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## THE LABOR STRIKES.

FOR the first time since the summer of 1877, made memorable by the great railroad riots, there are symptoms of a general disaffection among the working classes in the States, which has manifested itself in the organization of extensive strikes for higher rates of wages. These have followed each other with such rapidity and method that they would appear to have been the outgrowth of a plan carefully and deliberately considered in advance by the great labor organizations that of late have grown powerful and aggressive. The iron manufacturing and railway interests, among the most important of the country, and the most vulnerable to attack, have, as usual, been made to bear the brunt of the conflict. What the outcome will be it is difficult to foretell with certainty, but it is more than probable that, as is nearly always the case, the men will lose in the end. Both the time and the conditions of trade are unfavorable to them. There has lately been a lull in the iron trade—a natural reaction from the extraordinary activity of the previous year, and one that was the inevitable consequence of a poor crop and the collapse of numerous and vast speculative operations. On this account, and also because of the existence of a large stock on hand, the iron manufacturers can look with comparative serenity upon the situation, consoled by the reflection that the leaders of the labor organizations could not have chosen a time to precipitate the conflict that would have caused less inconvenience and loss to the masters, than they did.

So far as their ability to withstand an organized labor conflict, the railroads, in consequence of the disastrous war of rates carried on during the past year, are not in so strong a position financially as they should have been; but another element in their favor, which the movers in the strikes must have overlooked, and which more than counterbalances their weakened financial condition, is the continual flow of immigration to the shores of America. Last year for example, immigrants landed at the unparalleled rate of nearly 2,000 per day; and this year they are pouring in still more rapidly. These newcomers are made up largely of men in the vigor of life, and who are therefore available for immediate employment.

The trade unions have had time to replenish their coffers since the disasters of the panic years 1873-'77; but we gravely question whether the result will not prove the present movement to have been an act of supreme folly. It must be admitted, to the honor of the strikers, that their movements have been in the main quiet, orderly and dignified, and that but few instances of violence and intimidation have had to be recorded against them; but the initiation of the great strikes of the iron workers, and of the freight handlers, the former of which is still in progress involved in in both cases a discreditable breach of faith. The iron workers rejected plans for arbitration that they themselves had suggested and approved; and the freight men, without even the formality of asking for the additional pay they afterwards demanded, abandoned their work, apparently thinking they could easily coerce the companies into compliance with their demands. In this the men were seriously mistaken, and the indications at the present writing are that both strikes will terminate in complete failure for the strikers.

Irrespective of the merits of the issues for which the present warfare is being waged, it is certain, if long continued, to entail great disaster, suffering and misery upon the laboring classes who engage in it, and on this account will be regretted by all. As regards the iron trade, however it may be productive of results more far-reaching and calamitous than the organizers of the strike have dreamed, for whatever be the issue, the fight cannot but aid the British iron trade to the detriment of the Americans. The English papers are already rejoicing over the prospect. One of them, puts the case plainly: "If the men succeed, the increase in wages obtained will cause a rise in prices, and with the rise of prices the export of British iron to the United States in large quantities will become possible. Even last year there were somewhat over three quarters of a million tons of iron imported into the United States, and if prices were now to be raised, the import would be enlarged until prices rose here also to counterbalance the rise in the United States. Even if the men are defeated, and wages remain as they are, a rise in price is inevitable, provided the strike continues for a month or two. The cessation of production in all the great iron districts in the United States for several weeks, would give time for the exhaustion of the stocks on hand. Last year, as we have already said, over 9,000 miles of railway were made, and this year the rate of construction so far is still more rapid. Besides, there were at the end of last year more than 103,000 miles of railway in the United States, and this vast mileage requires constant renewals, which use up a large amount of iron. But if production is suspended for several weeks, while railway building and railway repairing go on, and stocks are thus greatly reduced, prices must rise ; and a rise of prices will open the door to foreign imports, and will thus give an impetus to the British iron trade."

With the prospect of the wholesale blowing-out of furnaces and shutting down of mills, which the flooding of the country with British iron would imply, the victory of the men would be a barren one indeed. It is a subject of infinite regret to right thinking men that there should be no better plan of adjusting differences between employees and employers than the destructive and suicidal resort to the strike. In the vast majority of cases, the strikers fail in their object, and the misery, wretchedness and suffering it entails, fall with terrible severity upon the dependent families of the wage earners.

If half of the executive ability and zeal displayed in organizing lodges, unions and the like, were spent in devising plans for the equitable arbitration of disputes and differences, the strike would be a thing of the past.

## THE PROGRESS OF OUR TIME.

The prediction made for the last twenty-five years, by all well informed scientists, that we were standing on the threshhold of an advance in science and in its practical applications, greater than the world has ever seen, has commenced to be realized. Thanks to the astounding advance in electrical science we send instantaneous communications, over distances of thousands of miles, even when oceans separate the stations ; we converse by mouth and ear with our friends several miles distant and that by help of only a metallic wire, undisturbed by intervening noises, which would entirely destroy ordinary sounds. We can convey light and heat over such wires, and even motive power, all disguised in what we call electric currents, which, notwithstanding their essential nature is still a mystery to us, we have learned to generate, to manage and make subservient to our purposes. The practical accomplishment of the last mentioned transformation, is wholly due to the providential abundance of coal and the consequent cheapness of steam power, all the electricity needed for the lights, which illuminate our cities and buildings being produced by this agent.

There never could be a more striking practical illustration of the correctness of the new doctrine of the conservation and correlation of forces than these facts. This doctrine teaches that the amount of force (motion of matter) in the universe is a constant quantity, in other words that force is indestructible, and that what we commonly call a loss of force is only a conversion into a special form of motion, which may be heat or electricity. It is the pride of our age to have demonstrated this as a truth.

If we trace the operations involved in electric illumination backward to its primary origin, we have to go back to the solar light. This was the cause of the growth of forests, of which the remnants form our coal beds, in which the solar light and heat is as it were stored up. It is this solar heat which evaporates water, and forms clouds from which rain descends, originating rivers and streams and all our water power ; this power may move machinery directly, but if we use the heat which was stored up in coal we must set the heat free by combustion, and either expand air or evaporate water, and use the expanding air or water vapor to act upon proper machines so as to move them. This motion is applied to the ingenious combination of iron cores surrounded by copper coils, which we call a dynamo. The iron having been slightly magnetized causes electric currents in the coils, which react on the iron, increasing its magnetism, while this mutual action and reaction between the magnetic iron and the current in the coils evolves at last electric currents strong enough to produce a light which is the nearest approach yet made by man to the sunlight, from which it has its primary origin. Or we may, in place of making a light, cause the electric current to act upon a similar combination of iron cores and copper coils which we call an electro motor, and cause this to move. In this case we reproduce the motor of the dynamo, and it gives a ready method of transmitting power to a distance, and that over a mere telegraph wire.

The fancy in which many indulge, that electricity will become a motive power, has, as matters look at present, no hope of realization, because the cheapest source of electricity as yet known is motive power, and this we must have first to begin with, in order to generate the electricity. It has been proposed to utilize the motive power of great cataracts such as Niagara, drive dynamo machines with the same, conduct the currents generated over wires to distant localities, and use them for illumination, or power, and such a plan is perfectly practical. Millions of horse power now running to waste can thus be utilized, and this is one of the improvements in store for us in the future.—*Industrial News.*

## TECHNICAL EDUCATION.

Writing of technical education in England, the American Consul at Bradford says that more than twenty years ago the Swiss Government established in Zurich a general scientific institution, instructing in applied mechanics, physics, and the arts. The cost is $100,000 a year, which is cheerfully borne by a population not larger than dwell within five miles from the City Hall in this city. After other Continental countries had maintained such schools many years, the subject was taken up in England. The Consul sums up his idea of these schools as being intended to supplement the education of the ordinary school by that especially calculated to increase knowledge of each man's trade or business, so that he may contribute more largely to the general wealth ; this, he thinks, should form a large part of national education, and pupils should consist largely of boys and girls drafted from the elementary schools, and no school in any important commercial center would be complete without an industrial museum, the advisers of the Livery Companies' Committee unanimously saying that laboratories and a collection of technical works, etc., are indispensable. As English manufacturers acknowledge that their most successful rivals are in those countries or localities where technical education has been carried to the highest point, the Consul is glad to know that a few technical schools have already been established in the United States, principally in the engineering and iron trades, and he earnestly hopes ere long to hear that a system of thorough technical education has been adopted for the whole country, there being no other means so effective for developing the resources of the country and improving its manufactures.

There will, of course, be no dissent anywhere as to the importance of this subject. The most skillful labor, although nominally high-priced, is really the cheapest; it is always found, also, in countries where the use and development of machinery are greatest, and although machinery, being cheaper than human labor, may seem to render the latter less necessary and to narrow the demand for all but the ruder class of labor, in practice it is not so, for there is an apparently indefinite field for the best labor in anticipating, contriving and adapting machinery. The more machinery becomes the servitor the more the most skillful men seem needed to be its directors. It is also a suggestive fact that tastefulness in goods is fast becoming regarded as an indispensable adjunct of utility, if not as an actual part of it. In this matter American wares are already second to none except, perhaps, those of France, and the character of labor here gives the highest warrant for training it. Moreover, the most prudent educational fact is the marked tendency toward special education shown not only in the establishment of a few technical schools, but in the changes in the curriculum of old institutions, this visibly affecting even the upper classes.

# Educational.

## MANUAL DEXTERITY.

From Boston on the east to St. Louis on the west, the changes are being run on the necessity of teaching the fingers as well as the minds of school children. No well conducted teachers' institute fails to take a vote on it, and no educational magazine neglects to publish a paper on "Manual Education in the Public Schools." The great public sentiment seems to have, at last, come to the conclusion that not every free born American citizen can live by his wits, and a few must be content to turn their attention to manual labor, at least the more delicate kinds, and not, of course, such as shall raise big blisters on the finger and coarse callouses on the hands. The jack knife with which the typical school boy has been wont to carve rude characters on his desk and bench, is to be exchanged for a kit of tools, and the native instinct of "cutting" cultivated, instead of being repressed as it long has been—with what success a visit to any district schoolhouse will show. Those fingers which schoolmasters have been wont to look upon as of no other use but be cracked with an oaken ruler are to be dignified and exalted to a first place in our educational system; they are to be trained and taught to follow deftly the dictates of the brain, obedient to its every wish.

What better example of a perfect machine have we than the human hand! Remove the skin and the few little lumps of adipose tissue, and examine its intricate mechanism; its system of levers and pulleys, the economy of space achieved by one muscle passing through another, and the union of cords and tendons whereby one finger is given the power to move totally independently of the rest, and then attempt to calculate the number of movements imparted to the fingers by these few muscles. Watch the movements executed by the fingers of a musician, whether he plays the bass viol, the zither, or the piano; follow the hand of the compositor as he sets these very lines, of the type writer, the telegrapher, the rapid knitter, or a blind man reading raised characters, and tell us whether the hand is capable of being trained, or the fingers of being educated.

How many of the graduates who have this summer left their alma maters feeling that their education was completed, knew all the uses of their fingers, we are unable to say; but it is safe to assume that not one in ten had acquired more digital skill than was needed to write a letter, tie a necktie, button a lady's glove, and conceal a "crib" in his coat sleeve. It is a notorious fact that in every chemical laboratory, in every dissecting room and every other place where young men of liberal education are compelled to handle tools, they soon find that their "fingers are all thumbs."

One of the first questions that is always discussed by every school board or institute before whom the question of manual teaching comes up is, Shall we teach only the use of tools, or shall we attempt to teach a trade and turn out finished mechanism? Do both, do either, do anything you like, only give the boys a chance, and leave the rest to time. If it has any vitality in it, it will develop into something. The useless members will wither and fall off, those most fit to survive will assuredly prosper, for the law of "the survival of the fittest" is not limited in its field to the growth of plants and animals. Cities and towns, trade and commerce, manufacturing industries, churches and schools, have their development conditioned thereby.

Boston, as usual, claims to lead in this movement. The Massachusetts Institute of Technology has been, under the late Professor Rogers, a remarkable success. Fighting its way against poverty and want, it has conquered all opposition, and Boston feels encouraged to try the experiment of incorporating manual education on her public school system. At the Dwight School a class room has been sacrificed to the hammer and saw. Carpenters' benches have been put in, and tools provided for eighteen boys. It is needless to say that the boys need no coaxing, that it is more popular than military drill, and even the time taken from study does not retard their progress.

There is probably no reader of this paper, certainly no inventor, who, if he is not familiar with the use of tools, does not feel that a few such lessons as that class get in sharpening, handling, and taking care of tools would not have been of as much use to him as all the Latin he learned in school, or that his time would not have been as well employed at that as in memorizing all the mountains in Asia or the rivers in Africa. This experiment may not prove a *financial* success in Boston, but we are satisfied that the idea will yet be made practical, and become in time a success.

Grant the desirability of such a modification of the school system, and practical difficulties will present themselves—have done so already. There is a lack of teachers: normal schools do not produce them, nor can they be found in the shops, although the latter can do more than the former. The number of good, thorough, enthusiastic teachers is small, because a good teacher, like a poet, is born, not manufactured in a normal school, and of this little band too few know aught about tools, or could lead and instruct a class in carpentry, while our best carpenters have as little conception of how to preserve discipline among school boys. Another difficulty is the expense; tools cost money, much more than books: wood must be used, and a fresh supply kept up. The pupils must not be asked to bear this expense, and tax payers object. This obstacle is a serious one in the free schools, where it is most needed.

It was not our attention to pass by the girls, but at present they are better provided for than boys. In Boston sewing is a regular part of the school curriculum, and they not only learn to sew but do it well. This is something that can be done at a slight expense, and teachers that know how to sew are not so scarce. Mr. L. H. Marvel, in his paper on "Manual Education in the Public Schools," which appeared in the June number of *Education*, says that in schools where sewing is taught the sewing does not detract from the efficiency of the other work of the school. The same writer adds: "Sewing was taught in all elementary schools half a century ago, and to boys and girls alike." It is unfortunate that this has not been kept up; it is better that a school boy should sew or knit, than that his fingers should get no training beyond that of clumsily grasping a pen holder, while his body is twisted into some painful position to conform to the unhygienic law of the writing master. In the kindergarten, which too few of our children enjoy the advantages of, efforts are made to train the eye, voice, ear, and hand, but the training stops when the child enters the school, and its effects are soon dissipated. One point must, of course, be guarded against, that the occupation of the fingers be not such as to *strain* the eye or produce near-sightedness.

An ingenious teacher would have no difficulty in arranging a series of exercises equal to any of the "finger gymnastics," of the music teacher, without being half so stupid, which should embrace the use of knitting, crocheting, and sewing needles, of stilettos and bodkins, of awls and gimlets, of scissors and pen knife; braiding, plaiting tatting, netting, tying knots, and splicing small ropes, are among the operations adapted to teaching girls and boys what their fingers are good for. One of our very skilled surgeons boasts of his skill in sewing, and the ability to hem the finest cambric handkerchief; and it would not injure any boy to be able to work a button hole, nor any girl to be able to tie up a bundle.

The sense of feeling since it resides in the fingers, could be cultivated at the same time, and while the skin is young and soft is the best time to learn to distinguish things by touch; the difference between wool and cotton, silk and linen, kid and dog skin, sheep and calf, between flour and meal, between pure sugars and mixed, between silver and lead—these are distinctions a knowledge of which will be of practical value.—*Scientific American.*

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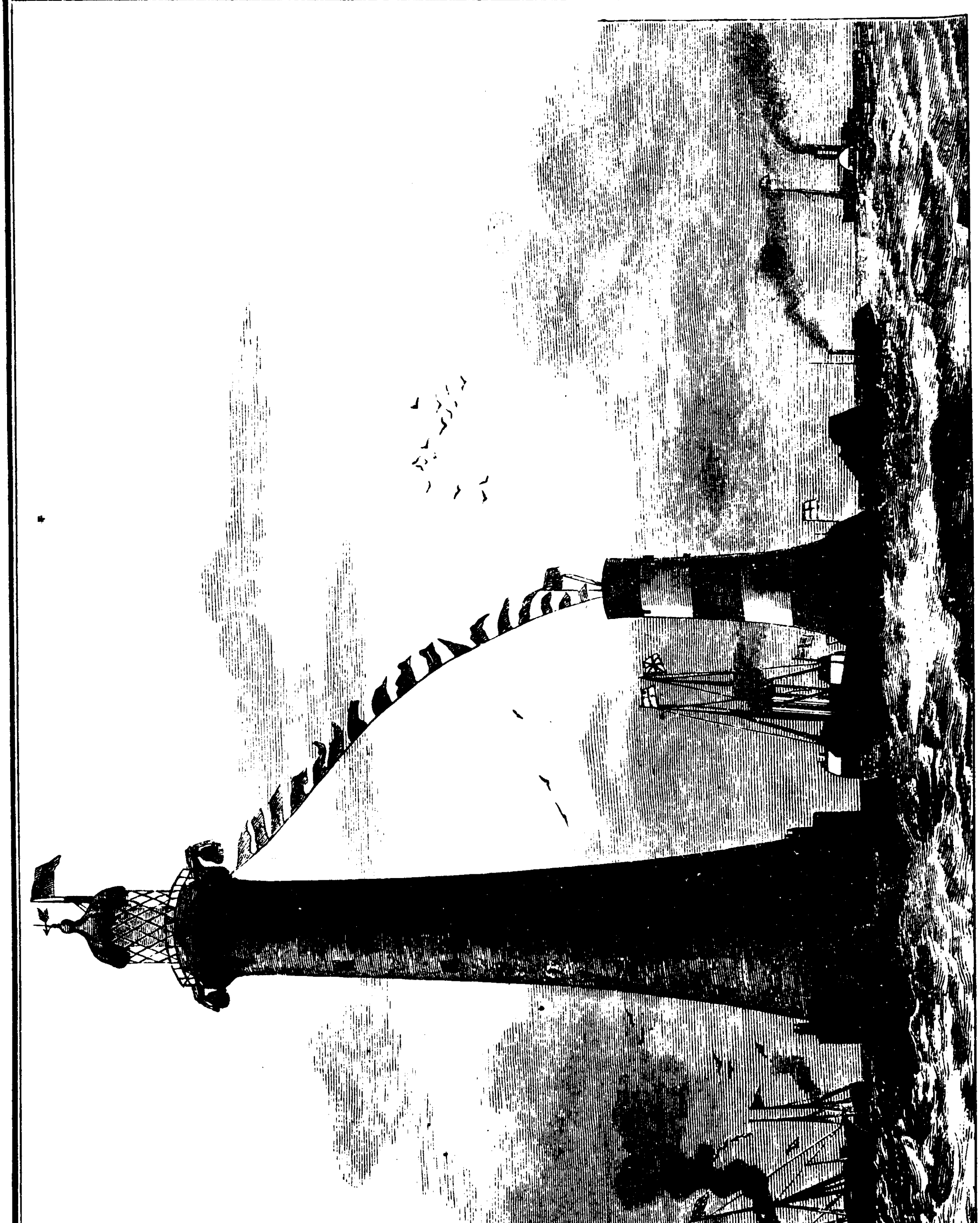
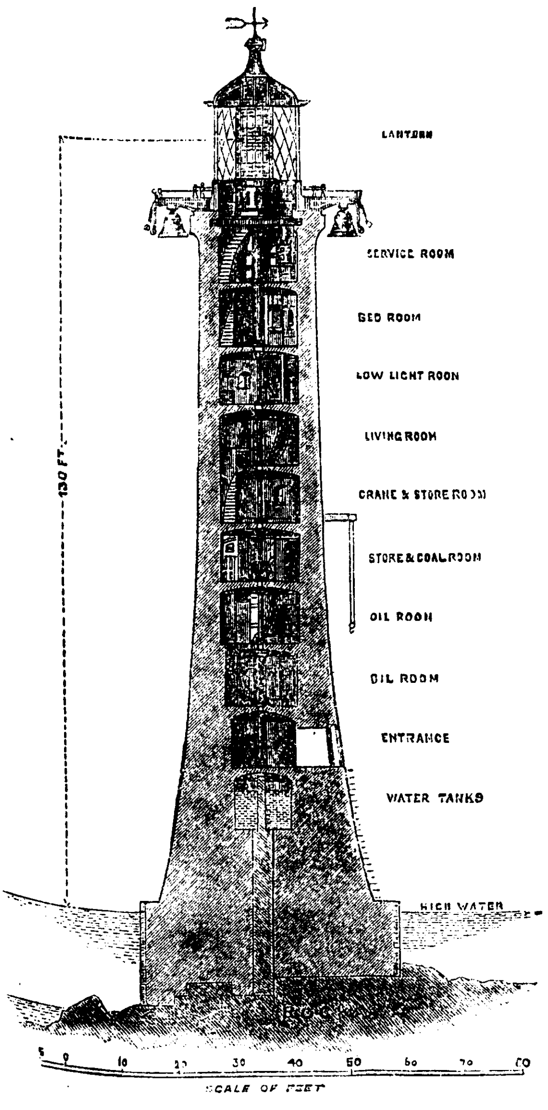
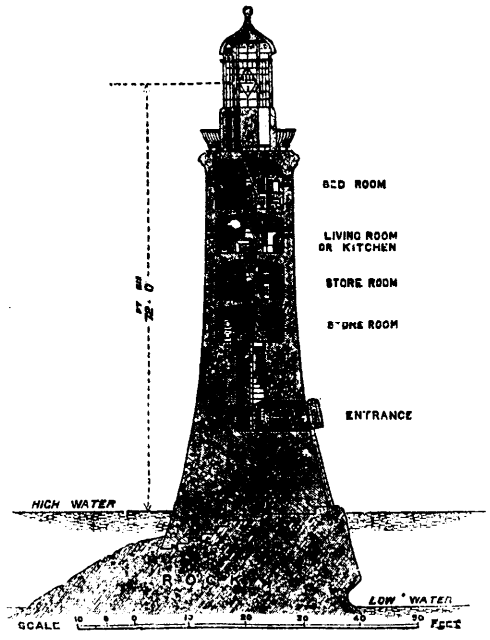
THE OPEN FIREPLACE.—A contributor to the English *Art Journal*, in an article upon the smoke nuisance, which is constantly increased by the enormous growth of the metropolis, writes: "It cannot, however, be said that up to the present time any system of domestic warming has been presented to the public which affords the undoubted advantages which the open fireplace possesses. The open fireplace of the old-fashioned pattern is undoubtedly the best engine of ventilation for a room. An open fire with a bright flame conveys warmth to the walls of a room, while its rays leave the air to be breathed cool; and there is no doubt that the perfection of ventilation would be not only to have cool air to breathe, but to be surrounded with warm walls, floors, and furniture, so as not to feel ourselves parting with our heat to surrounding objects. Besides this, the open fire enables each occupant of a room, by selecting his position, to regulate according to his wishes the amount of heat he desires to obtain from it. There are, no doubt, cold countries of Northern Europe where the worship of the open fire does not prevail; but so far as England is concerned, it may be said that the abolition of the open fire would materially alter, if not revolutionize, many of our social arrangements."



