must be modest or pronounced, according to the limitations of space, position, &c. The simplest form of a leaf, placed side by side (the principles of repetition), or leaf and bud (the principle of alternation), would form lines of horizontal decoration. A leaf repeated, one below the other, would form a line of decoration for a vertical position. A line of decoration for the top of a picture frame might consist of leaves or pendant flowers, or buds in a drooping position. A suitable line of decoration for the bottom of a frame might consist of geometrical forms, squares, diagonals, circles or arches, enclosing leaves or blossoms—a treatment suggestive of an architectural base—illustrating the principle of repetition by inclosure. If the upper portion of a frame, or the back of the wall pocket, already instanced, were made with a pediment life finish, space would be afforded for decorative treatment of a more natural or realistic character. The question of conventional or natural treatment, about which authorities differ, readily settles itself in practical work. According as the space to be decorated is limited and the position constrained, will the treatment be more or less conventional. When the space is ample and the position one of importance and dignity (the panels of a cabinet for instance), the decoration may be as natural as the skill of the pupil can make it.

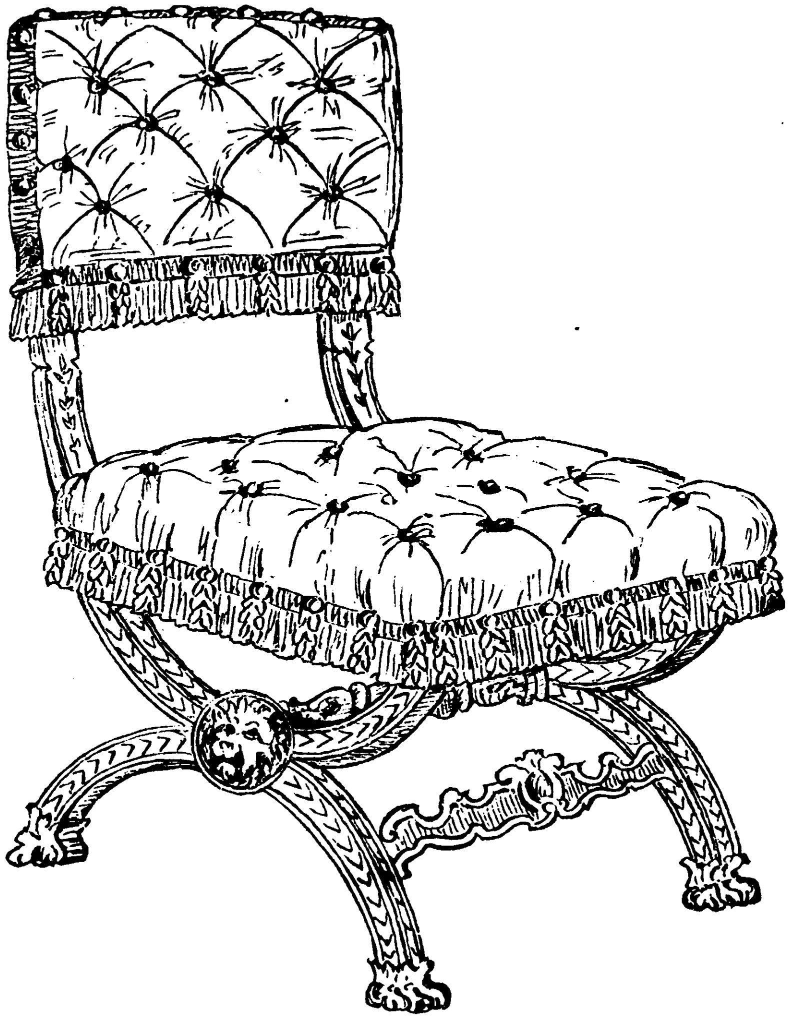
The carving tools with which the pupils begin to lower and model are small and convenient, and of a kind which would be called engravers' rather than carvers' tools. It is believed much of the success that has attended the Cincinnati experiment is due to the use of these easily managed tools, the handle of which is 2½ and the blade 2 inches long, The ordinary carving tool, with its long handle, is held in one hand and steadied and guided by the other. This action requires a special training of the arms, combined with considerable force, to produce accurate cutting. It is similar to the effort required to draw or write accurately without resting the hand upon the paper. The short tools, on the contrary, are easily held in one hand, while the other is free to hold and turn the work to the required direction. By special recommendation of the short tools for the fine and delicate work which is first encouraged is, that the training which the fingers and hand have received in holding the pen and pencil for writing and drawing, suffices to give the necessary skill for carving, without spending time in acquiring a new technique of fingers, hand and arm. After six months' practice, when the pupil needs to cut from half to one and a half inch deep, the ordinary large tools, with a little mallet, are used.