INAGURATION OF THE NEW EDDYSTONE LIGHTHOUSE.




SECTION OF THE NEW TOWER.




SECTION OF THE OLD TOWER.

## Engineering, Civil & Mechanical.

### INAUGURATION OF THE NEW EDDYSTONE LIGHTHOUSE.

The first Eddystone Lighthouse was built by Henry Winstanley, in 1696. It was constructed of wood and stone, and was carried away, together with the architect and keepers, by a violent storm in November, 1703. A second, of similar construction, was built in 1708, by John Rudyard, a silk mercer, of London, and this was burnt down in 1755. The famous building by Smeaton succeeded this, and stood for over a century on the famous reef. In 1877 it was discovered that the foundation had been undermined by the waves, and that, although the tower itself was sound, the portion of the reef upon which it rested had become insecure. The construction of a new lighthouse had therefore become imperatively necessary; and its cornerstone was laid by the Duke of Edinburgh, August 19, 1879.

The new tower is from designs by Mr. James N. Douglass, chief engineer to the Trinity Board. The building has been entirely carried out under the personal superintendence of Mr. Thomas Edmond, the resident engineer, with Mr. W. T. Douglass as his assistant. It is entirely of granite from the De Lank quarries at Wadebridge, near Padstow, in Cornwall, with the exception of seven courses, in the lower part of the tower, from Aberdeen. A solid cylinder of granite, 44½ft. in diameter, was first built up from the rock to the height of 2½ ft. above high water. From this, as a base, the tower springs, leaving a terrace, 4½ ft. wide, all round.

Experience and observation satisfied Mr. Douglass that the shape of Smeaton's tower, of which so much had been said, was not the best that could be designed, and that, by allowing the waves to run up readily toward the summit this shape had the effect of throwing the main stress of the water upon the upper part of the tower, where it acted with enormous leverage to weaken the base. He has, therefore, placed the curved portion of the tower upon a base with vertical sides, which will not have the same tendency to produce an upward run of the waves, and has also laid the foundation in a manner somewhat different from that which Smeaton had employed. The tower is built of granite blocks, some of them 6 feet 6 inches deep, 2 feet thick, and 3 feet 10 inches on their outer circumference, and they are all without a flaw. Throughout the whole tower every stone is dovetailed, by projections and grooves, into those above, below and on either side of it; and the interstices between the blocks have been filled up with Portland cement, which blends the whole into a mass, the joints of which are as hard as the granite itself.

The Eddystone rocks, which are of gneissic formation, consist of three reefs, the western, southern, and northern, with odd rocks dotted about irregularly. The old tower—Smeaton's, now in course of demolition—stands upon the northern extremity of the western reef. The new tower, just completed, stands at the northern extremity of the southern reef, the middle of the three. The whole group of rocks occupies nearly a square mile at low water, and stands a little to the north of a direct line between the Start Point in Devon and Lizard Point in Cornwall, being about forty miles from the former and thirty from the latter. The distance between the two towers, from center to center, is only 127 feet. The height of the focal plane of the light in the old house was 72 feet above high water, and was visible thirteen miles, while that in the new house is 133 feet, and is visible seventeen and a half miles.

On Thursday, May 18, 1882, the new lighthouse was set in operation by His Royal Highness the Duke of Edinburgh, as Master of the Trinity House Corporation, who have the charge of all lighthouses round the British coasts.

The Duke went to the Millbay Docks, where he was received on board his old ship, H. M. S. Galatea, which at once moved into the Sound. She was followed there by the Trinity yacht Siren and the Harpy, which contained the Mayor and Corporation of Plymouth. The Carron, with the Mayor and Corporation of Devonport, and the Vivid, the yacht of the Port Admiral, Sir Houston Stewart, were waiting off the pier, and with the Triton, Trusty, Perseverance, and other government steamers, joined in the procession, followed by a number of private steamers and by a whole fleet of yachts. The Galatea led the way, closely followed by the Siren; the Vivid and the Harpy coming next in order. The ships in port were dressed with flags from sunrise, and as the royal standard was hoisted salutes were fired from the citadel and men-of-war. The weather was brilliant. As the Galatea passed through the Sound two American corvettes, the Portsmouth and Saratoga, which were lying there, dressed colors and fired a royal salute. The run out occupied about an hour and a half. The coast of Devon and Cornwall, from the Prawle Point to the Dodman, was distinctly visible, and the sea was covered with craft of all sizes, from tiny fishing boats to ocean mail steamers on their way up channel. The Eddystone was reached at a quarter past eleven, and the vessels grouped themselves around the reef. This is well shown in our engraving, which is from the *Illustrated London News*. Altogether 9,000 persons were present at the Eddystone at the time the light was inaugurated; but the ceremony was not participated in by more than a select few of those on board the Galatea, with the addition of Mr. C. F. Burnard, the Mayor of Plymouth. The Duke of Edinburgh landed on the Eddystone Rock about half past eleven. A prayer was offered by the Rev. Dr. Wilkinson, the lamps were lighted, and the machinery which sets in motion the fog bell was started by the Duke of Edinburgh. Everything was found in the most perfect order. The ceremony over, cheers were raised by the party at the lighthouse, and taken up again and again by the occupants of the steamers which lay around. The Duke then embarked amidst another round of cheers, and the start homeward was speedily made, the Galatea and the Siren being this time the last to leave. The run back was made at full speed, after the Galatea had steamed round the American vessels in the Sound, which manned yards in honor of the visit. Millbay Pier was again reached a little after two. Here an address was presented by the Mayor and Corporation of Plymouth, and His Royal Highness drove from the pier to the Guildhall to attend a luncheon, given by the Mayor, Mr. Burnard. The magnificent hall was splendidly decorated. The company numbered over two hundred, and included the Duke of Edinburgh and elder brethren of the Trinity House, Admiral Sir Houston Stewart, and other heads of departments in Plymouth and Devonport, Commodore Luce and the officers of American vessels in the Sound, the magistrates and members of the Corporation of Plymouth, Devonport, and Stonehouse.

The Mayor, on rising to propose the health of the Duke of Edinburgh, said: "I may say that when I suggested to His Royal Highness, as I did, that we had not expected our American cousins on this occasion, and that it would be desirable to recognize their attendance, he at once expressed the pleasure it would give him to propose the toast of their healths. (Great cheering.) I have now to propose the health of the Corporation of the Trinity House, including the health of His Royal Highness, the Master." (Cheers.)

His Royal Highness, in concluding his remarks in reply, said: "I beg to thank you once more for the way in which you have drank to the health of the Trinity Brethren, and more particularly for the way in which you have associated my name with the toast. (Loud cheers.) The fact has been alluded to more than once by the speakers who have addressed this assembly, that we have among us to-day representatives of our Transatlantic cousins. I ask you to join with me and with the Brethren of Trinity House in welcoming among us Commodore Luce and the officers of the American squadron." (Loud cheers.)

Commodore Luce, was enthusiastically received, and said: "Your Highness, your Honor the Mayor, and gentlemen, I esteem it a great privilege to be present to-day to speak in the name of Americans. (Cheers.) As Americans, it is good for us to be here. (Cheers.) The very name of Plymouth recalls to mind the Pilgrim Fathers—(cheers)—and reminds us of Plymouth Rock in New England. As it has been happily expressed, the ocean does not divide but knits Old and New England. (Loud cheers.) Our traditions date from this country. (Cheers.) When my distinguished friend Admiral Sir Houston Stewart, reverted to the fact of Sir Francis Drake playing bowls upon Plymouth Hoe, just before he and Hawkins and Howard of Effingham, set out to meet and defeat the Spanish Armada, I was reminded that it was just as much the New England as the Old that was interested in that great epoch. (Cheers.) The Pilgrim Fathers and the Plymouth Rock are inseparably associated by us in America. And I would go further and ask what American there is who has not been nurtured in the English classics, and what American there is who has not had instilled in him the early English instincts of civil and religious liberty? (Cheers.) As the Old England has given light to the physical world, let us hope that it may continue to give light to the moral and religious world. (Cheers.)

Commodore W. B. Hoff, of the Portsmouth, Commander Henry C. Taylor, of the Saratoga, and Flag Lieutenant A. Ward were also present at the luncheon.

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## PROGRESS OF THE HUDSON RIVER TUNNEL.

Work on the tunnel beneath the Hudson river, uniting New York City and Jersey City, is being pushed so rapidly that one-fifth of the whole distance is now completed. On the New Jersey side the tunnel is advanced at the rate of three feet a day, a feat said to be unparalled in the history of engineering. The engineers in charge are confident that the greatest difficulties of construction have been overcome. Two tunnels extend under the river bed from the Jersey shore. The southernmost is now 600 feet long the northern 1,000. The peculiar formation of the soil on the New York side necessitated the sinking of a caisson, instead of the use of a shaft, as was done on the New Jersey side. The caisson is forty-eight feet long, twenty-nine and a half feet wide, and twenty-six feet in height, outside measurements, and is sunk so that its bottom is fifty-six feet below the mean low-water mark and sixty-five feet, below the surface of the street. It is made entirely of wood; its walls are three feet thick, the sides having a slope of one-half inch to the foot. so that its interior somewhat resembles the sloping sides of an inverted funnel. It is one-third larger than that used on the Jersey side and weighs 400 tons. On top of the caisson a coffer-dam in three compartments was constructed, these compartments running east and west across the caisson, and the central compartment being nine feet in width. In this are the air-locks admitting to the base of the caisson and thence to the tunnel proper. The two side compartments are filled with the material removed from the excavations, thus serving as a load for the caisson. The whole arrangement with its load weighs about 2,500 tons. The caisson is, of course, air-tight. When the caisson was sunk to its proper level the bottoms of the lower halves of the projected tunnels were bricked up inside the caisson. The work thus far was comparatively easy, but that which has followed during the past four weeks, the opening of the north tunnel, has been watched with much interest by engineers. It consisted in cutting out the side of the caisson westward, and the construction of the iron bulkhead and of the tunnel walls, every step in which work was a desperate fight against the yielding earth and the permeating water. When the side of the caisson had been cut through, the work of excavating the earth had to be carried on very slowly and carefully, for a new and unanticipated difficulty was met with. In addition to the pressure from above and from the sides, there was found to be an upward pressure of water from the bottom of the tunnel of twenty-eight pounds to the square inch. The water that found its way to the tunnel from below was found to be fresh, and to come from the southeast, where seemingly there is an underground spring whose waters make toward the river. How long this newly discovered trouble will annoy is purely a matter of conjecture with the engineers, but they think they have discovered a plan of successfully battling with the possible leakage from above or below.

When the rough excavation at the heading is made, a circlet of iron plates, set together against the soil so that they are air-tight, is constructed. This plan differs from that hereto-fore used in the work only in the substitution of smaller and variously shaped plates in place of the four by two and a half feet plates used on the other side. This change was made so that the exposed surfaces could more quickly be covered and the leakage, if any should occur, be more easily stopped and the treacherous soil be prevented from caving in. The plan has thus far proved efficacious, and the first section of the north tunnel, twelve feet out from the caisson, is completed. Workmen are now pushing forward the construction of the tunnel in the heading extending ten feet further toward the river. When this section is completed the work further out toward the river is begun, a new obstacle is to be met with and overcome. From the heading to beyond the river bulkhead wall is a distance of forty-seven feet, but before the tunnel can pass under the wall it must pass through the earth into which the piles on which the bulkhead walls rest are driven. But little trouble is anticipated, however the plan being to cut these piles off and build the walls of the tunnel of twice the ordinary thickness in order to support the additional weight imposed. Once beyond this wall of piles, and under the river bed, it is thought that the progress upward and downward will be comparatively easy, for it is expected that at a distance of from 300 to 400 feet from the caisson the workmen will strike the impervious silt which permits of much more rapid progress. Fifty feet below the mean low water level the opening cut is situated, but the tunnel most descend considerably below this level before the middle of the channel is reached, for at that point the depth of the water is sixty-three feet. With the increased depth of the water comes an increased pressure, a necessity for heavier masonery, and more problems which may defy theoretical engineering. The engineers in charge are confident, however, that the penetration of the treacherous soil on the New York shore—virtually a quicksand—is the most formidable obstacle to be overcome. Others, however, think that the greatest difficulties are yet to come and the greater skill yet to be exercised in successfully carrying the tunnel under the bed of the river channel. The interior of the tunnel is lighted with electricity, and telephonic communication is maintained with the shore. The work is expected to be completed in five years.—*Illustrated News.*

## A CURIOUS TORPEDO.

This latest offspring of Australian destructive ingenuity promises to be a distinct success. Its motive power is not compressed air, neither is it contained in the body of the torpedo. To propel the weapon through the water at a speed of from 15 knots to 20 knots an hour for 1,000 yards, a separate engine, or at least a special connection with an existing one, is necessary. This engine drives two drums, about 3 feet in diameter, with a velocity at their peripheries of 100 feet per second. Their duty is to wind in two fine steel wires, No. 18 gauge, of the same sort as that used in the deep sea sounding apparatus of Sir William Thomson. The rapid uncoiling of these wires from two small corresponding reels in the belly of the fish imparts to them, as may readily be conceived, an extremely high velocity. The reels are connected with the shafts of the two propellers which drive the torpedo through the water. The propellers work, as has long been known to be necessary to insure straight running, in opposite directions and both in one line, the shaft of one being hollow and containing the shaft of the other. Now, at first sight it would seem as if hauling a torpedo backward by two wires was a sufficiently curious way of speeding it "full speed a-head," but it is found in practice that the amount of "drag" is so small, as compared with the power utilized in spinning the reels that give motion to the propellers, that it may be left out of calculation altogether. Of course it is at once seen that this method of propulsion does away with the necessity for air-compressing engines and reservoirs pressed to 1,500 lb. on the square inch, which, however carefully constructed, must always involve a certain element of danger, however small. Neither are any delicate little engines, controlled and stopped by complicated, though exquisite mechanism, required. But these advantages, great as they may be, are as naught compared with the power possessed by the user of the Brennan torpedo to guide and govern its course and movements.

Many experiments have been recently made at Woolwich, and more especially at Chatham, and there seems little doubt, as far as can be seen at present, that the new torpedo will prove most valuable for the defense of harbors.—*Standard.*

A NEW BRANCH OF SILK MANUFACTURE.—A new and curious branch of silk manufacture has started into life in Paterson, N. J. The mode of manufacture is a secret, and is very closely guarded. Only the wearers posses the secret. The weaving is of a very high order, and those employed earn very high wages. The goods produced are made up to perfectly imitate sealskin. The process is entirely dissimilar from that of making plush and velvets. The goods in appearance are said to puzzle experts. If this statement is correct, a patent had better be risked than secrecy in manufacture.

# Mechanics.

## MACHINE FOR COLORING AND GROUNDING PAPER FOR PAPER HANGINGS, ETC.

In printing offices, book-binderies, paper hanging factories, etc., large quantities of colored paper are used which is generally colored on one side only. Formerly these colored papers were produced by manual labor, but of late, machines have been used for applying the color, rubbing the same on the paper, drying the paper, and then smoothing the same.

Mr. Ferdinand Flinsch, of Offenbach a. M., Germany, is well known as a manufacturer of machines for coloring paper; and the machine exhibited at the patent exhibition in Frank-a. M, gives ample proof of his ability in constructing and manufacturing machines of this class. In the annexed engraving a perspective view of this highly interesting machine is shown. Into the machine the paper is placed in large rolls: it is then unwound by the machine, colored, dried, smoothed, pressed, and finally wound into a roll. The first machine in which the roll of white paper is placed is a coloring machine, and the same draws the paper through coloring mechanisms, and then takes it over a large cylinder, upon which the color is distributed on the paper by a series of rotating brushes. The moist paper is then conducted upon a second machine which is used for drying it. In this second machine the moist paper is hung on a series of rods or shafts, and is moved backward and forward on the same a greater or less length of time until it is dry. This drying machine is very interesting, and is different from other similar machines inasmuch as chains are used to turn the rods, whereas heretofore belts or ropes were used, which produced irregular movement, as the ropes or belts contracted more or less, and thus some parts of the sheets were moved faster than others. These defects are avoided by the use of the chains. The paper is conducted through the space or room several times, and thus a very great length of paper can be dried within a very small space. After the paper has been dried it is passed to the winding machine, which winds it into a very solid and firm roll, the edges of which are as smooth as if they had been turned off. The fourth machine is an automatic adjuster for the rods or shafts on which the paper is hung while drying. A small steam engine of about one-half horse-power is sufficient to drive all the machines.—*Der Practische Maschinen-Constructeur.*

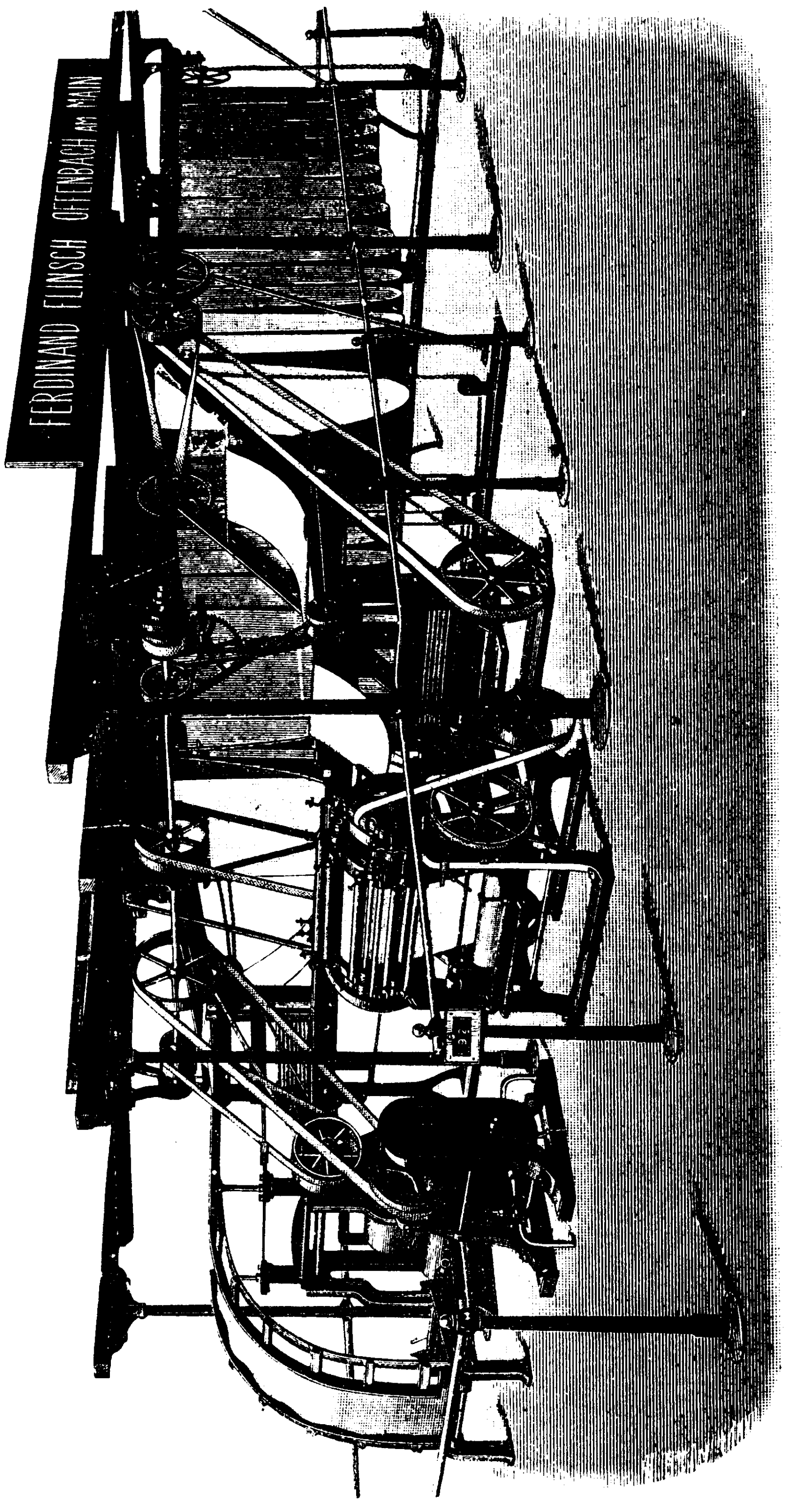
## IMPROVED PULVERIZER.

We give an engraving of the Thompson Patent Pulverizer, improved by Stephen P. M. Tasker, of the firm of Morris, Tasker & Co., Lim., of Philadelphia. It has been so changed by Mr. Tasker that nothing now remains of the original mill but the ball held between flexible disks. These improvements are results of experiments made at the Pascal Iron Works and during a year and six mouths' run at the mines. It is now perfected as a machine; and for the reduction of ores, etc., it stands, as we believe, unequaled. The efficient working of the mill cannot be realized unless it is seen in operation.

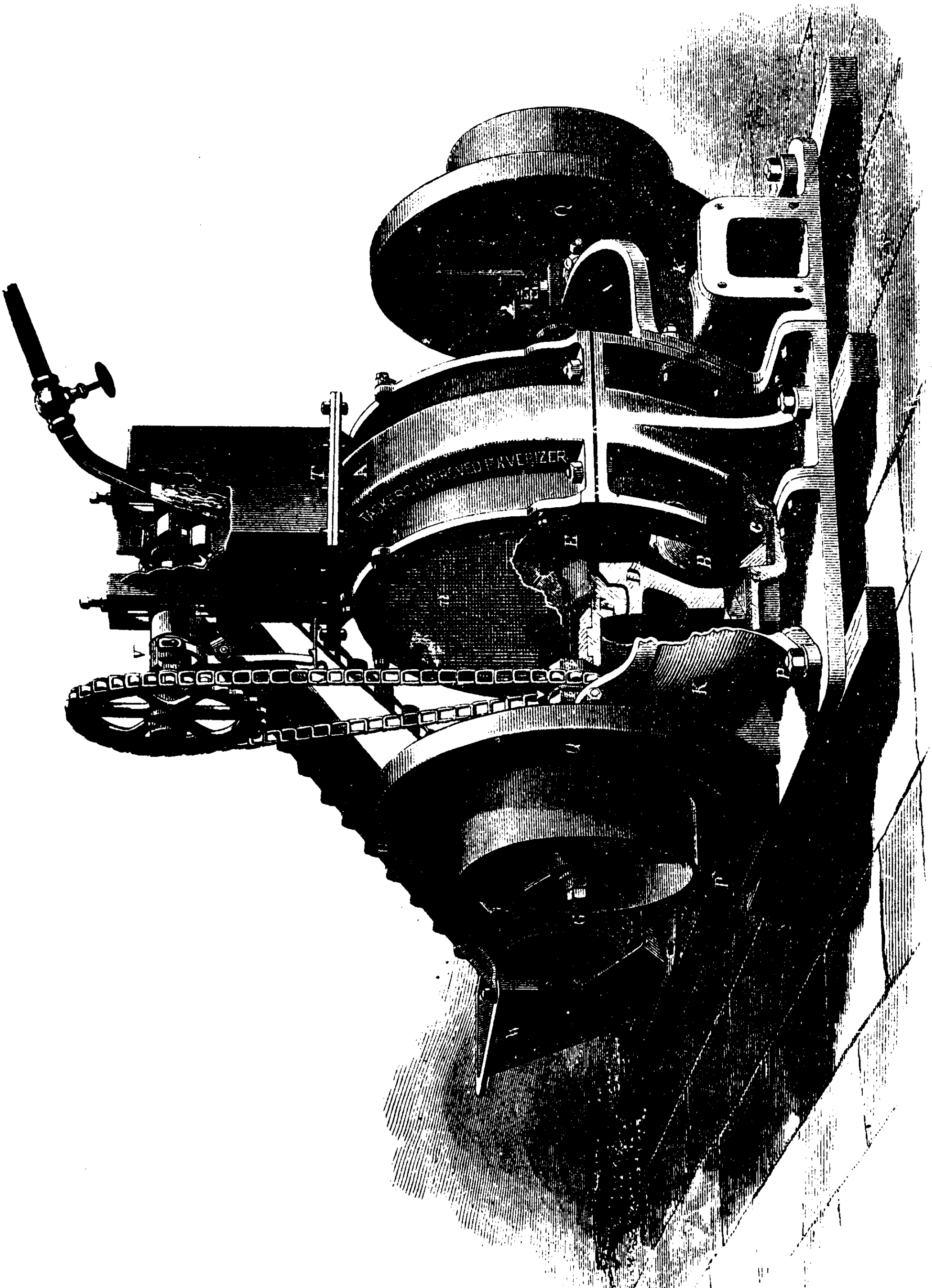
As the motion is a simple rolling motion no foundations are necessary. The pedestals are supplied with screws for raising or lowering the journal-bearing boxes in the event of the mill being set out of plumb.

In this mill contrifugal force is given to a *loose* ball. This is a principle which we believe has never been correctly applied before. The ball, B, is carried around the inner periphery of a steel shoe ring, C. by means of flexible disks. B, whose surfaces are chilled where they touch the ball to prevent wear. The disks are set up by means of nuts, I, on the shaft on the outside of the screen frames, and they are kept apart by a strong steel spring, E, between them on the shaft. The disks are carried by the clutches, which are fast to the shaft. On the sides of the machine are the screens, N. As the ore is fed in at the top by the automatic feed it drops into the mill, and, after being pulverized, is washed under the edges or rims of the disks, which have a clearance of one-eight inch. All that is fine enough passes through the screen; that which is too coarse is caught in the take-ups and forced back under the ball again until it is fine enough to pass through the screens.

The fineness depends on the number of mesh of the screen and the quantity of water used; the more water used up to a certain quantity, the more pulp will be washed out. With very little water a less quantity will be done, but it will be




MACHINE FOR COLOURING AND GROUNDING PAPER.—(SEE PRECEDING PAGE.)



TASKER'S IMPROVED THOMPSON PULVERIZER.

very much finer. To give the mill all the water that can be used requires but 400 gallons per ton of pulverized ore. This compares very favorably with the amount of water used by the stamp mills in the Black Hills, where they must economize water. They use 2,500 gallons per ton of ore. At the Rara Avis mine just enough water to carry the pulp over the plates was found to be all-sufficient. This mill, which has used the machine longest, is doing satisfactorily from 3 to 4 tons per hour, with but little wear.

There is no wear of note on any part of the mill except on the ball and shoe ring. The latter is made of rolled steel, and will wear for several months. The ball is made of the very best cold blast charcoal iron, deeply chilled, which gives it a degree of hardness not exceeded by the best tool steel. The wear on the ball is very slight; at the rate of 60 tons per day the ball will last from two to three months; in fact the total wear is not 20 per cent as much as a stamp mill with an equal capacity. The amount of slimes made is but a very small percentage of that made by a stamp mill, and from the peculiar form of the pulp is more readily concentrated, as shown by actual workings on a very large scale.

The mill in its construction is very simple and easily set up. Any wearing part can be replaced in one hour. The lower half of each screen frame is supplied with a door, which is hung on hinges, so that it can be raised and the mill cleaned out while it is in operation, if necessary. It is not possible for rust gold to escape being brightened by the rubbing it receives while in the mill.

All parts of the mill are made very exact by templates, which assures a fit when extras are required at the mines. Another great point in the mill is its very low speed and small power required. The large mill, which reduces 60 tons per day through a 60 mesh screen, and is really capable of doing much more, only requires 10 horses power, which drives it very easily, the speed of the shaft being but 190, while the ball makes about one-third less revolutions per minute.—*Scientific American.*

## SODA BY THE INCH.

Soda which is imported at the cost of $52 to $55, can be taken from soda lakes in Wyoming and placed in the Eastern markets at a cost not exceeding $25 per ton. The Wyoming soda is chemically purer than the imported, and the method and rate of supply indicates practical inexhaustibility. Means are now being taken to secure early access to the deposits, and when these are perfected our import totals will lose an annual item of from $6,600,000 to $7,000,000. In Nevada crystallized soda can be dug up as ice is from a pond, except in the case of soda no one knows how far it is to the bottom of the pond. Out near Ragtown there is an inexhaustible supply of pure soda extending down to an unknown depth. On the surface of the ground are two or three feet of sand, but below this lies the soda, looking like a solid mass of ice. It was this soda that gave rise in early days—when the emigrants were crossing the plains—to stories that in places there was to be found, under a few inches of sand a solid mass of ice. The soda as dug up from the plains, in sheets from two to three inches in thickness really does look more like ice than does any other mineral formation.—*Mining News.*

## FORMATION OF ALLOYS BY PRESSURE.

W. Spring has shown that, when a mixture of bismuth filings, cadmium, and tin, in the proportions necessary for the formation of Wood's alloy, is subjected to a pressure of 7,500 atmospheres, the mass thus obtained powdered and again subjected to the same pressure, a metallic block is formed which has all the physical properties of the alloy. Its specific gravity, color, hardness, brittleness, and fracture are the same; and when thrown into water heated to 70°, it melts at once. In like manner Rose's metal was made by subjecting the proper mixture of lead, bismuth, and tin to high pressure. If zinc and copper filings are repeatedly subjected to pressure, a mass resembling brass is finally obtained.—*Berichte der deutsch, chem. Gesell.*

Annealing Chains.—It cannot be too much insisted upon that chains of cranes, or those used for other purposes, should be regularly and periodically inspected. As all chains are liable to become brittle by use, they should be annealed once a year, by heating them in a furnace uniformly to a dull red heat and then allowing them to cool very slowly.

# Chemistry, Physics, Technology.

## THE BLUE PROCESS OF COPYING TRACINGS.

As we have had several inquiries recently in regard to the best method of copying tracings by what is known as the "blue printing process," we will give a brief description of the method employed by us; we do not say it is the best, but it certainly is as simple as any other, and has always given us perfect satisfaction.

The materials required are as follows:

1st. A board a little larger than the tracing to be copied. The drawing-board on which the drawing and tracing are made can always be used.

2d. Two or three thicknesses of flannel or other soft white cloth, which is to be smoothly tacked to the above board to form a good smooth surface, on which to lay the sensitized paper and tracing while printing.

3rd. A plate of common double-thick window glass of good quality, slightly larger than the tracing which it is wished to copy. The function of the glass is to keep the tracing and sensitized paper closely and smoothly pressed together while printing.

4th. The chemicals for sensitizing the paper. These consist simply of equal parts, by weight, of citrate of iron and ammonia, and red prussiate of potash. These can be obtained at any drug store. The price should not be over 8 or 10 cents per ounce for each.

5th. A stone or yellow glass bottle to keep the solution of the above chemicals in. If there is but little copying to do, an ordinary glass bottle will do, and the solution made fresh, whenever it is wanted for immediate use.

6th. A shallow earthen dish in which to place the solution when using it. A common dinner-plate is as good as anything for this purpose.

7th. A brush, a soft paste-brush about 4 inches wide, is the best thing we know of.

8th. Plenty of cold water in which to wash the copies after they have been exposed to the sunlight. The outlet of an ordinary sink may be closed, by placing a piece of paper over it with a weight on top to keep the paper down, and the sink filled with water, if the sink is large enough to lay the copy in. If it is not, it would be better to make a water-tight box about 5 or 6 inches deep, and 6 inches wider and longer than the drawing to be copied.

9th. A good quality of white book-paper.

Dissolve the chemicals in cold water in the following proportions: 1 ounce of citrate of iron and ammonia, 1 ounce of red prussiate of potash, 8 ounces of water. They may all be put into a bottle together and shaken up. Ten minutes will suffice to dissolve them.

Lay a sheet of the paper to be sensitized on a smooth table or board; pour a little of the solution into the earthen dish or plate, and apply a good even coating of it to the paper with the brush; then tack the paper to a board by two adjacent corners, and set it in a dark place to dry; one hour is sufficient for the drying; then place its sensitized side up, on the board on which you have smoothly tacked the white flannel cloth; lay your tracing which you wish to copy on top of it; on top of all lay the glass plate, being careful that paper and tracing are both smooth and in perfect contact with each other, and lay the whole thing out in the sunlight. Between eleven and two o'clock in the summer time, on a clear day, from 6 to 10 minutes will be sufficiently long to expose it; at other seasons a longer time will be required. If your location does not admit of direct sunlight, the printing may be done in the shade, or even on a cloudy day; but from one to two hours and a half will be required for exposure. A little experience will soon enable any one to judge of the proper time for exposure on different days. After exposure, place your print in the sink or trough of water before mentionud, and wash thoroughly, letting it soak from 3 to 5 minutes. Upon immersion in the water, the drawing, hardly visible before, will appear in clear white lines on a dark blue ground. After washing, tack up against the wall, or other convenient place, by the corners to dry. This finishes the operation, which is very simple throughout.—*The Locomotive.*

Basic Scoria of the Bessemer retorts, Martin furnaces, etc., containing as they do from 10 to 15 per cent of phosphoric acid, M. Naujean thinks could be utilized with advantage in the manufacture of artificial manures.

### THE DIRECT TRANSFUSION OF BLOOD.

Among the various methods of transfusing blood that have been employed, the most commendable appear to be those of Dr. Oré, of Bordeaux, and Dr. Roussel, of Geneva. The process of the latter has recently occasioned a remarkable cure which has attracted much attention from the medical world, and we are therefore glad to make it known to our readers. Facts, as we know, speak for themselves, so we will give these in a succinct manner. Mrs. M., aged 31 years, had had five living children and two miscarriages. In December, 1881, after six months of gestation, she gave birth to two children—one of them was stillborn and the other lived for a few hours only. The patient in spite of all care gradually became feeble from week to week. She was attended by her physician, Dr. Chauvin, and by Drs. Brochin and Pean. On the 31st of January she went from bad to worse; and, on the 1st of February, there was little hope for her. Anorexia, vomitings, insomnia, inertia, diarrhœa, anemic hectic fever, cadaverous face, and approaching dissolution; such were her symptoms. Drs. Pean and Brochin then suggested transfusion as a last resource. This was performed by Dr. Roussel, who describes the remarkable operation as follows: on the 5th of February, Dr. Brochain came to the Grand Hotel to ask my concurrence. I found the patient inert, scarcely conscious, without heat, without respiration, as pale as a corpse, veins invisible, and pulse filiform at 140.

The heart and lungs appeared to me to be healthy, and I consented to operate, February 7th, 4 o'clock P. M. The patient is in the state above described; to-day she has had diarrhœa nineteen times; her pulse is filiform, tremulous, and 150. The sister and husband of the patient offer me their arms; but, after an examination, I prefer to make a choice elsewhere. There is made known to me a business man of the street who employs many strong workmen. Mr. Z. at once comprehends the importance of my request and causes his men to call, and to them I explain that it is a question of saving a mother of a family by giving her a little blood taken from the arm of one of them by a single puncture which I affirm will be harmless. Several consent. I select a young man of about thirty years of age, healthy and robust, named Adrien Renaud. We go up to the patient's room, where are present Drs. Brochin and Chauvin and the husband, sister, and other relatives. The transfuser is washed in warm water to which has been added a little soda. I uncover the breast of the patient, and stretch her arm along the edge of the bed. I seat R, and place his arm parallel with that of the patient, and surround it with a bandage so as to cause his veins to swell. After having carefully sought and noted with ink the course of the humeral artery at the bend of the elbow, I mark a point of ink at two centimeters beyond the course of the artery, on the median vein, which appears to be prominent and well swollen with blood. Resting the initial cylinder of the transfuser in such a way that it figures the circumference of this central point, I cause the annular cupping apparatus to adhere by a pressure on its bulb.

Then, turning to the patient, I find that her veins are so bloodless as to be invisible. I succeed in discovering them by placing a bandage on her arm. I raise a fold of the skin transverse to the median vein, and cutting it with the bistoury, find that the vein is bluish and very narrow. I prick it with a fine erine, and then, removing the bandage from the arm, confide to Dr. Brochin the care of cutting a small piece from the vein with the point of a fine scissors and of introducing the canula into the narrow vessel. A few drops of very pale, thin, and incoagulable blood run out.

During this time I have dipped the bell of the aspirating tube of the instrument into a vessel of water heated to about 40 degrees. By working the bulb, this water fills the entire transfuser, heats it and expels the air that it contains. It was after all the air was expelled by the water that Dr. Brochin introduced the canula into the patient's vein.

The patient is now in such a state of inertia and anemic anæsthesia that she makes not even the slightest movement, either during the incision of the skin or during the preparation of the vein.

Our two subjects are now united by an uninterrupted channel full of water and free of air. A sharp tap on the head of the lancet opens Renaud's vein, and his blood soon makes its appearance at the orifice of the tubes, after having driven the water before it. The water section tube as well as the expulsion tube are closed, and a direct current of blood is set up. Slowly, never removing my eyes from the patient, I press the pump bulb, and force the blood easily into the vein in quantities of 10 grammes each time. At the tenth contraction of the bulb the patient breathes more deeply and quickly. When questioned she answers that she feels no discomfort, but experiences a heat rising from her arm into her breast.

Dr. Brochin easily ascertains under his finger that the blood is distending the rubber tube and the vein at each pressure; and, moreover, we all perceive the vein becoming more apparent and turgid as far as the arm pit.

At the seventeenth injection of ten grammes, perceiving a resistance in the bulb and a slight agitation in the patient, I stop transfusing, after 170 grammes of Renaud's blood have passed into the patient's veins.

The preparations for the operation were somewhat prolonged by the absolute lack of comfort and room in the appartment. It was difficult to light the latter well, and Dr. Chauvin was good enough to hold a lamp so as to light alternately each subject. The operation itself lasted five minutes.

Renaud's arm was dressed with a simple bandage, and he returned to his work very much pleased with the service that he had rendered.

February 8th.—The patient has slept, although she has awakened several times. During the day she has eaten six times. She has spoken aloud, and has not felt the least pain.

February 9th.—The patient has slept well the entire night, and for the first time in six months.

Feb. 10th and 11th.—State of convalescence assured.

February 12th and 13th.—Madame M. is sitting up, and is certainly cured. Hereafter she can dispense with my care.

Such is the interesting case that we have desired to make known. It now remains to say a few words in regard to the instrument employed by Dr. Roussel—his transfuser.

The apparatus consists of a soft, elastic, warm, and moist tube, after the style of the blood vessels, designed to be placed between the vein that yields the blood and that which receives it. This tube carries a suction and force pump, which gives impulsion to the venous blood, while measuring the quantity and velocity of the same. Two bifurcations, one at the beginning, and the other at the end of the tube, allow of the entrance and exist of a current of warm water so as to drive out the internal air and heat the instrument without the water itself being forced into the patient's circulation.

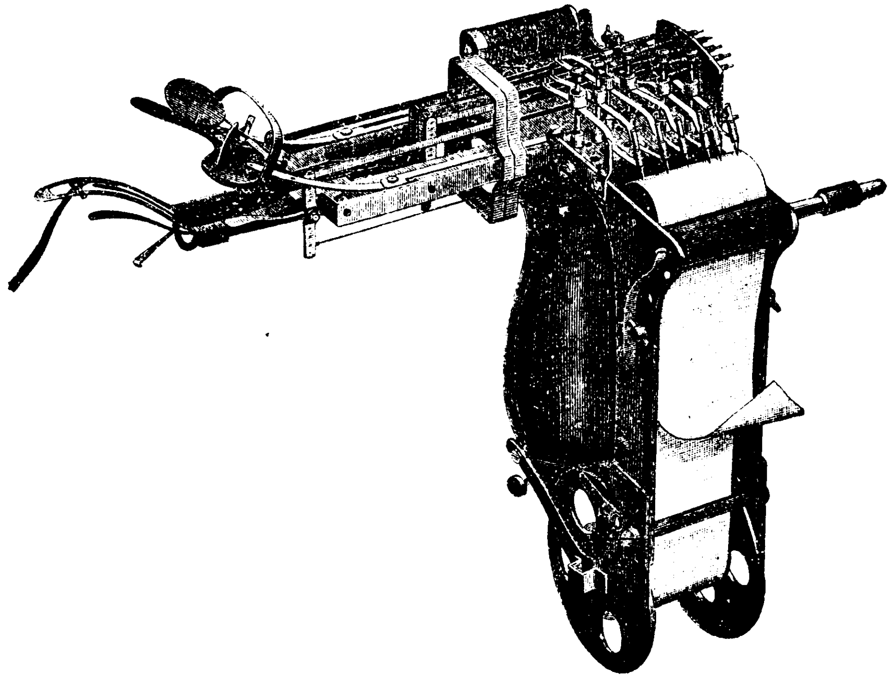
The above description which is taken from *La Nature*, seems to indicate a method of transferring blood which is likely to be generally adopted, as it avoids the many difficulties which have hitherto accompanied the operation of removing blood from one person in order to inject it into the veins of a second.