Among the work produced in this department of the School of Design, have been stands and tables of various designs, caskets, foot-rests, wall-pockts, book and dining-room shelves, hall-racks, bench ends for churches, hanging and standing cabinets, bedsteads, bracket and standing mantels (a mantel 11 feet high is now in hand), picture frames, table and standing easels, bureaus, washstands, wood and coal boxes, gentlemen's dressing stands, music stands, music-book cabinets, fruit and alms plates, alms boxes, newel posts, pedestals, base boards and wainscoting, a parlor organ and piano, and, not to be omitted though one-half completed, the decoration of the great organ of the Music Hall.

The woods most preferred for carving are black walnut and cherry. The latter, when the fruit stain of the wood is developed with lime-water, produces a cameo-like result, throwing up the design with fine effect, especially suited for base boards, wainsscoting, &c.

Sir Robert Porter's Battle of Agincourt.—A few weeks ago a picture one hundred feet long and thirty feet deep, was hung in the Guildhall, London, to remain on view for a week. The picture contains upwards of one thousand figures, and is a representation of the battle of Agincourt. It was painted by Sir Robert Kerr Porter (painter of the Siege of Seringapatam) when nineteen years of age, and was, about the year 1819, presented by him to the Corporation of the City of London. It has occasionally been utilized as a screen at the Mansion House, but owing to its immense size it has been found necessary to cut it into three sections. The centre piece, which is fifty-four feet long, represents the battle at its height. The side pieces are twenty-three feet long. The one on the right portrays the retreat of the French army, while on the left is a beautiful landscape, with a portion of the English army advancing through a well-wooded and watered country to give battle to the foe. As it is impossible to find space for the picture in its entirety, a committee has been appointed to consider the advisability of mounting and restoring it.

Adhesive for Rubber Belts.—A simple adhesive for rubber belts is made by sticking powdered chalk, which has been evenly sprinkled over, to the surface of the belt by cold tallow or boiled linseed oil.



DESIGN FOR A CHAIR.

A Signboard and a Question.—The newspapers have given particulars of a singular dispute touching the ownership of the signboard of the Royal Oak Hotel, Bettws-y-Coed, submitted for the decision of the Bangor District Court of Bankruptcy. The sign, which is well-known to most tourists in Wales, was painted by David Cox in 1847, as the signboard of the hotel. David Cox re-touched it in 1849, and in 1861, at the request of many admirers of the artist, it was placed in the hall of the hotel. The late landlady having gone into liquidation, the trustees claimed to include in the effects the old signboard, for which it was stated a connoisseur had offered 1,000*l*., and a dispute now arose whether the painting was not a fixture, and as such belonged to the lessor, Lady Willoughby D'Eresby. The judge, after a perusal of the voluminous affidavits, decided in favor of her ladyship, directing that the costs of the application should be paid out of the debtor's estate. To make us agree in the decision as to this old sign, we ought to hear that no other signboard had been put up in its place outside. The incident reminds us of Sir Edwin Landseer's old shutter. Mr. Jacob Bell had done some friendly commission, as on many other occasions, for the artist, and the latter desired to give him something. Bell would have nothing, but ultimately said, "Well, give me the old shutter in the stable window," a rough panel on which Landseer had partly painted a picture. For this, as he told us himself, he was afterwards offered 600*l*.

THE FAN-TAILED POODLE.

The *Deutches Familienblatte*, of Berlin, gives the above, which it styles "A new American invention—dedicated to the Society for Preventing Cruelty to Animals."