### GENTILLI'S GLOSSOGRAPH—AN AUTOMATIC SHORT-HAND APPARATUS.

Amadeo Gentilli, C.E., brought before the public a short time ago an invention with which he has been occupied for a number of years. The purpose of this apparatus is to record speech automatically, in easily deciphered characters, with the rapidity of the normal flow of speech. The inventor did not proceed with his studies as the inventors of the telephone and phonograph, upon the principle of acoustics, because he could not succeed in making practical use of the microscopical characters thus obtained; but he converts the motions of articulation of the organs of speech into visible permanent characters.

An easily managed instrument, shown in Fig. 1, is provided with delicate levers which rest upon the different parts of the tongue and lips, and slender wings swing before the nostrils. The levers of this instrument may be taken in to the mouth without any inconvenience.

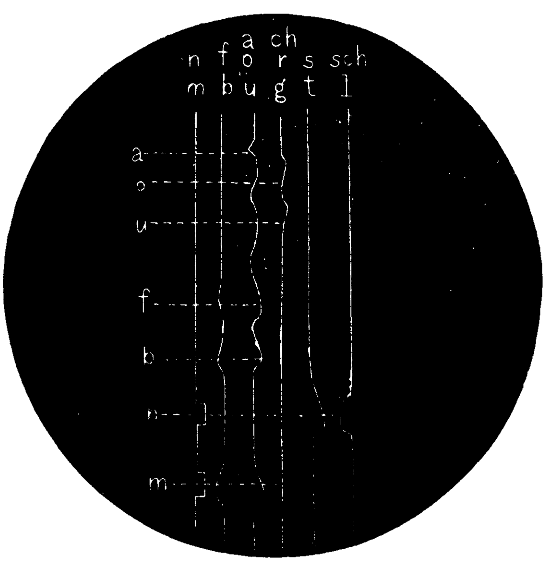
On speaking, these levers and the wings move, and their motions are transferred partly in a mechanical way and partly by electricity by a writing pencil, which is moved forward by hand or clockwork. Upon the utterance of the vowels and consonants, moving one or more parts of the organ of speech more or less strongly, or upon the air being exhaled through the nose, the signs corresponding to the sounds uttered are recorded and may be read at once. For example in uttering ch, r, g, the back part of the tongue is raised, with s, h, l, the tip of the tongue; and with e. i, the whole tongue is moved; with s, l, the tongue is pushed forward against the teeth; with o,u, the under lip, and with f, b, the upper lip is moved; and with n, m, the soft palate is depressed in such a manner that the air which otherwise would issue from the mouth finds its way



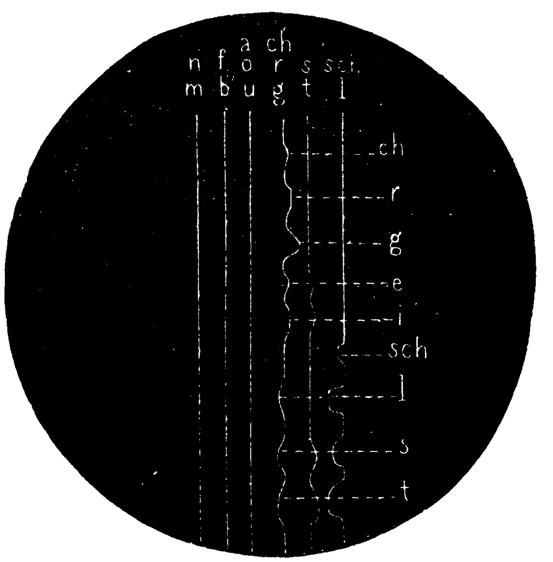
GENTILLI'S GLOSSOGRAPH.

through the nose. These characteristic motions through double levers are transferred in the instrument from the inside to the outside of the mouth in such a way that with the utterance of ch, r, g, lever IV. ; with e, i, levers IV. and V. with s, ch, l, lever VI. ; with s, t, levers V. and VI. ; with a, o, u, lever III ; with f, b, levers II. and III. and are put in motion and produce larger or smaller variations of the pencil from its position of rest. The nasal sounds n, and m, place lever I. in motion.

These few signs suffice for the interpretation of language, for in our conventional orthography, taking into consideration only the phonetic sound marks, it will be found that b, d, and g, are only less degrees of intensity of sound than p, k, and t; that c, z, q, and x, are composed from ts, kw, and ks; that between f and v no difference exists; and that w is only a sonorous modification of v. The system of writing of this apparatus, as represented in Figs. 3 and 4, may be quickly learned. There are certain rules which make the deciphering




RECORD OF THE GLOSSOGRAPH.




RECORD OF THE GLOSSOGRAPH.

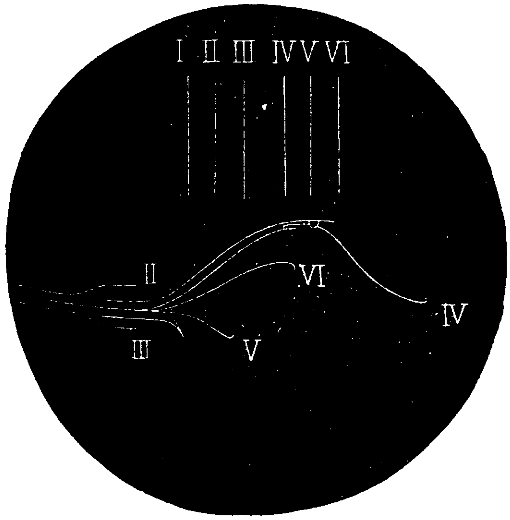



DIAGRAM OF THE LEVERS.

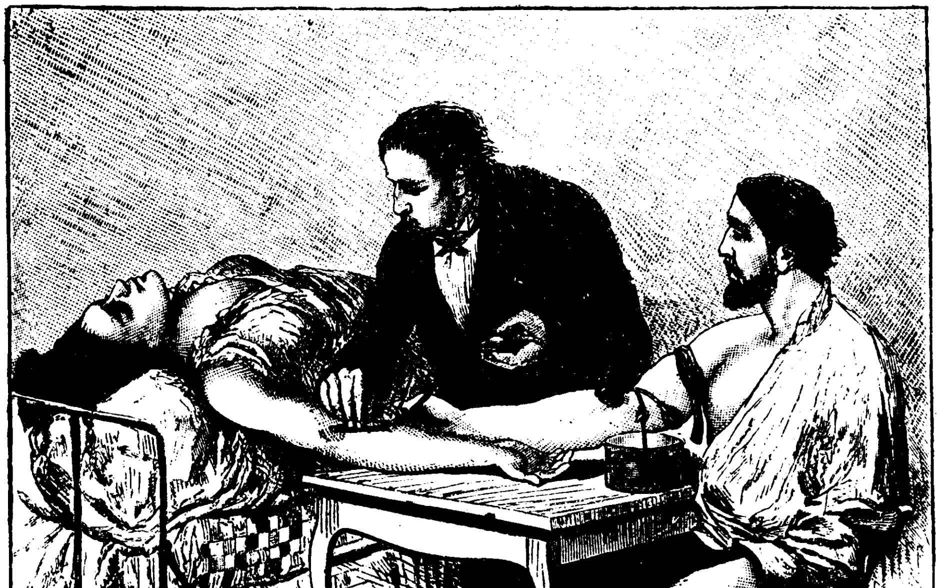
easier. These rules rest upon the laws of the construction of syllables and the combination of consonants.

The German and Italian languages are best adapted for recording by this apparatus, because in these languages the phonetic mode of writing varies least from the orthography, but this does not prevent its being applied to other languages.

Stenography through the use of this apparatus (which the inventor calls a glossograph) becomes, in a certain measure, the public property of every one who will undertake the easy and interesting labor of learning the key of this "nature's self-writing. This apparatus may be used for the recording of public speeches, not by the orator himself, but by one employed for that purpose, who takes the instrument in his mouth and repeats the speech softly, for the voice plays no part in bringing out the signs.

The glossograph has the advantage over stenography as it is practiced now, as it requires no previous study or practice, it demands no straining of the attention, and consequently causes no weariness. Only the deciphering requires practice. The employment of an apparatus which will enable us to write four or five times as rapidly as formerly, especially in an age when so much writing is done as in ours, will not be confined to the noting down of public speeches, and if the compass of the practical value of this invention has only been glanced at it must be percieved that there is a fruitful principle in it which is capable of great development. Herr Gentilli a short time ago gave an exhibition of his invention before the Institute of Physical Chemistry of the University of Leipsic, and gave proofs of the practical utility of the apparatus.

A few imperfections which appeared at the first exhibition of the apparatus have since been obviated by the Inventor. He has separated the speaking apparatus from the writing apparatus, and provided the latter with clockwork, so that the writing is more distinct, and by the relative duration of the single signs a valuable knowledge of the signs may be obtained. The transmission of the motions is made by electricity: the contact of the tongue with the soft palate, or the lips with each other, is imprinted by the closing of the working current.—*Illustrirte Zeitung.*



THE OPERATION OF TRANSFERRING BLOOD.—(SEE PAGE 235).

# Miscellaneous.

## PROGRESS IN TELEPHONY.

A new advance has been made by this remarkable instrument. Mr. Van Rysselberghe has just devised a new system of telephone differing very sensibly from all those known. The arrangement and details of the apparatus have not as yet been made known to us, but the following result of some experiments that have just been made with it are communicated to *La Lumiere Electrique* by Mr. F. Geraldy :

The system had first been put in operation on the line from Brussels to Ostend, but its inventor, desiring to experiment with it to a greater distance, has just tried it between Paris and Brussels.

Through the kindness of Mr. Van Rysselberghe I was permitted to be present at the experiments on the 17th of May. I ascertained that conversation between Paris and Brussels was easy, that articulation was clear, and that it was not necessary to speak loud, but only in a clear and distinct voice—that, however, being required by the telephone.

Such a result, were it the only one obtained, would doubtless not be absolutely new, for our readers will recall the experiments at great distances with the Herz system, that we have had occasion to describe. Various attempts of this nature have been made with more or less success, but we may say that that of Mr. Van Rysselberghe has succeeded better than any that has been tried. But that is only only one feature of the system.

The inventor has bestowed his attention on a means of overcoming that terrible enemy of the telephone, induction. On this subject, I recall anew the studies made by Mr. Herz, on a means of applying the condenser in telephone lines as a preserver as well as receiver. The process employed by Mr. Van Rysselberghe has some points of contact with those experiments, while very sensibly differing from them. Mr. Van Rysselberghe, by an ingenious detour, instead of guarding against induction on the telephone line where it produces its injurious action, endeavors to prevent its occurrence by suppressing it in the lines on which it is produced. To this point we shall hereafter return more in detail. He has experimented, however, only imperfectly at Paris, where there was no time during these first experiments, designed only as a study, to provide all the prejudicial lines with preservative apparatus. The partial experiments have, however, sufficed to prove the efficacy of the process on telegraph lines.

From the combination of these two measures (I mean the improved telephone, and induction overcome), Mr. Van Rysselberghe has derived an unexpected and striking result ; for he has succeeded in putting upon the same line and in causing to operate at the same time, a Morse telegraphic apparatus and a telephone. I have seen these apparatus work at the same time, and it is beyond dispute that they do not perceptibly interfere with one another, the double transmission being effected without any difficulty. At the first trial, which took place on the 16th, there were transmitted simultaneously to Brussels two dispatches. The telephone dictated one (which it is unnecessary to reproduce here), while the telegraph was registering another (and entirely different one). These two dispatches were at once sent to their address. It should be remarked that they passed at ten minutes past eight in the morning, that is to say, after the work of the office had been resumed, and when inductive actions were already very energetic. We shall study more at leisure the processes employed by Van Rysselberghe, but it has seemed to us well to call attention to these beautiful experiments at once after their occurrence.

## ELECTRICITY IMPORTED FROM FRANCE.

The curious feature of the importation of one of the imponderable forces across the Atlantic is one of the scientific events of the day. The steamer *Labrador* imported a number of Faure secondary batteries which not only did duty on shipboard for illumination, but are ready for further service. It appears from a statement of the engineer who had charge during the voyage that a Faure battery will last about 400 hours, delivering one weber per hour of current, with an electro-motive force of two volts. If this is correct it requires two secondary batteries to run an Edison lamp, but these two batteries will run such a lamp steadily 400 hours without replenishing the charge. The battery is a very simple affair, composed of sections of sheet lead, coated with the red oxide, and contained in a water-tight box. A battery large enough to run an Edison lamp of sixteen candles would occupy a space of about eighty cubic feet, and a battery large enough to light a Fifth avenue residence about 500 cubic feet. Such a battery would be contained in a box eight feet square, which is by no means of cumbersome proportions ; and the objection which has been preferred against the system on this account is consequently without any proper foundation ; while, on the other hand, the cost of the battery is not high and the cost of recharging is merely nominal. It must be conceded then that, with the Faure battery as a basis of operations, it is possible to prepare charges of electricity for the market to be sold to the general customer in the same manner as oil is sold to the customer, not alone for lighting purposes, but for all the purposes, scientific and practical, for which the current is available. The immediate value of the demonstration of the availability of the Faure battery concerns the introduction of the electric light for domestic purposes. Under it the consumer can buy and use any lamp he pleases—an Edison, a Swan, a Maxim, a Werdermann, a Brush, or a Sawyer—just as he buys and uses a kerosene or other oil lamp. It is claimed that the supply of electricity can be bought in Faure boxes at a moderate rate. What may be discerned in the Faure arrangement just now may be a destruction of the monopoly that has been created by the consolidation of electric light companies ; and it is to be hoped that the work of manufacturing for consumption will soon be undertaken by those who are interested in M. Faure's discovery. It has been successfully initiated in Paris, and there is no reason why it should fail here.

## BRICKLAYING AND BRICKWORK.

The supreme importance of the drainage of dwelling-houses led us to linger over this portion of our subject rather longer than we intended, but the gravity attending inefficient precautions in this particular is not merely an excuse but a justification for treating it at some length. The foundations may be of rock, the mansion may be built of marble, the workmanship may be unsurpassed, and the decorations may satisfy the taste of Alma Tadema himself, but if the drainage be at all defective, though it be a palace in appearance, it is little better than a hovel, in so far as a dwelling-place is concerned.

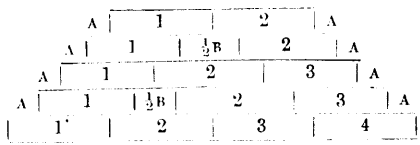
The foundations of a building are sure to be well looked after if the building itself is of any extent, or is required to carry heavy weights, and also if it be of sufficient importance to require the direct supervision of an architect. Indeed, architects as a rule pay a good deal of attention to the foundations, for they know that the security of the whole superstructure depends upon its solidity at the base. In this respect they seldom fail, and it is not often that any serious mishap occurs through deficiency or oversight in this particular. Where no architect or surveyor has charge of the building there is great danger of "scamping" in the foundations, and singularly enough nearly the whole of our suburban dwellings are erected entirely without supervision or control in this important respect. The freeholder stipulates for certain conditions—as to frontage, elevation, "class," materials, &c., and as to foundations, drainage, and the like, in general terms — but it is not often that any portion of the work is executed under the direct superintendence of the architect or surveyor. The result is that a large proportion of the houses of moderate rentals are built on what is little better than surface soil, or on "made ground" consisting of rubbish and offal.

If the houses have "basements" or only "half-basements," this necessitates a certain amount of excavation, and such excavation generally reaches to the more solid subsoil, if no deeper. This is perhaps one of the greatest advantages of a basement or half-basement story, but care must be taken to make provision to carry off the surface water, if any, so that no damp shall accumulate under the floors. But if there is to be no basement the trenches for the foundations must go down to a solid subsoil as a base. The builder who builds on "made ground," such as we often see in various parts of the metropolis, ought to be heavily fined, for not only is the building unsafe in the ordinary sense and meaning of that term, but it is unsafe by reason of the putrid matter of which a good deal of such made ground is composed, in so far as regards the health of those who are destined to dwell in houses so built. We have no hesitation in saying that the fearfully unhealthy condition of some houses is due entirely to this cause, and all efforts to effect a cure are unavailing, for the simple reason that the whole ground is putrid or tainted.

Supposing then that the trenches are properly sunk to the depth required — that is, to the solid subsoil — and that all loose, damp earth is removed from the surface, then a layer of concrete should be placed in each trench sufficiently wide to take the "footings" of the walls to be built thereon. The width of the concrete must obviously depend upon the thickness of the proposed walls; but it should not be less than six inches wider than the first course of "footings," so as to allow of a set-off on either side three inches wide at least. If the superincumbent weight of the structure itself is intended to be great or if it has to carry a great weight, then the depth, and even width, of the concrete foundation must be proportionate; if, on the contrary, the house is not to be of so heavy a character, and is to be simply a dwelling-house, then the concrete need not be very thick, but it ought, nevertheless, to be very good. Indeed, the quality of concrete is of more real importance than its quantity in all cases, but especially for dwelling-honses. Its object in this case is not so much solidity and strength as it is to prevent dampness; in order to effect this it must be good. The use of cement is necessary where great strength is required, and also where the foundation is subjected to the action of water. Blue lias lime, stone lime ground, if fresh and good, is very suitable for foundations, for it solidifies into a kind of natural rock. If Dorking stone lime ground be used care should be taken that it be supplied and used while it is quite fresh. If either the lime or cement used for concrete is at all deadened, its value, for the purposes mentioned, is gone; and it should be mixed and used quickly, so that its strength shall not have vanished ere it is deposited in its place. Sufficient water must be used to "slack" it thoroughly, but not enough to destroy its "binding" properties and power of fusion.

The "gravel" used for concrete should be as free from "dirt" as possible; if it be at all loamy or clayey it helps to destroy the properties of the lime or cement. Ballast is often used, but care must be taken that the ballast so used shall not be of such quality as to "give" when touched by damp. Some kinds of ballast seem to have no damp-resisting properties at all; these must be avoided. Coarse clean gravel is by far the safest, and is preferable to any other ingredient for concrete purposes, if it is at all easily obtainable, and at reasonable cost. If the ingredients of which the concrete is composed are bad in themselves, or are subject to chemical changes when mixed together which tend to destroy their essential character, or to neutralize their natural effect, then it is better to dispense with the farce of concreting altogether. If badly done, with bad materials, it is worse than useless; for you imagine that there is security, when in reality there is nothing of the kinn. With good tone ground lime, and clean coarse gravel, or shingle and sand, or good dry ballast, the proportions may be one of lime to five, six, or even seven, eight, oe nine of gravel, according to the "strength" of the lime. Under ordinary circumstances one to seven may be taken as the fair proportions of lime and gravel, or other ingredient. The depth of the concrete should never be less than twelve inches, and some contend that it should not be less than eighteen inches, and its thickness should allow for a good set-off beyond the face of the first and widest course of footings. And it is most important that the whole extent of the foundations, or as much of it as is possible, should be put in at one and the same time. If the concrete is put in the trenches in sections, there is no binding whatever between the parts; it is simply like putting in so many blocks—large or small, as the case may be. Its solidity and strength will then only equal the weakest part, and in proportion as the strain tells upon that weak point, so does it increase in intensity, until it takes the full bearing of all that converges thereto, or yields by reason of its inherent weakness, or gives way utterly to the lateral or superincumbent pressure. The pressure and strain should be as nearly as possible equal at all places and at all parts throughout the whole bnilding.

The concrete being in and settled, the next thing to be done is to put in the "footings." The footings, if of brickwork, ought never to be less—indeed cannot well be less—than nine inches wider than the wall proposed to be built, for in this case there is only room for two set-offs of 2¼ inches each on either side. This very slender foundation, if upon concrete, may do for cottages and the like, but not for buildings of a higher class, of greater pretensions, or those requiring strength. For all houses above the commoner sort of workmen's dwellings the footings should not have less than four set-offs, or nine inches on either side, or a total of eighteen inches extra to the fnll thickness of the wall. Even the commonest villa or suburban dwelling ought to have this width of footings, upon a solid concrete foundation, which, in the case of brick walls of eighteen inches in thickness — that is, two bricks wide lengthways — would be double the width of the wall, and would have footings thus:—




In the above example the brick wall is supposed to be two full-length bricks in thickness — that is, eighteen inches wide the first course of the footings would consequently be thirty-six inches, or four bricks lengthwaya wide; the second course would be twenty-seven inches wide, or three and a half bricks wide—that is three stretchers and one header; the third course would be three stretchers wide; and the fourth, or top course of the footings, would be two stretchers and one header in thickness; and then would be started the face of the wall, two brick lengths wide. The set-offs on either side (marked *a*) are supposed to be 2¼ inches wide in each case. Should extra strength be required, or should the superincumbent weight or pressure to be borne necessitate a more solid foundation, the width of the footings and the number of set-offs must be increased in proportion to the needed requirements of such building, otherwise the proportions above given will suffice for all practical purposes.

There is one hint which should be borne in mind, namely, that the bricks in footings should be laid lengthwise in the wall, as far as practicable. Where half a brick is required, the half brick should be as near the middle of the wall as possible, as, for example, in the illustration they are where the headers are shown (marked *b*), courses two and four from bottom, on first course. The reasons for thus laying the bricks in footings lengthwise are because of the necessity of giving to the wall the widest bearing possible in a lateral direction. The strain longitudinally will be met by other precautions when the building is more advanced.

Now, having got the footings in, one more step should be taken to ensure perfect freedom from damp: either pour a layer of asphalte over the top bed of the brickwork about three courses from the top of the last-footings course, or lay down a course of slates in cement, or cover with a sheet of lead the whole of the inner and outer walls of the building. Upon this layer, whichever may have been selected, proceed to build your house or construct an edifice of greater pretensions and dimensions.

There is yet another matter of great practical utility in building operations, and especially in the construction of dwelling-houses, namely, the building of dry areas, and the insertion of proper air-bricks at convenient points for ventilating purposes. A current of air should pass right through the building underneath the lowest door; if it does not dry rot will be sure to make its appearance, and with disastrous results. If the pressure of earth against the wall be great, headers should be thrown out here and there from the dry area wall to the main wall of the building, but these must be only at such intervals as will not interfere with the free circulation of air.

If the hints and suggestions here given are properly attended to there will be little fear of any damp arising to rot the floors, discolour and destroy the paperhangings or other decorations, and to injure the health of the inmates by foulness—either from defective drainage or damp. Let it not be thought that the directiong here given will entail much extra expenditure. In point of fact the extra cost will be comparatively nothing as an item in the entire cost of the building. It looks a good deal upon paper, but an expenditure of £20 extra while the work is being done will make all the difference in the world between a thing well done and badly done. Besides which, if more care were taken at the first with the drainage, the foundations, the footings, the ventilation, and the selection of the site, the edifice itself might be built with far less expensive materials, without much detriment to its rental value as a dwelling-house, or to its intrinsic value as a building. Even in the smaller class of house property it would pay in the long run to do all that is here recommended to be done. But as a rule houses are built to be sold — this makes all the difference.—*The Building and Engineering Times.*

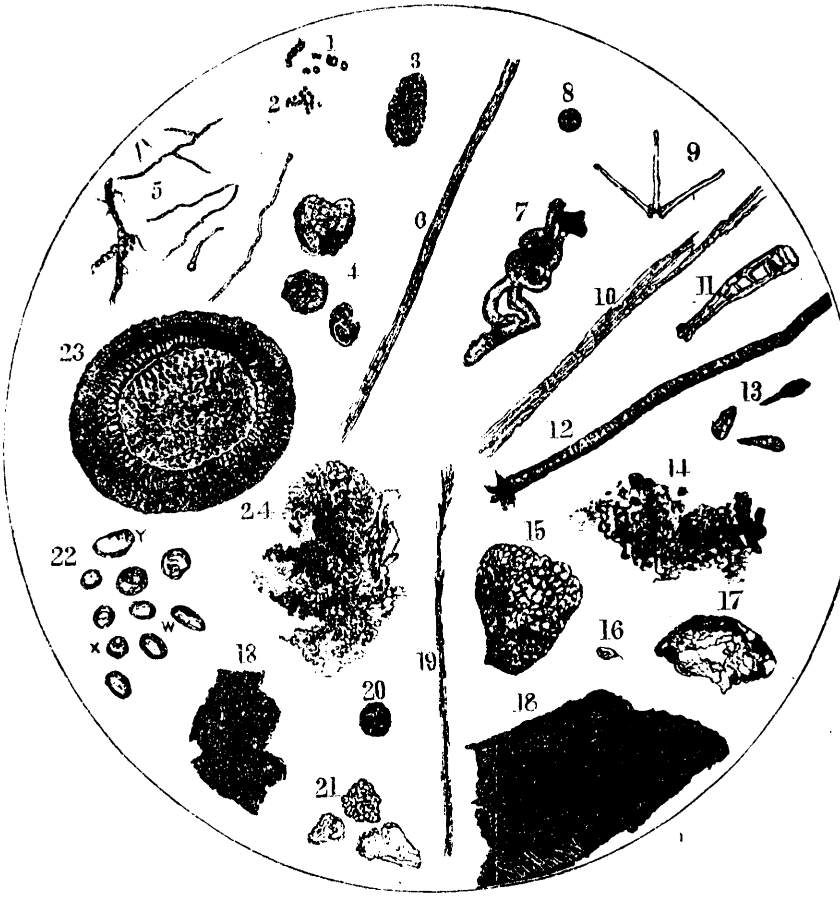



FIG. 1. MICROSCOPICAL EXAMINATION OF ICE.

## MICROSCOPICAL EXAMINATION OF ICE.

BY EPHRAIM CUTTER, NEW YORK, MEMBER PHILOSOPHICAL SOCIETY GREAT BRITAIN, ETC., ETC.

This paper is a report of an examination of the forms found in the water derived from melting of ice used in domestic consumption. The subject is one that is interesting, because ice is an article of commerce, and is extensively consumed in this country.

Again, it is interesting as the notion prevails that water is purified by freezing, and hence can be used freely, even though it may come from ponds or lakes whose waters are impure. How far this notion is sustained by chemical examination is seen in the following extract:

"The notion that ice purifies itself by the process of freezing is not based on trustworthy scientific observation. On the contrary, it is utterly wrong in principle to take the ice for consumption, from any pond the water of which is so fouled as to be unfit for drinking purposes."*

Again, how far the notion of ice purifying itself by freezing is sustained by a morphological (*morphos*, form, *logos*, account) examination may be gathered somewhat from what follows. I say "somewhat" advisedly, since the report simply relates to the specimens examined, and may be modified by subsequent examinations. So far as the results are positive, they are final as to the specimens examined, but not so to specimens not examined. Those must be judged by themselves. The examinations reported here are microscopical, and relate to objects not recognized by the unaided vision, which for distinction is now termed *macroscopic* (*macros*, large, and *scopein*, to view); this includes ordinary vision. Should any doubt, it is easy to test the statements by taking domestic ice sufficient to fill an ordinary ice pitcher which is clean. Melt and filter the water resulting through a bag made of fine twilled cotton; say three inches by one and one-half, and when the water is filtered down to the capacity of the bag, inverting the bag into a clean tumbler or goblet, then sopping it in the water in the goblet, and finally twisting the bag longitudinally.

The filtrate thus obtained will give to the naked eye an idea of the amount of dirt found; and if the quantity of the dirt is like that obtained in the preparations for the following observations, some surprise will be excited and evidence afforded to sustain those who are accustomed to filter drinking water into jars or bottles, and to cool it indirectly by placing said jars of water into a refrigerator. Indeed, Dr. Cuzner, the artist, will testify that ice enough to fill a goblet has, when melted, produced foreign substances in quantities incontestably evident before the microscopical examination. Still, as will be seen in ice examined at Amherst, Mass., I found hardly any sediment. Hence, all ice is not to be pronounced impure, but rather the ground is to be taken that if some ice is quite free from dirt, the great ice companies should take pains to furnish only such ice for drinking purposes.

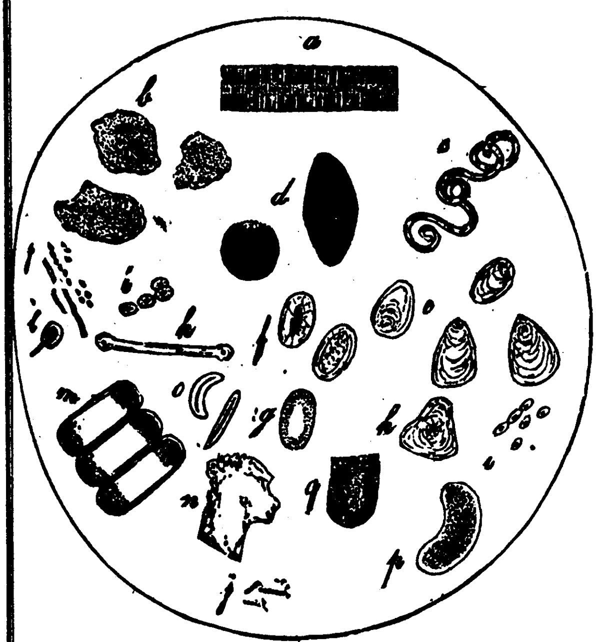


FIG. 2.

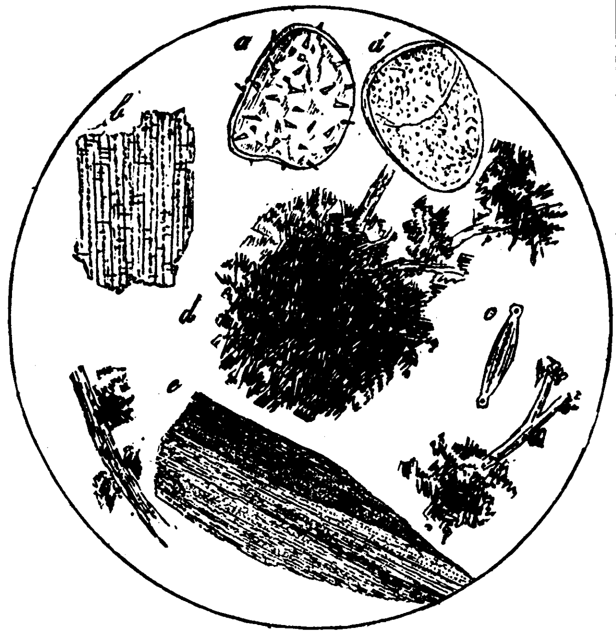


FIG. 3.

There is no doubt that ice exposed to the air after it has been taken from the water, especially in summer time, attracts dirt. This is seen in the refrigerating apparatus of Mr. A. J. Chace, of Boston, who cools and purifies air by ice aspiration. Last summer the writer placed at Weehawken, N. J., near 42nd Street pier ferry, a simple apparatus made of a common wooden water pail, with four half-inch holes bored in sides, two inches above the bottom; one inch higher was a shelf of oil cloth loosely fitted; on this was placed ice. The top was loosely covered with oil cloth. The rationale was that the ice as it melted cooled the air, which was displaced through the side holes; then warm air would enter the crevices at the top, and thus a current would be formed, which, carrying with it the bodies found in the air, would then lodge on the ice by its stickiness during melting.

FIG. 4.

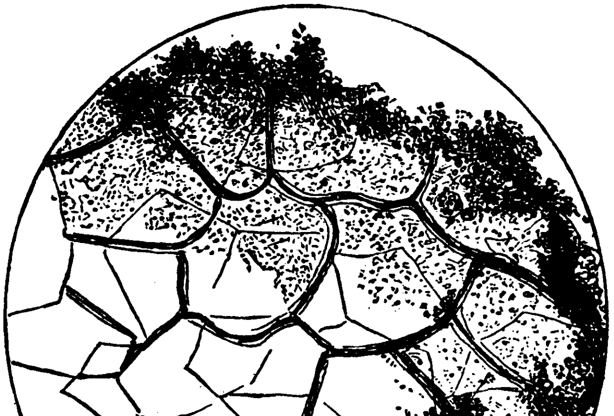


FIG. 5.

In an exposure from 8 P.M. to 7 A.M, next day, the mass of ice nearly melted, and what was left was covered black with dirt; and the water from the melting was so loaded with sand and dirt, that I was unable to obtain the object of the aspiration, to wit, the defection of the so-called ague plants of the district. So it seems that ice conveyed in open carts on highways must attract more or less dirt that floats in the atmosphere, and may explain the superabundance of dirt in urban as compared with suburban ice.

It will be my aim to show what forms may have come from the water and what from the air. When large cakes of ice are black with interstitial dirt frozen into its substance (as seen this summer on 8th Avenue), it needs no expert to point out presence. This report is intended to show something of the field for exploration that here is open to the student of food stuffs. It is not intended for alarm, nor for discredit of ice companies, for there is no doubt they use care and judgement in their business. Nor does it aim to exclude ice from use. It would simply try to regulate use by knowledge, so that exposure to filth may be avoided as much as possible.

### FIRST EXAMINATION.

Ice said to be from Maine, from a New York ice company. It was soft, cloudy, spongy, light, opaque. Mode of examination: A clean bag, one half inch by four inches, made of cotton cloth, was tied to the escape pipe of a refrigerator—zinc lined, shelf at top—that had been washed and cleansed with filtered water. The filtrate of from thirty to forty pounds of ice was collected by inverting the detached bag into a clean goblet, then sopping the inverted bag in the filtrate, and wringing the bag also. Power of microscope, one-fifth inch objective. Eye piece, one inch and half inch, 350 diameters.

Fig. 1, drawn by Mr. Hotchkiss, from specimens: 1, Yeast; 2, bacteria; 3, pelomyxa; 4, difflugia; 5, yeast vegetating filaments; 6, mycelial filaments of red water fungus; 7, dark red-organic unknown body; 8, trachelomonas; 9, astrionella formosa; 10, bast fibers; 11, ascus; 12, wool; 13, spherotheca fungus; 14, decaying leaf; 15, diffiugia unusual; 16, monad; 17, silica; 18, carbon; 19, feather barb; 20, difflugia globosa; 21, epithelia; 22, starch of corn, wheat, and potato; 23, egg of bryozoa; 24, dirt, debris, etc.; 25, abundant mycelial filaments; 26, actinophrys sol; 27, aneurœa monostylus; 28, bacillaria diatom; 29, chitin,; 30, closterium; 31, cotton fiber; 32, distoma vulgaras; 33, other diatomaceæ; 34, dinobryina sertularia; 35, eggs of entomostraca; 36, epidermis of wheat; 37, englenia viridis; 38, gemiasma verdans; 39, hair of plants; 40, leaves of moss; 41, liber fibers; 42, lyngbya; 43, oscillatoria; 44, pediastrum boryanum; 45, other pelomyxas; 46, peridinium cinctum; 47, pitted ducts; 48, potato starch; 49, protococcus; 50, rotifer; 51, scenedesmus quad; 52, skeleton of leaves; 53, silk; 54, spiral tissues of leaf; 55, transverse woody fiber. Thirty-three of these objects belong to fresh water, and twenty-two to air as a medium of communication. At my request, Dr. G. B. Harriman, of Boston, examined this filtrate, and found almost two-thirds of the forms found in Boston ice by him, and reported farther on.

### DESCRIPTION OF CUT. (FIG. 1.)

1. Yeast. This is the alcohol yeast of the yeast pot, torula cerevisiæ, the spores of which are everywhere present, ready to germinate if they have the opportunity. Its presence in ice is interesting.

2, Bacteria. These are minute self-moving protoplasmic bodies. Some regard them as ultimate forms of life; others that they are but the embryonal forms, seeds, or babies (as is were) of a vegetation, yet capable of immense reproduction by division, arranging themselves into masses, chains, etc., at will. In order to know what plants they belong to, culture is necessary. It is possible that those in the cut may be the spores or seeds of the yeast plants, but it cannot be said with certainty.

3. Pelomyxa. This means "mud mucus." It is an animal classed with the rhizopod or root-footed protoplasmic animals. They are very greedy, and eat much mud or dirt. The color in this case is dark amber, and may be mistaken for decaying vegetable matter. The writer regards them with suspicion, as contributing when dead and decaying to cause the "cucumber" and fish oil taste that sometimes occurs in hydrant drinking waters, notably the Cochituate.

4. These are portions of difflugia (Latin *diffluo*, to flow); these are like number 3, only they have the property of building over themselves a covering made of particles of sand glued together so as to protect their structural protoplasmic bodies. Lately, the writer saw a difflugia cratera, whose shell had been broken on one side. The cilia that were usually seen at the natural opening were seen to be active at the artificial opening. The contour of the hole changed under view from circular to a narrower one, forming a segment of the first; showing an action of repair; suddenly there was a gush of protoplasmic jelly, and the animal was dead, dying in its efforts of reconstruction!

5. Yeast filaments such as are seen in fluids where air has access.

6. Mycelial filaments of a red fungus, found commonly in Horn Pond, Woburn, Mass.; also at Cambridge. Name not known to writer.

7. Is a curious dark red tubular body, fragments of which I have often seen in hydrant drinking waters. Its fracture is glassy. It is an animal substance probably, and this is the best specimen I have seen.

8. Trachleomonas. These are by Ehrenberg claimed as infusoria. They are very abundant in hydrant waters at all seasons of the year. The specimen here is dead, but the living individual moves its curious long flagelliform filaments, by means of which it gracefully propels itself in any direction at will.

9. Astrionellia formosa. A beautiful, very common diat m, that arranges itself into forms like the spokes of a wheel. Three spokes only are here given; usually, twelve. This power of self-symmetrical arangement is surprising and mysterious.

10. Bast or linen fiber. This probably came from some table cloth, towel, or clothing.

11. This may be an ascus or theca of a fungus, which is a part of a fructification of the fungus, and also found in lichens. It is strikingly well developed.

12. Wool fiber. Note the macerati n at one end.

13. This is found in mildews.

14. Decaying leaf.

15. Probably a large difflugia.

16. An isolated infusoria; very common in hydrant water.

17. Piece of difflugia.

18. Charcoal, probably.

19. Feather barb.

20. A very small difflugia globosa

21. Epithelia; probably animal. These are suspicious organisms. See New York *Medical Record*, April 8, 1882. They are parts of the investing covering of all portions of the human body, inside and out.

22. Starch grains: X, corn or maize; Y, potato; W, wheat.

23. This is the egg of a bryozoa, or polyzoa found not unfrequently in the drinking waters of our cities and towns. It corresponds to the "winter egg" of entomosdraca. It forms one of the four modes of reproduction which Smith distinguishes: First, eggs from spermatoxoa; second, from internal development (*this very one*); third, external buds: fourth, brown bodies in empty eggs. This particular egg is seen to have an oval opening, whence the contents have been hatched or destroyed. It has been traced to a single polyp. Usually, the animals live in a colony, and are met with in fresh water on stones, sticks, sides of flumes, and free. I have seen colonies of these bryozoa in masses as big as a bushel basket, hanging on and covering the perpendicular boards of a flume. In the present csse, the egg is nearly as large as the animal in a state of rest. Its detection shows decidedly the presence of animal life in ice.

24. *Dirt*. This is hard to picture, but should have a place in this report, though it has been defined as "matter out of place."

Of the remaining thirty-one things named, six are animal or animal substances, the rest are vegetable or vegetable substances. They do not include the whole of objects found as some could not be classified or named by the writer. It may be of interest to add that the melted filtered water from this specimen was quite black and dirty looking to the naked eye, and that the examination of this specimen shows impurities, both from bodies that float in, or are blown through the intervention of the air; and also, those found in the water of the ponds and lakes, and that are used for drinking purposes. So far as it goes, the examination favors the cooling of drinking water by indirect contact with ice as a cooling agent, or by setting the filtered water in a refrigerator. How far the things named are injurious has not yet been settled. It is a problem that may well attract the attention of those interested in the department of public medicine, though there is no doubt that drinking water is more potable without them.

SECOND EXAMINATION.

Ice from a New York Company. A common silver ice pitcher, porcelain lined, was cleaned with filtered Croton water and filled with broken ice, source unknown, clear, compact, solid, diaphanous, and pure looking. This was allowed to melt. One quart of water resulted, and was filtered as before, and examined with following results :

1, Bacteria ; 2, bast fiber ; 3, broken down tegument and substance of leaves ; 4, coal ; 5, cloisterium lunare, dead ; 6, collection of liber fibers ; 7, collection of mycelial filaments ; 8, dirt abundant ; 9, a desmid, penium ; 10, difflugia globosa ; 11, euglypha ; 12, exuvium ; 13, egg of the fresh water polyzoa above named, unhatched ; 14, euglypha cristata : 15, foot stocks of vorticells, twenty-five in number ; 16, fiber of wool, colored blue ; 17, fungus filament ; 18, gluten cells, wheat ; 19, gromia, dead ; 20, humus ; 21, large paramecia. 22, leptothrix 23, long vegetable hair ; 24, linen fiber embedded in a mass of decaying vegetable substance ; 25, large double body, probably eggs, but possibly vegetable ; 26. nostoc ; 27, membrum disjectum of a large entomostraca ; 28, pelomyxa ; 29, potato starch ; 30, portion of a leaf with chlorophyl attached, color unchanged ; 31, silica ; 32, shell of a cypruss ; 33, supposed egg of an entomostraca ; 34, vorticell, dead ; 35, vegetable hairs ; 36, worm ; 37, wheat starch ; 38, yeast. Twenty of these objects are aquatic, the rest come by means of air.

THIRD EXAMINATION.

Same as preceding, with more ice of like kind. 1, Amœba ; 2, bacteria ; 3, corn starch ; 4, cotton fiber ; 5, chitin ; 6, claw of water spider ; 7, dirt ; 8, daphne claws ; 9, epithelium, animal and vegetable ; 10, gromia ; 11, gemiasma ; 12, humus ; 13, linen fiber ; 14, potato starch ; 15, pelomyxa ; 16, parenchyma of leaf ; 17, portion of a red water fungus ; 18, piece of a red cranberry skin ; 19, protococcus, probably gemiasma ; 20, silica ; 21, silk fiber ; 22, vegetable hair ; 23, wheat starch ; 24, wheat gluten cells ; 25, yeast. Ten of these objects come from water.

FOURTH EXAMINATION.

G. B. Harriman, D.D.S., of Boston. Mass., my associate, reports as found in the melted water of one cake of ice, Boston Highlands : 1, acanthodinium, with clusters of twelve spiral cells separated in all directions ; 2, botridium cells ; 3, cloisterium ; 4, chlorococcus. 5, cotton fiber ; 6, cryptomonas lenticularis ; 7, claws of insects ; 8, decaying leaves ; 9, dust and excrementitious matters ; 10, difflugia, dead, several varieties ; 11, daphne claws ; 12, epithelial scales. human ; 13, fish scales ; 14, fungi and spores , 15, humus ; 16, hairs of various animals ; 17, linen fiber ; 18, large masses of decaying vegetable substances ; 19, navicula ; 20, nebalia ; 21, peridinium cinctum ; 22, peridinium spiniferum ; 23, starch ; 24, vorticella, two joined together ; 25, woood fiber of various kinds ; 26, yeast.

FIFTH EXAMINATION.

Ice from Amherst, Mass., furnished by Mr. C. H. Kellogg. Specimen taken from his cream cooler, and thoroughly washed. This showed but little morphological impurity beyond epithelia, animal and vegetable. From statements made by Mr. Kellogg, this ice was probably chemically contaminated by a paper mill.

SIXTH EXAMINATION.

Ice from Horn Pond, Woburn, Mass. This presented considerable lightish colored deposit, in which a few animal and vegetable forms were found, but was mainly made up of epithelia and amorphous dirt. The result was unexpected, as unfiltered Horn Pond water is rich in forms of life.

SEVENTH EXAMINATION.

Ice from New Haven, Conn. This specimen was quite free from forms of life.

EIGHTH EXAMINATION.

Ice from a provision store, July 13. 1, Amœba, alive ; 2, bacteria ; 3, cœlastrum sphericum ; 4, chlorococcus ; 5, diatoma vulgaris ; 6, epithelia ; 7, linen fiber : 8, monads ; 9, monostylus auccurœa . 10, mass of carbon ; 11, nostoc ; 12, one gonidia of cœlastrum sphericum ; 13, protococcus ; 14, scenedesmus obliquus ; 16, scenedesmus quadricauda ; 16, starch grain ; 17, staurastrum ; 18, tabellaria ; 19, tetrospore ; 20, trachelomonas ; 21, vegetable epithelium collection : 22, young closterium.

FIGURE 2.

Forms found in ice used in New York. Drawn by Dr. A. T. Cuzner, Peckskill.

*a.* Tabellaria.—A diatom found commonly in all surface drinking water. They have the power to arrange in rows, and the specimen in the cut has fifteen individuals in one aggregation, which is a small one. Diatoms are regarded as plants by the majority of observers. A good deal of difficulty arises from trying to measure things with the lines and plummets of past time, when the things in question were absolutely unknown, and hence could not be properly named at the date when the word "plant" was invented. As knowledge increases names must be changed. The diatoms are generally regarded as innocent, though some observers take the opposite ground.

*b.* Epithelia. These are probably human, washed into the water and frozen into the ice. They are constantly thrown off in washing sputa and the excretions of the body. They are also found on all other vertebrate animals and on vegetables.

*c.* Is spiral tissue from some leaf, probably.

*d.* Is a gromia—a rhizopod—animal

*e.* Is potato starch more highly magnified than in Fig. 1. It is somewhat remarkable how long a time starch will exist unchanged in shape or form in pond waters.

*f.* Wheat starch cooked.

*g.* Wheat starch uncooked.

*h.* corn starch.

*i.* Yeast.

*j.* Bascilli, vibriones, bacteria.

*k.* Astrionella formosa.

*l.* Monad.

*m.* Three algæ ranged side by side, green chorophyl collected at extemities.

*n.* Chitin.

*o.* Sporangia fungus.

*p* and *q* Pelomyxas.

FIGURE 3.—(CUZNER).

Forms found in ice water, New York.

*a, a.*[1] Carapaces of entomostraca.

*b.* Tegument of wheat.

*c.* Synhedra, a diatom.

*d.* Mass of dirt, *débris*, etc.

*e.* Leaf of moss.

The other objects are portions of decayed leaves.

FIGURE 4.—(CUZNER).

One inch objective. Ice water forms.

*d.* Portion of limb from a water spider.

*e.* A sphagnum leaf entire.

*f.* Portion of another sphagnum (moss) leaf with reticulation shown.

*g.* Spined vegetable tissue.

FIGURE 5.

Portion of tree leaf with parenchymatous chlorophyl. This was drawn from a solar projection by Dr. Cuzner. It shows how the process of decay was averted by freezing.

FIGURE 6—(CUZNER).

Mycelial filaments of a vinegar yeast found in connection with melting ice. At the bottom are the embryonal spores of the yeast.

This shows what happens when ice water is allowed to stand exposed to the action of the air. A long, dirty, greyish, gelattinous ribbon, half an inch wide and about one-eighth inch thick, appeared to be a mass of what is called "the mother of of vinegar." The cut gives the appearances under the microscope. The significance shows what is the full development of some of the embryonal forms of life found in ice water when subjected to conditions that are present in refrigerators.

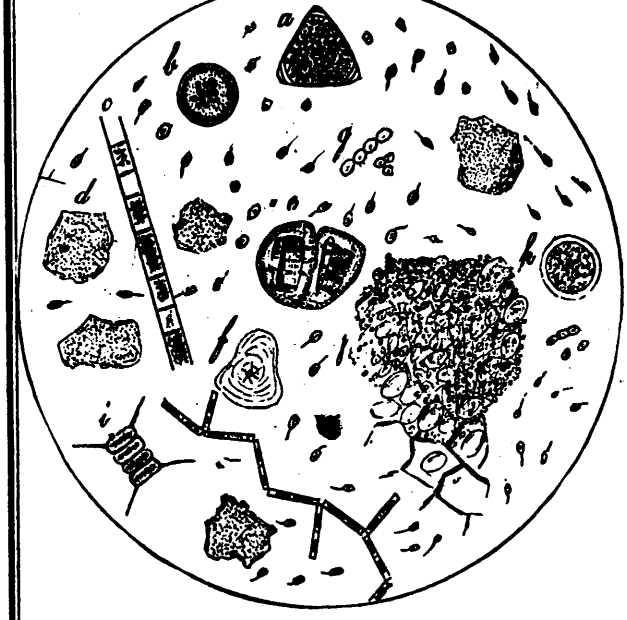



Fig. 7.

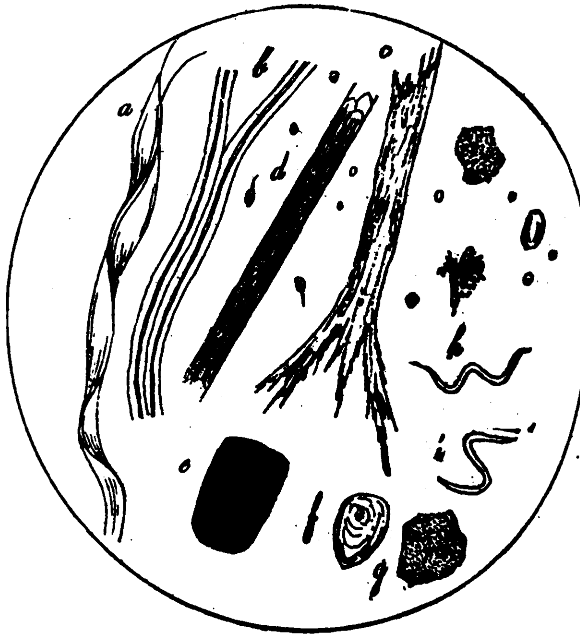



Fig. 8.

FIGURE 7.—(CUZNER).

Forms from Boston ice. (Not from Dr. Harriman's specimen.)

*a.* Epilobium montanum—pollen.
*b.* Diatom.
*c.* Melosira.
*d.* Pavement epithelia. Five specimens.
*e.* Diatom vulgare.
*f.* Starch.
*g.* Alcohol yeast.
*h.* Peotococcus.
*i.* Scenedesmus quadricauda.
*j.* Parenchyma of wheat

The numerous objects in this field are monads that developed in large numbers in the specimen kept for a few days, as might be expected.

FIGURE 8.—(CUZNER).

Objects found in ice water.
*a.* Cotton fiber.
*b.* Silk fibers.
*c.* Bast fiber frayed by maceration.
*d.* Wool.
*e.* Polomyxa.
*f.* Starch. (This is common.)
*g.* Epithelia pavement.
*h, i.* Curious algæ, sometimes crooked like an oxhorn, allied to ankistrodesmus falcatus.—*Scientific American.*

## IMPROVED TIN CANS.

A very simple and neat improvement has been effected in the preparation of tin cans now so extensively used for preserved foods. The body of the can has a bevelled rim, upon the slope of which the cover is soldered. When the cover is smartly tapped around the edge, it is expanded, and the solder joint broken by the wedge action of the bevel. The can is thus opened without injury to the lid, while the present inconvenient and even dangerous process for cutting open these air-tight cases is entirely avoided. The improvement involves no additional cost, and the soldering is applied externally.

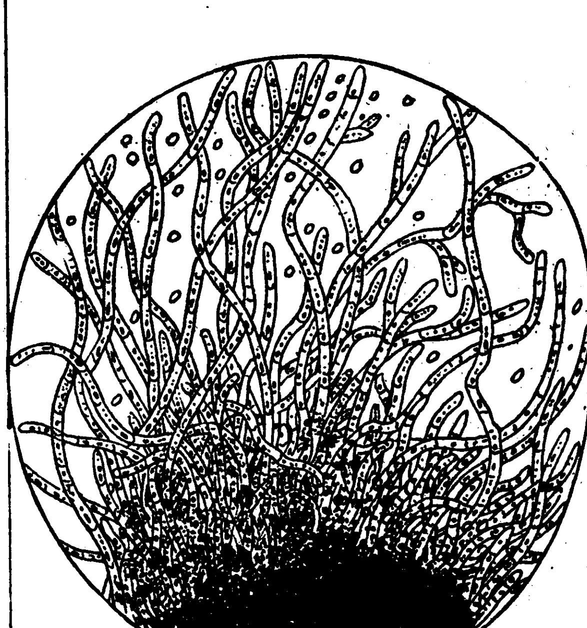
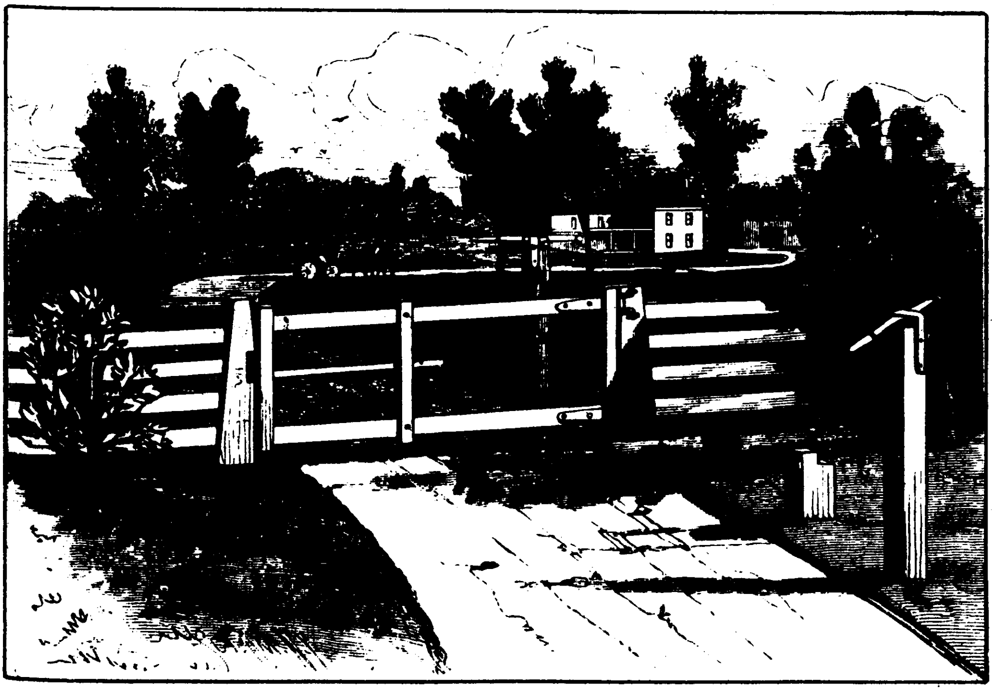


Fig. 6.



LUKENS' IMPROVED GATE

## THE RELATIONS OF FIRE EXTINGUISHMENT TO THE INSURANCE RISKS.

BY CLIFFORD THOMPSON.

It is very much like "carrying coals to Newcastle" for me to attempt, in this presence, to discuss "The Relations of Fire Extinguishment to the Insurance Risk." It is a topic with which you are all familiar, and has for years been one of your stock subjects to write about. Whenever you have found a dearth of topics upon which to concentrate your editorial intellects the subject of fire extinguishment has always been ready at hand for you to discourse about, even as the Jews form a ready and convenient subject for callow clergymen to berate when their supply of more pertinent ammunition is exhausted. But there is one thing to be said about the subject of fire extinguishment, it can never be too much talked about for the good of the general public. It is, indeed, to be regretted that its discussion is confined so closely to that class of journals which we represent, for the annual increasing fire losses of the country constitute a serious drawback to the prosperity of the nation. Could they be prevented or materially reduced, every individual in the community would be benefited. As the great proportion of fires are due to ignorance, recklessness, or carelessness so pronounced as to almost criminal, those great daily, weekly and monthly disseminators of wisdom and news could not do a better service to their fellow-men than by devoting a portion of their time to expounding the gospel of fire prevention. Give us the prevention, and the question of extinguishment will take care of itself. In what I shall have to say at this time I shall not confine myself very closely to the text assigned me, but shall endeavour to forget for the moment that I am identified with either an insurance or a fireman's paper, and strive to consider the question of fire prevention, fire extinguishment, fire losses, and insurance risks from the standpoint of a citizen taxpayer whose burdens are made heavier by fire losses.

Fires have occurred at all stages of the world's history, and under all the varying conditions of civilization. Man's ingenuity has never been able to devise adequate means for enforcing proper measures of prevention, and probably never will be, at least in this life; and if the fire hazard in the world to come is not greatly increased many of us will be happily disappointed. The prevention of disastrous fires is possible, of course, by the proper construction of buildings and cities, but that such construction will ever be attained is far from probable. Hence we must continue to regard constantly recurring fires as inevitable under existing conditions, and resort to the best means possible for reducing their disastrous effects to the minimum. To do this, we need to pay more attention to the science of fire prevention than to fire extinguishment. Buildings can be constructed of slow burning material so put together as to render them very nearly fire-proof. There are many such structures in European cities, and a few in the cities of this country. But it is impossible to make their contents fire-proof, and hence fires are liable to occur in them. But in buildings of this class it is possible to burn the entire contents of one portion of them without disturbing the occupants of the other portions. When buildings generally are so constructed, the fire losses will be reduced to the minimum. Under existing conditions of society, however, it is impossible to secure this nearly fire-proof construction. Property owners will not expend the additional sums necessary to erect such buildings, and no set of law-makers has ever been assembled that possessed the requisite practical knowledge to enable them to frame laws prescribing the methods of fire-proof construction. Experience, especially in this city, has demonstrated that it is impossible to enforce even such precautionary measures relative to building construction as have been enacted. Incompetent, careless, or corrupt officials have neglected their duty in the matter, property owners are opposed to restrictive laws, and architects and builders evade them whenever it is made their interest to do so. As a consequence, our cities are now filled with badly constructed, highly inflammable, and dangerous buildings, and their number is being added to day by day. The constantly increasing fire hazard has rendered necessary more elaborate and costly means of fire extinguishment. In this city it costs about $1,500,000 a year simply to maintain our fire department, involving a tax of nearly $1.50 a year upon every man, woman and child within the limits of the city. A tax in nearly the same proportion is rendered to support the fire departments in other cities. The losses by fire in New York average about $4,000,000 a year; the amount paid for fire premiums annually averages $2,225,000, while the uninsured losses bring up the aggregate cost of fire losses, fire insurance, and fire protection to very nearly 10,000,000 a year. This is what we pay in this city for the blessed privilege of erecting cheap, flimsy, and inflammable buildings—for ignorance, recklessness, and carelessness. Apportion this sum among the tax-payers of the city, and it makes a tax of $100 upon each, and probably more.

It is a theory of fire insurance that premium rates are made to harmonize with the risk—the greater the fire hazard the greater the premium. If this theory was carried into practice, we should have little need to enact building laws for it would then be to the advantage of every property owner to make his buildings as nearly fire proof as possible to escape the extra hazardous premiums that would be required upon buildings of the class now existing. As a matter of fact, however, the discrimination in premium rates is more a matter of theory than of practice, and in reality the rate is scarcely higher on a building known to possess many and varied hazards than upon one that has few. There is, therefore, no incentive to fire-proof construction, and property owners are content to put up shams that are attractive to tenants instead of substantial structures calculated to defy both time and flames.

A property-owner in Boston some time ago stated this point very clearly in reply to a published letter written by Mr. Edward Atkinson. After stating that he was the owner of several buildings, he said that he would not spend one dollar for fire prevention or fire protection; that he was willing to spend money freely to secure the best sanitary condition for his houses, and to make them attractive to his tenants, but the fire hazard was of no interest to him whatever; that he paid the insurance companies to assume the risk, and they were responsible for it. He said, however that if any company would make it an object to him to provide fire protection he would do so, but as long as he could get just as low rates without such protection as he could with it he would not spend money for such object. This is the secret of the flimsy character of the buildings that disgrace our cities to-day and jeopard the safety of whole communities. Insurance companies do *not* charge for the risk as they find it, and, by not discriminating, rob property-owners of all incentive to fire-proof construction. Until such discrimination is made, and property-owners shown that it is to their pecuniary advantage to provide proper means for preventing and extinguishing fires, the fire losses of the country will most certainly increase year by year in proportion to the increase of population and the development of our commercial and industrial resources. Insurance companies now employ surveyors to inspect buildings and pronounce upon their fire hazards, but such inspections have far less influence upon the establishment of rates than does the excessive competition for business engendered by the active rivalry of numerous insurance companies. A few years ago the sanitary condition of buildings began to be actively discussed, and out of the interest developed in the subject there has grown a new profession, composed of sanitary experts, who are competent to remedy defective drainage, correct bad plumbing, and by other means convert a pestiferous house into a safe and wholesome domicile. When insurance companies encourage property-owners to adopt means for fire protection and prevention we shall soon find another class of experts taking the field to advise property-owner as to the best means of providing against disasters by fire. At present, instead of fire prevention being provided at the cost of individual property-owners, too much reliance is placed upon the means for fire extinguishment maintained at public cost, and upon the complaisance of insurance companies that insure property for its full value, or more, at absurdly low rates.

From the underwriters' standpoint, the means available for fire extinguishment have no relation to the insurance risk. At least, that is the inference to be drawn from their practice. Just over in New Jersey there is a manufacturing city that is literally without water for fire protection. A little stream passing through one end of the city furnishes sufficient water for numerous hat factories located on its banks, but is totally insufficient to protect them from the flames, as has been demonstrated on numerous occasions. Its fire limits embrace the main street and twenty feet on each side of it. The front of the street is lined with brick buildings, while twenty feet in rear of them there are any number of frame sheds, tumble-down stables, and cheap wooden structures. When a fire occurs the people turn out to see the property burn, not with the expectation of saving it. Yet in that city, composed mostly of special fire hazards, and virtually without fire protection, the rates of insurance are no higher than they are in Newark, where a splendidly-equipped fire department gives excellent protection to property within the city limits. Other instances without number might be cited to prove that the means provided for fire extinguishment have no influence whatever upon insurance rates, whatever it may actually have upon insurance risks. We all remember how, some time ago, there was a hue and cry about the insufficient fire protection in Chicago, and how the insurance companies threatened to cancel their policies and withdraw from the city. How many of them actually did cancel their policies, or gave up their business there? It was a long time before any better fire protection was provided; but what company refused a risk on that account during that time? Possibly, if the entire fire department of New York city was disbanded, the underwriters might become frightened, cancel policies, and stop writing in the city; but if one-half the apparatus only was disabled, who believes that one of them would refuse a premium tendered, or would still trust to luck to bring them out all right, and the competition for business would be as active as ever. Whatever may be the theory of underwriters regarding fire protection, in practice they generally do not regard it as of any value, for, be it good or bad, it has little or no influence upon rates. To citizens and tax payers, however, an efficient fire department is of inestimable value. So it is to the underwriters, but they do not recognize it as other citizens do. Only a few days ago a fire occurred in a wood-working establishment up town which was filled with highly inflammable material. It originated on the top floor, in a paint shop, and in a few minutes the upper story was all ablaze. In an incredibly short space of time the firemen were at work, and their efforts were directed by the cool, clear-headed judgment of officers of long experience in the service. In a subsequent report of the fire the daily papers extolled the skill and energy displayed by the firemen, by whose extraordinary exertions the fire was confined to the upper story. The only damage done to the property on the lower floors was by water, and was inconsiderable. But for the timely arrival of the firemen, and their able and energetic action, the building, with all its contents, would have been destroyed. The actual loss was not more than 10 per cent. of what it would have been had the building been entirely consumed or the firemen five minutes late in reaching the scene. The value of the fire department to the underwriters in this instance was equivalent to 90 per cent. of the amount of insurance on the property. Instances of a similar nature occur daily, and the efficiency of a fire department is an element that should figure prominently in the establishment of insurance rates. Nothing but the superior machinery employed in the fire departments of the large cities, and the celerity, experience, and good judgment of the fireman, prevent conflagrations of magnitude occurring with frequency.

The means for fire extinguishment bear a most important relation to the insurance risk; but if such importance is appreciated by underwriters they do not recognize it in their dealings with the public. It is not long since I heard the president of a city insurance company complain of the scarcity of fires in New York. Said he, "If the fire department goes on putting out all the fires so promptly we shall lose our business." Another insurance president has written and said that "underwriters want plenty of small fires to keep the people alive to the value of insurance. We don't want fire departments too well equipped; all we want is protection from large conflagrations." This is the underwriters' view of the relations of fire extinguishment to the insurance risk. Yet these same men, as good citizens and taxpayers, admit that this view is opposed to public policy. In their own communities they advocate the best means attainable to protect their property from fire, and we know of some of them who have complete little fire departments of their own for the protection of their private residences. In one of my conversations with the president of a company who held these views, and who also said that over-insurance was responsible for fully 30 per cent. of all fires, I said, "Then you must hold that fire insurance is a curse to the community?" "Most certainly I do," was his reply; "it is a benefit to individuals, but a curse to the community." The welfare of the citizen and the taxpayer demands the most efficient means of fire protection attainable, while the interests of underwriters is consulted by having plenty of fires, but no conflagrations.

Modern architecture is rapidly outgrowing our present means of fire extinguishment. Buildings are run so high up in the air as to be entirely out of the reach of the fire departments.

No stream of water can be projected from the ground to their roofs, nor can ladders be built long enough to reach the upper floors. All the firemen can do in such cases is to wait till the fire burns down to them. Such was the difficulty they had to contend with at the great fire in Worth Street a few years since. The fire was raging a hundred feet above the street, and no engine was capable of throwing an efficient fire stream to that height. The water that could be projected that distance was merely a spray, and of no effect in putting out the fire. And so the flames spread from one building to another, creeping behind the hollow-iron front that projected beyond the division walls, till they had done their destructive work. Other buildings have so enlarged the areas between walls that, when a fire gets started, it becomes such a formidable volume of flame and heat that it is both unapproachable and uncontrollable. Such was the case in the South Street fire, and also in the Havemeyer and Elder refinery. One or two brick walls dividing the area of these buildings would probably have kept the fire confined so that it might have been controlled.

The buildings of to-day are as much beyond the capacity of our present fire-extinguishing machinery as those of twenty years ago exceeded the capacity of the old hand-engines. Either there must be limits put upon the construction of buildings, or there must be improved means devised for extinguishing fires. There is not likely to be any reduction in fire hazards; on the contrary, new ones are constantly being devised, but there has been no radical improvement in fire extinguishing machinery since the invention of the steam fire engine. New methods of utilising these are being brought forward by firemen and inventors, but no machines of greater capacity for projecting water have been invented. What are necessary to control fires in large buildings, or even in small ones that imperil others, are large, powerful streams of water sufficient to drown out a fire at short notice. When a fire gets good headway in one of a block of buildings, the object of firemen is not so much to save the contents of the burning building as to protect those adjoining. To do this they must drown out the fire by the application of a large volume of water. This is protecting the insurance risk to the best advantage. But to get these large and powerful streams an abundant water supply is necessary, and, in this respect nine out of ten of the cities of this country are deficient. In certain portions of New York the water supply is wholly inadequate, and Brooklyn, Boston, Philadelphia, Chicago, St. Louis, New Orleans, and many other cities are little better off. Without an abundant supply of water there can be no efficient fire protection. The day will come when all our seaboard cities will have the high-pressure water service delivering efficient fire streams of salt water directly from the hydrants, and these placed in such close proximity to each other that forty or fifty streams can be concentrated upon a certain point. With such means at hand for fire extinguishment, the conflagration so much dreaded by underwriters will be impossible.

It has been so frequently demonstrated that private fire-extinguishing appliances are of little value that I do not propose to discuss them. It is absolutely useless to equip a building with standpipes, hose, extinguishers, &c., unless men of intelligence are placed in charge of them, trained in their use, and held to a strict accountability for them. I had the curiosity, a short time since, to unroll a coil of hose that had been in a building a number of years without being looked at. It was cotton hose, rubber lined. When stretched out, it was found that there were any number of holes in it where the rats had carried off the cotton to make nests with, and the rubber lining had been so softened by heat that the inner surfaces of the hose were welded together. In another instance, I found a coil of cheap, unlined linen hose that would hold water no better than a sieve. You all remember, no doubt, that the Locust Grove Hotel was splendidly equipped with fire-extinguishing apparatus-force-pumps, pipes all through the building, hose on every floor, &c. The fire broke out in the oil room, adjoining the force-pumps, and the fire-extinguishing appliances were consequently almost the first things burned. About the only private appliances that I know of that have proved of value in extinguishing fires are the automatic sprinklers, the use of which is required by the New England mill mutuals in all the mills they insure. These sprinklers have proved of immense service in putting out fires in large factories, and have been enthusiastically commended by Edward Atkinson and his associate officers in the mutual companies. It did not seem practicable to bring these into general use, for the reason that, working automatically under the effect of heat, and releasing the water supply when a certain temperature was reached, there was danger that the uncontrolled flow of water would do more damage than the fire. But improvements have been made in them of late, and, among other things, they are so arranged that an alarm is sounded simultaneously with the starting of the water, and human intelligence is thus summoned to extinguish the fire or turn off the water, as circumstances may require. It seems to me that this means of fire extinguishment may be advantageously introduced in places that are now inaccessible to the firemen. By making the floors water-tight, and providing scuppers to carry off the superfluous water through leaders to the sewers, there would be little danger of injury to goods or material located on the floors below where they were operating. Certainly any method that promises to control fires in buildings that are now, for all practical purposes, beyond the reach of the firemen, is deserving of careful investigation.

The fire losses of the country have reached such magnificent proportions as to demand the attention of every thinking man. They average, according to estimates of underwriters, about 100,000,000 dollars annually. Add to this the large sums paid for insurance premiums and for the maintenance of fire departments, and taking into account, also, the losses of the thousands of mechanics and others who are thrown out of employment by reason of the burning of the industrial establishments in which they found employment, and we get some idea of what we pay every year for enjoying the luxury of burning up buildings. The efforts of every intelligent man should be directed to overcoming the ignorance and carelessness that are responsible for this enormous waste of the nation's wealth. In doing so, no one need be afraid that he is opposing the interests of underwriters, for however efficient may be the means adopted for fire prevention and fire extinguishment, there will always be a sufficient number of fires to keep alive that interest in insurance that is so necessary to the successful collection of premiums. Fires have always been plentiful, and always will be sufficiently so to make insurance a necessity. The system of insurance has so grown into our commercial and industrial economy that it has become an essential factor in our national and individual prosperity. It is not dependent for its success upon the number and magnitudes of fires that occur, but the character of the indemnity it offers against possible contingencies. Those contingencies are ever present, regardless of any means that may be adopted for fire prevention or extinguishment. If there should not be a fire in New York city for a year, that fact would not reduce the volume of insurance premiums by a single dollar. The welfare of the community demands the very best means of fire extinguishment, and the best that can be obtained will in no way conflict with the interests of fire underwriters.

In these rambling remarks relative to fire matters my purpose has been to direct attention more to the subject of fire prevention than to discuss the relations of fire extinguishment to the insurance risk. I regard the insurance interest in the subject as entirely secondary to that of the community, but that interest is in no danger whatever of being impaired by any efforts that may be made tending to lessen the fire losses of the country. At present, neither property-owners nor the companies derive any advantage from buildings being either fire-proof or extra hazardous. Either condition plays but an insignificant part in the establishment of rates, and has but little effect on the aggregate of premium receipts. While the fire hazard is an important factor in establishing rates for classes of risks, yet these rates are scarcely affected by the question of available means for fire extinguishment. It is fair, therefore, to assume that fire extinguishment is not regarded by underwriters as sustaining any important relation to the insurance risk. Consequently, if property-owners demand the best possible facilities for extinguishing fires, they cannot be regarded as antagonizing the interests of underwriters. If the latter show a little inconsistency in devising fire departments equal to the prevention of conflagrations, which they do not want, but inadequate to the putting out of small fires, many of which they desire, that is their fault, not mine, for I have simply quoted their public utterances. Having thus opened up this subject for discussion, I shall expect to hear other views expressed. Some of you, no doubt, will take issue with me on some of the points I have touched upon. If you do not, you certainly ought to. Hoping I have said enough to arouse your natural belligerency, I leave my remarks in your hands for dissection.

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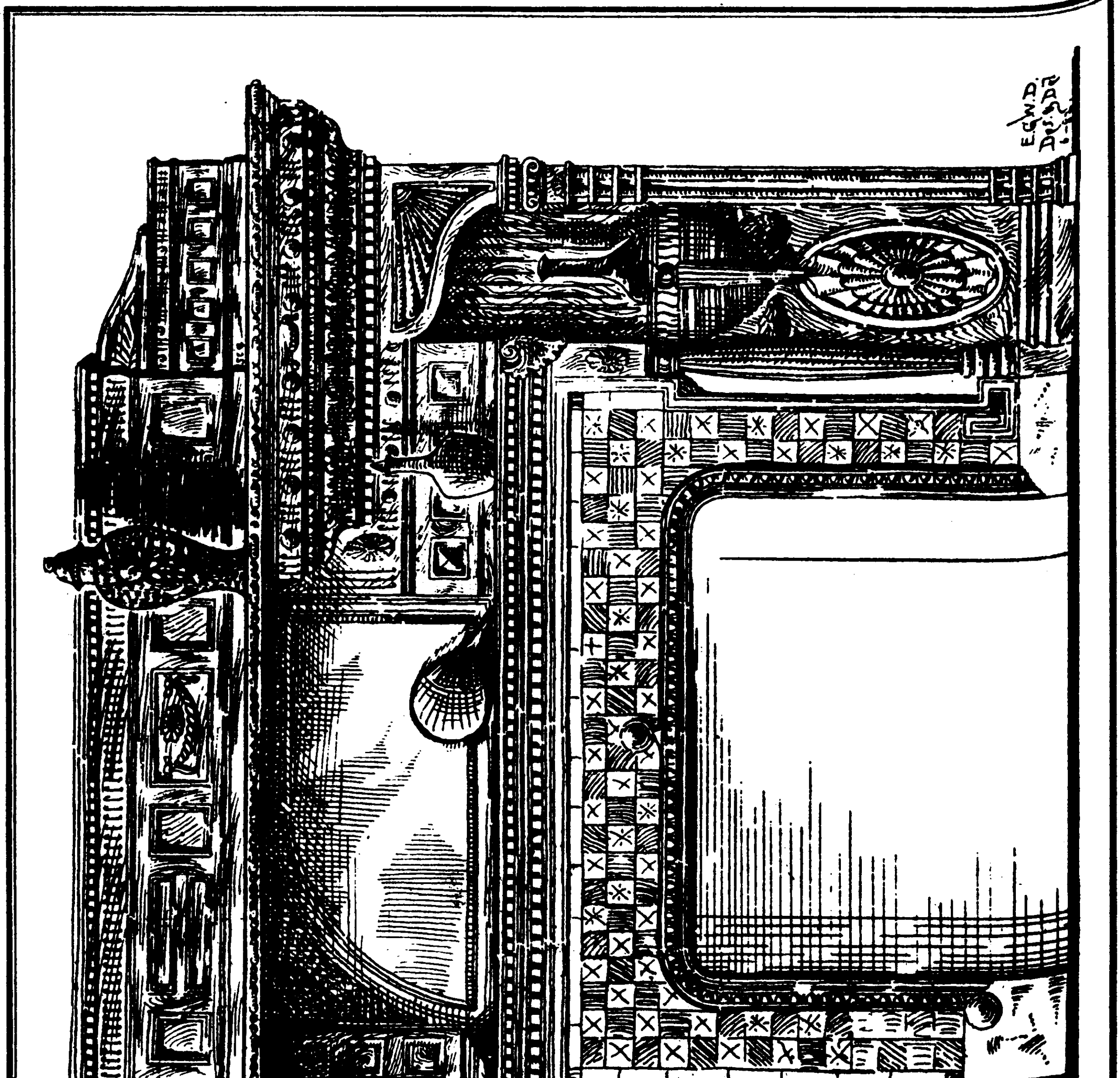
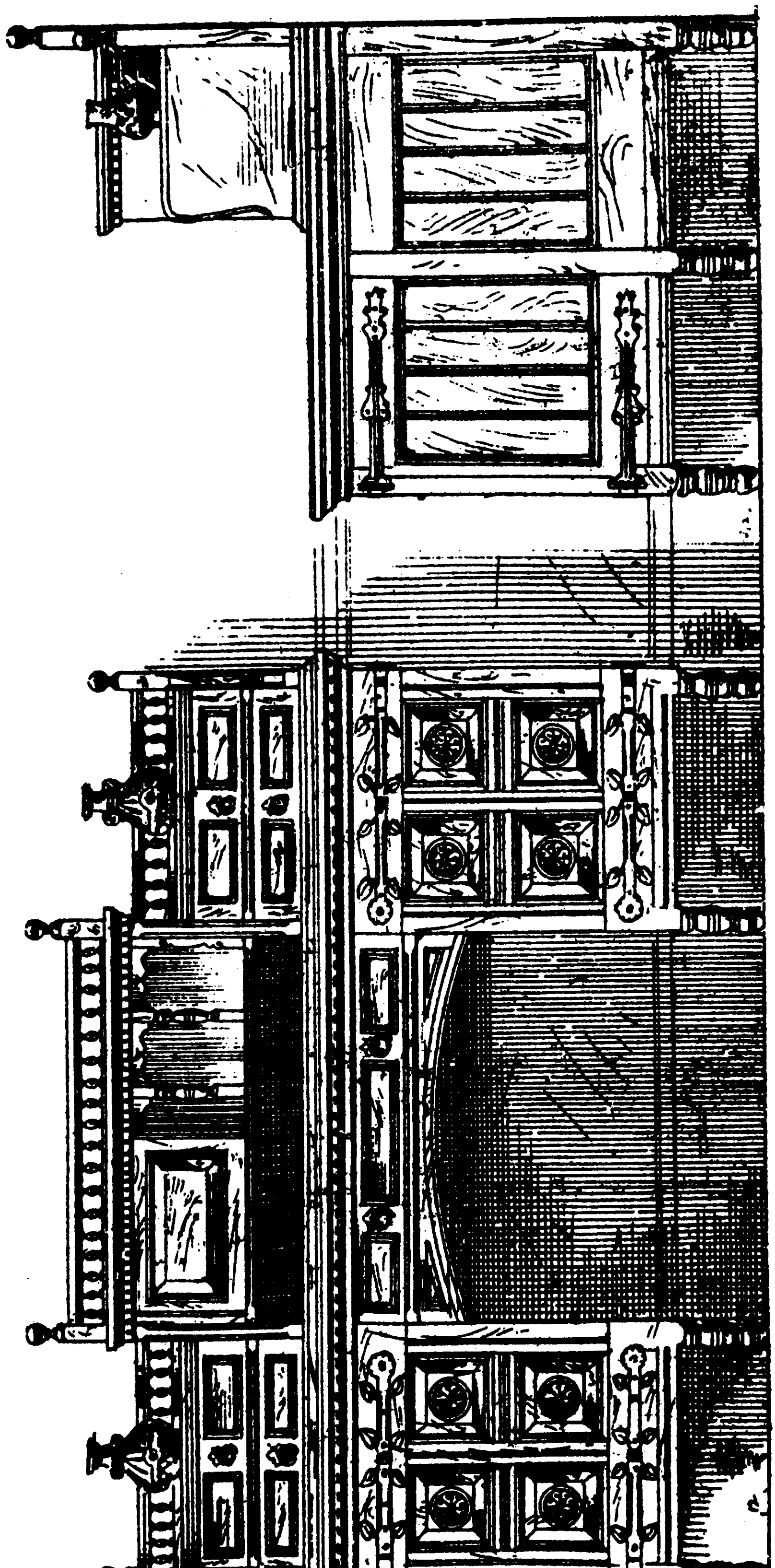
THE search for pearls in the mussels of Ohio has been a considerable industry for years.


Design for Mantel
By E.G.W. Dietrich,
N.W. cor. Penn Ave. & 6th St.
Pittsburgh, Pa.

Dining Room.



"FASHIONABLE FURNITURE."

# Cabinet Making.

## CABINET DESIGNS.

On the following page we show one of the excellent designs for dining room furniture to be found in Mr. J. O. Kane's new work on Fashionable Furniture, which is full of suggestions to our workmen and will well repay perusal. It is sometime since we devoted any space to our cabinet making friends, but we propose in this and following numbers to let them see that we have not forgotten them.

Opposite to this we exhibit a design for a mantel, which for originality, oddity and variety, exceeds anything we have seen for some time. The design contains a number of suggestions and combinations which some of our artists, who love novelties, will, no doubt, appreciate.

The design is the work of E. G. N. Dietrich, of Pittsburg, Penn.

## HOW TO MAKE A DIVAN CHAIR.

(COMPILED FROM THE *Cabinet Maker* OF LONDON.)

One of the most prolific features of the modern furniture trade has been the astonishing multiplication of easy chairs. A few years ago, such articles of luxury could almost have been reckoned on one's fingers. Now we have dozens of them. An age of luxury has given rise to this host of aspirants for the comfort seeker, and some of the devices are certainly luxurious to excess.

The type of chair selected for this chapter is one often in request, and if properly carried out will afford as much ease as any pattern in the market. As indicated by the perspective sketch annexed, the frame is set out to allow for what is known as double-stuffing, or spring edges to seat—a class of upholstery in demand of late years. The making of such a frame is so simple a matter that it is scarcely necessary to explain the "modus operandi." For the sake, however, of novices in the craft, it may be briefly described as follows: First make a mould for back, taking care that it is a nice graceful line, and no other mould will be required for the job, as the rest of the pieces are perfectly straight. Get out stuff to thickness indicated and then fit up back, square top and bottom, as shown; leave 4½ inches between top of seat and stuffing rail to allow for the double stuffing mentioned above. If the chair is to be upholstered in the ordinary way with the usual thickness of rolls, only 2 inches need be allowed between these rails. Having thus got the back up, glue and frame up front, and then cross-frame the chair together from back to front.

In fitting the spindle stump which supports the arm, the best plan is to first fit arm on stump, a pin having been left on the latter, which may be allowed to come right through arm, and can thus be wedged in the top when finally fixed. Before fixing, however, mortise and lap over the square lower portion of stump on to side rails, and when properly adjusted the arms can be glued up and the chair frame is complete. It is as well to place an iron batten under seat to give extra strength.

An excellent plan to finish off a frame of this kind is to glue over the joints a strong piece of canvas; thus protected, the "rickets" are almost impossible, even if the stuff is a little "fresh." Either dowels, or mortising and tenoning, may be employed in the manufacture. The sizes given on this working drawing will answer equally well for a similar chair with "stuffed-in arms." If, however, the latter is required to be full in the stuffing, an extra two inches should be allowed in width of seat.

If an extra amount of ease is required, the chair should be made with a seat sloping from front to back; an inch longer on the front legs, and half-an-inch shorter in the back, will give a desirable angle of comfort. It must be remembered that the joints in side rails will require adjusting in order to suit this angle. This chapter has more to do with the framemaker than the upholsterer; we can therefore only refer the latter to the drawing annexed as a guide to the style of stuffing desirable. The sketch shows the chair stuffed in tapestry now so fashionable, with dark velvet edges and trellis fringe to harmonize. The same shape can of course be used for leather or other material.

It has been arranged to hold an International Electrical Exhibition in Vienna. As exhibitions of this nature are to be held this year in Munich and in Trieste, it has been decided to postpone the Vienna one until August.

## CHATS WITH OUR CARVERS.

FLORAL FORMS AS APPLIED TO "QUEEN ANNE."

"By slow degrees to noble art we rise."

We shall not apologize for inviting our carvers to consider yet further the treasures of nature that lie so handy to their chisels. At this time of the year, when vegetation is bursting forth into so many new and vigorous forms, opportunities occur for the study of natural design that do not present themselves at other seasons. As the poet Arnold puts it,—

"In the sweet spring days,  
With whitening hedges and uncrumpling fern,  
And blue-bells trembling by the forest ways,  
And scent of hay new-mown,"

there are especial charms which may be turned to profitable account. Flowers, "earth stars," as they have been aptly called, are in themselves so beautiful, that to say anything to commend their study seems almost as superfluous as to paint the lily, or to gild refined gold. It may, however, happen that some of our carvers, from the matter never having been brought under their notice, or owing to a town life or other hindering cause, have not hitherto fully appreciated these natural beauties, or have failed to see in them any practical bearing for themselves. To such we again address ourselves, hoping to demonstrate to them that in the study of such subjects they may gain both enjoyment and profit. A loving appreciation of nature has in all ages characterized the noblest minds, and the advantage of such study in the art school of Dame Nature was beautifully put by Professor Richmond, in his recent Oxford address. At the risk of being charged with plagiarism, we embody his remarks upon this topic *in extenso*, for they so exactly convey the lessons we wish to impress upon our "wood sculptors."

"Now I would ask you," says the Professor, "to follow me into the fields and there to see whether it would not be a pity that any student of art should ever go there without his pencil and book. In the first place, we all know that nature is inexhaustible, that her power of suggesting forms and combinations of forms is endless. It was in old days from natural objects that the Greeks derived their patterns, the Byzantine artists their interweaving designs of flowing vines, and the Goths found out their endless wreath of ornament. Only recently a Persian carpet, dating from the end of the sixteenth century, was shown to me. In words it is impossible to convey any idea whatever of the variety of flowers which covered the surface, flowers not conventionally but truly drawn, while at the same time they were arranged and ordered with sufficient geometrical precision to form a definite pattern. Now each and every one of the flowers woven in this carpet must have been studied carefully from nature, for the daintiness of drawing, finish of color, and characteristic growth could not have been so finely conceived or so various in all their attributes had not the artist been fully alive to the beauty of nature. If there is to come a new style, an individual style, let us call it—by individual I mean the workings of a man's taste made visible in his art—it must be through the study of nature acting upon a trained taste formed on the example of good works of art. Having learnt what the laws of design are, having acquired taste for that which is most pleasing in the combination of lines, by contact with specimens from Greek, Roman, Byzantine, or Gothic designs, let him who is prompted with a desire to express himself in form betake himself to fields or gardens, and there draw whatever he admires in leaf or flower. And let him do this in courage, trusting that the judgment born in him by the experience he has gained in the study of good work will not fail him. Gathering thus from nature, a true student will get material to work upon in his designs, and he will find himself anxious to express himself rather than to copy others. We must remember that in old times the architect of a cathedral, church, or building, for whatever purpose designed, trusted much to the workmen for the details of carving and ornament. These workmen varied (as we see by their workmanship) in natural ability. Some were cleverer designers than others, some had more fancy than others whilst again others among them were little else than excellent manipulators, or good carvers in marble or stone. But such men as these were true artists, and one of the great interests, especially in Norman or early English architecture, is the presence of the affections of many minds, the variety of invention, and variety of design, so got, and only so, by the individual character of every workman's taste being stamped upon all his achievements.

I cannot, for my own part, see why the same method of labor should not apply to modern management. I cannot see why, if the stone-mason lived simply, cultivated his taste (this he has plenty of facility for doing), and during his spare hours lived the life of an artist, during his walks studying nature and art, in holiday time refreshing his body and mind in the fields, learning lessons in design from plants, flowers, herbs, weeds—in fact, whatever he came across—I say I cannot see why the carvers of our churches should remain mechanics only, nor can I see why he should not be a designer and artist, as were the masons of past times. Whether he be trusted must depend upon himself, and before the workman of to-day is trusted to design, it must be quite certain that desire to do really good work exists in him, and, further, that those artisans who would be dignified by the title of artist must, in the first place, prove themselves to be honest workmen. They must give evidence that there is no desire to scamp any work laid before them to execute. Faithful in copying with the utmost exactness, being animated by desire for perfection, work must be the pleasure, and labor the distinguished element, of him who desires ever to be truly an artist. No really good designer ever scamps his work : in fact, it is just in proportion to the strength of imagination that the artist will keep up through toil, and become thereby the buttress of his invention. Whatever you find in art of good design, whatever has lasted through fashion and changes of opinion, will always be marked by good and perfect workmanship. There is to be found a reward in art greater than can be got by money, and more, the best economy for every workman is good work and absolute conscientious labor. This must tell in the long run, and will, if persisted in through all temptations to slacken exertion, ultimately prove to be physically and morally successful."

Some floral forms lend themselves better to a perpendicular than a horizontal position, and it is well to consider the nature of the flower or plant before placing it. Thus, to enrich a perpendicular molding, the fuchsia may be used, for as thus applied it retains the manner of its growth. "Daisy chains" suggest the joys of bucolic childhood, and daisy "swags," are just as appropriate and pleasing.

It would be wise of the young carver to pop out into the fields, gather a specimen of each of these examples, and make full-size drawings of the flowers for his portfolio, saving them against a rainy day. Such a bank of natural wealth will yield good interest in years to come, and there will be found, as Professor Richmond says, "a reward in art greater than can be got by money."

It may be well to refer yet again to the advantages of "conventional" *versus* purely "natural" treatment, and in order to make the two terms distinct we may give a definition from a standard authority : "Naturalism is the direct imitation of natural forms, the ambition of the designer being to make his work as much like the real thing as possible ; while conventionalism, deriving its inspiration from nature, modifies the forms to suit the requirements of ornament. Naturalism is animal or vegetable form merely applied ; conventionalism is nature adapted. "Ornamentation," to quote one of our greatest writers on art, "should be natural ; that is to say, should in some degree express or adopt the beauty of natural objects ; it does not hence follow that it should be an exact imitation of, or endeavor to supersede, God's works." It may consist only in a partial adoption of and compliance with the usual forms of natural things, without at all going to the point of imitation ; and it is possible that the point of imitation may be closely reached by ornaments which, nevertheless, are entirely unfit for their place, and are the signs of a degraded ambition and an ignorant dexterity." To indicate the lines of such study in a simple and practical way is merely the object of these chapters. To those who would pursue their researches more extensively, we would recommend the persual of Mr. J. K. Collings' "Art Botany" and various standard works on plant form.—*The Cabinet Maker.*

## IMPROVED GATE.

We give an engraving of a new driveway gate, recently patented by Mr. John F. Lukens, of West Mansfield, O. The gate is composed partly of wood and partly of iron rods. It is very light both in weight and appearance, but amply strong. It is capable of being very easily operated from the carriage or by a person on horseback, and at the same time it may be opened and closed in the same manner as a common gate.

The gate opening and closing attachment may be readily applied to any of the ordinary gates now in use at a very slight expense. As shown in the engraving, the improvement consists simply of a crank formed of a wrought iron rod, and put through the upper eye of a common gate hinge. This crank is supported in bearings on the gate post, and the upper end of the rod of which it is formed is bent to form a lever for receiving the wires which connect with the levers, by means of which the gate is opened and closed. A movement of one of the hand levers in one direction turns the crank so as to raise the free end of the gate, when it will swing open of its own gravity. The movement of the lever in the opposite direction produces the reverse effect, and the gate closes.

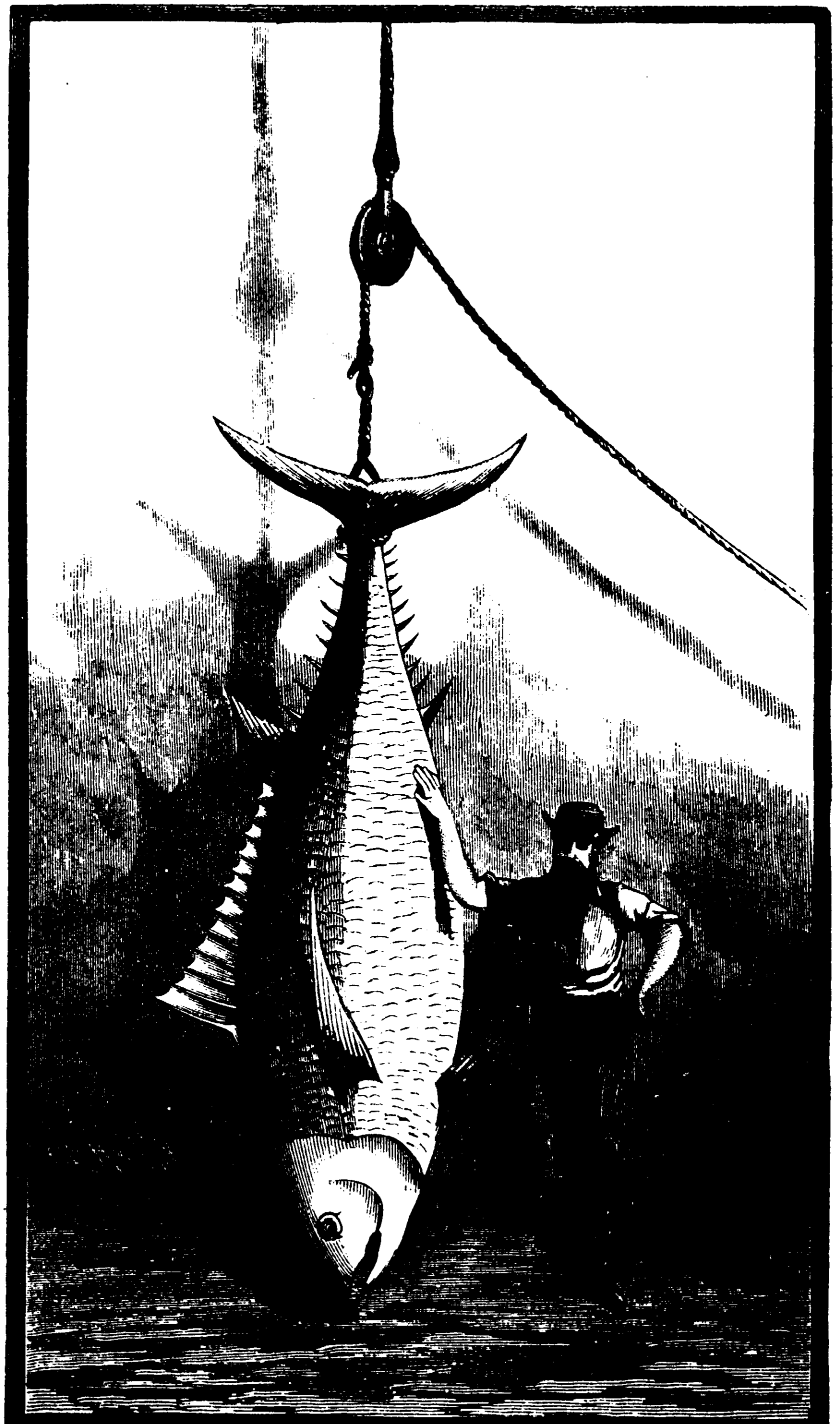
Further information in regard to this invention may be obtained by addressing the inventor as above.

## PETROLIUM'S SURPRISES AND DISAPPOINTMENTS.

The history of the discoveries in the oil fields in this country has been one of a series of disappointments to the producers. From 1866 to 1872 the price per barrel averaged from $4 to $5, and the producers were making money rapidly. Then the field in Butler County was struck, and from that day to this the production has been greater than the consumption. Before Butler had begun to decline the Clarion field was opened. Then came the Bullion pool with its 2,000 and 3,000 barrel wells, which forced the price down to $1.50. This field was soon exhausted, and better times for the producers were at hand, when the Bradford field, the largest in extent ever known, was opened. For nearly five years the Bradford field, increased its production, until it had a daily out-put of over 100,000 barrels. The consumption was not over one-half this amount, and with the Standard Oil monopoly squeezing the producers many of them went to the wall. Then Bradford began to decline, and again a silver lining was seen in the cloud ; but again disappointment came. In May, 1881, the first well was struck in Allegany County, New York, and a new field was opened which soon more than made up for the decline. In the spring of the present year the Allegany field showed that it had passed the climax and was on the decline, and again the producers looked forward to the near future when the consumption would equal the production. Then was the great "646" mystery struck, and with it followed disaster to the owners of wells generally, and lower priced oil than since the summer of 1874, when for a short time it sold for 45 cents a barrel. Where the next field will be is only a matter of conjecture.

The only time when the excitement over a new oil field was as great as that now reigning in the Cherry Grove district was in 1865, when the Pithole fever took possession of the public. The first well was opened there in May of that year. In less than two months Pithole was a city of considerable proportions, and within six months it had 8,000 inhabitants and almost as large a floating population. At the pinnacle of its greatness it had fifty hotels, some of them palatial and gorgeous, and one of which cost $80,000. It had miles of streets lined with banks and all kinds of business establishments. A $50,000 transaction was considered of small account, and, miscalculating the future of the place, wealth was squandered on new enterprises which in the minds of its citizens promised fabulous fortunes ; but Pithole was only a child of six months' growth when it began to exhibit symptoms of an early decay, and it declined almost as rapidly as it sprang up. The *Tribune* correspondent visited Pithol, the other day and found only one voter living in the place. The railroad was long ago torn up, and most of the houses were torn down. Two of the streets are still open, and beside them remains a pitiful scattering of old houses in the last stages of decay. Fields of corn and oats stretch over the streets and squares where once were gaudy theaters and dance-houses, gorgeous saloons and mammoth hotels. When the oil fever was high a half acre of what is now waste pasture land was sold at a rate equivalent to $100,000 an acre. Over on the hill still lives old Mr. Copeland, who in 1865 refused an offer of $700,000 for his farm. Two years later he would have taken as many cents. He still own it, and his daughter teaches school and supports the family. In all this there may be a lesson for speculators at Garfield to-day.—*N. Y. Tribune.*

THERE is annually manufactured on the Mississippi River and its tributaries about 1,500,000,000 feet of white pine lumber, with its proportionate accompaniment of shingles, laths, and pickets.



THE AMERICAN TUNNY.

# Natural History.

## THE AMERICAN TUNNY.

BY C. F. HOLDER.

Probably no family of fishes exceeds the mackerels (*Scombrinæ*) in their economic value. Having a wide geographical range, the different genera are found in almost all the waters of the world, everywhere being a benefit to man and from their beauty, form, and peculiar habits attracting universal attention. The family is divided into four sub-families: 1st. Scombrinæ, distinguished by the short first dorsal and the wide space between it and the second, and the pectorals high up, including the genus *Scomber*, or common mackerels. 2d. The Orcyninæ, of which the subject of our illustration is a member. Here the spinous dorsal is contiguous to the soft, the pectorals comparatively low, the caudal peduncle with a median adipose carina, or fleshy keel, and two others, one above and one below, converging backward. This sub-family includes orcynus, sarda, and cybium, and related forms. 3d. Thyrsitinæ, in which the spinous dorsal is also long and pectorals comparatively low, but the caudal peduncle is not keeled. This family includes the genera thyrsites, ruvettus, etc. 5th. Gempylinæ, distinguished from the others by the very long body (the height being less than a tenth of the length), and the

GIRAFFE AND YOUNG IN THE BERLIN ZOOLOGICAL GARDENS.

numerous spines of the first dorsal, represented by the genus gempylus. Very recently an American tunny was brought into Fulton Market, and from its great size attracted general attention. It was nearly nine feet long, and weighed between 800 and 900 pounds—a magnificent fish, its entire make up denoting wonderful speed and activity in its native element, where, with their rich coloring, iridescent and silvery tints, they prasent a wondrous spectacle. It is rarely that they are captured so near New York city. In Rhode Island and by some of the more northern fishermen it is called the albicore, as well as American tunny, and its range is from Newfoundland to Florida. Rondelet figures a tunny under the name Thon, and another species which he calls Pelamyde, or Thon d'Aristole. The first he denominates in Greek as Orkunos, which, he says, is the "Grand Thon." The generic name now used is evidently from the old Greek designation, and tunny is from thynnos, the more common term in use among the ancients. The fish seems to have been well known along the Mediterranean Sea. Rondelet figures a bize, which he calls also sarda, and which he says is called by Pliny pelamydes. It will be seen, then, that these names, which are retained by modern naturalists, were used by the earliest writers to designate species very closely allied.

Storer says: "The species known along our coast as horse mackerel and albicore comes on to Massachusetts Bay about the middle of June and remains until October. It is frequently taken for its oil, which is taken from the head and belly, a single specimen often yielding twenty gallons."

They grow to a great size, and in 1855 one was caught off Lynn, Mass., that weighed over 1,000 pounds, was 10 feet long, and 6 feet in girth. It was presented to the Lynn Natural History society by Dr. J. B. Holder, who was then the honorary curator. In a memorandum note in the History of Lynn, Dr. Holder says, "In this year (1850) they were very abundant, small ones being seen jumping out of the water; and I have measured several that were 10 feet in length."

After this they were rarely seen, but in 1871 a number were observed, as well as great quantities of a small tunny, *Orcynus alliteratus*, which, remarkable to relate, and showing their great range, had previously only been known in the Mediterranean Sea. The common tunny of the locality is the *Thynnus vulgaris*, and is said to have been seen in our waters. It attains a much greater size than its American representative (*Orcynus secundo-dorsalis*). Specimens have been found 20 feet in length, exceeding half a ton in weight. A casual observer would hardly note a specific difference between the two, so much do they resemble one another. From a very remote period the fisheries near the Island of Sicily have been valued, and in the summer vast shoals of them are caught in large nets or by means of what the Italians call tonaro.

In appearance the thynnus bears a close resemblance to our mackerel, except in point of size. Each jaw is furnished with a row of small sharp pointed teeth, slightly curved inward; the tongue and inside of the mouth are very dark colored; the cheeks covered with long narrow pointed scales; the operculum is smooth; the dorsal and anal fins are followed by nine small finlets, and the tail is crescent-shaped. The upper part of the body is very dark blue; the belly a light gray, spotted with silvery white; the first dorsal fin, pectorals, and ventrals black; the second dorsal and anal nearly flesh-colored, with a silvery tint; the finlets, above and below, yellowish, tipped with black. This description well applies to the American tunny, though the Fulton Market specimen had lost its brilliant colors when we saw it. Mr. Garrell, quoting from Mr. Couch, says that "the tunny appears on the Cornish coast of England in summer and autumn, but is not often taken because it does not take bait, or at least the fishermen use no bait that is acceptable to it, and its size and strength seldom suffer it to become entangled in the nets. It feeds on pilchards, herrings, and perhaps more other small fishes, but the skipper (*Esox saurus*) seems to be its favorite feed, and it has been seen to leap in the air after them and endeavor to cut them down after the manner of the thrasher.

According to a French writer the greatest tunny fishery of the present day is that at Provence. Here the haul is made by an inclosed net called the *madrague*. The net consists of a combination of nets, which is quickly cast into the sea to head the tunnies at the moment of their passage. When the sentinels posted for the purpose have signaled the approach of a shoal of tunnies and its direction by the indications of a flag which points to the spot occupied by the finny tribe, the fishing boats are immediately directed to the spot indicated and ranged in curved lines, forming with the light floating net, a half circular inclosure turned toward the shore, the interior of which is called the garden. The tunnies thus inclosed in this garden between the shore and the net become crazed with terror; as they advance along the shore they press upon the inclosure, or rather a *new* interior inclosure is formed with other nets held in reserve. In this second inclosure an opening is left through which the fish have to pass. In continuing thus to diminish the space by successive inclosures each occupies a smaller diameter, in which the fish are inclosed in about a fathom and a half of water. At this moment a seine is thrown into the garden, this is in turn hauled by the men into shallow water, and the small fish taken by hand, and the larger by hooks made for the purpose and thrust into the gills. A single day of such fishing will oftentimes produce 16,000 tunnies, ranging from twenty-five pounds upward. The madrague above mentioned is a permanent fishery, and consists of a vast inclosure formed of nets into various chambers, supported by corks and held in place by weights. The net is intended to arrest the shoals of tunnies as they leave shallow water for open sea. For this purpose a long alley or run is established between the sea shore and the park or madrague. The fish follow the run, and after passing from chamber to chamber, at last find their way into the interior. To force them near the "park" long nets are used, hauled by boats, and finally, when they are thoroughly in the toils, the net is raised to the surface, and the victims killed with poles and various weapons, the sport, if it can be called such, lasting the entire night.

As an eating fish it is there preferred to the salmon, and a French gourmand says of it, "For our part we put it far above salmon. Nothing is comparable to the fresh tunny thrown into a hot frying pan, and sprinkled with vinegar and salt. When properly cooked nothing can be more firm or savory. In short, nothing of the kind can rival or even be compared with the tunny as we find it at Marseilles and Cette."

The large tunnies of our coast are by no means such delicacies, though their cousins, the mackerels, when fresh and broiled—not fried—are equally up to the French ideal.

## IS MAN THE HIGHEST ANIMAL.

The measure of zoological rank is the specialization exhibited by all the organs taken collectively. Specialization may be exaggerated in one or several organs, without the animal therefore attaining as a whole a high rank. This is the case in man. The measure of specialization is afforded by embryology, which shows in earlier stagas the simplicity and uniformity of structure which in later stages is replaced by complexity. The human body preserves several embryonic features. In man we find three series of high differentiations, namely: in the brain, in the changes induced by or accompanying the upright position, and third, in the appositility of the thumb to the other digits. These are the principal, though of course not strictly the only characteristics of man, which show that he is more specialized than any other animal. In other respects he shows a still more striking inferiority. It is of course a familiar observation that his senses are less acute than those of many animals—he has neither the keen vision of the falcon, nor the delicate scent of the dog. He is equally inferior in many structural features. His teeth are of a low mammalian type, as is shown both by his dental formula and by the presence of cusps upon the crowns of the teeth, a peculiarity of the lower mammalia, entirely lost in the horse, the elephant, and many other "brutes." His limbs show a similar inferiority, since they are little modified, preserving even the full dumber of five digits, and in respect of these members man stands therefore very low, lower than the cow and the pig. He plants the whole sole of his foot upon the ground, yet none except the lower mammalia, together with man and his immediate congeners, are plantigrade. So too with his stomach, which is so simple as compared with that of a ruminant, and indeed, is of about the same grade as that of the carnivora. It makes, however, a still more forcible impression to learn that the human face, which we admire when withdrawn under a high intellectual forehead, is perhaps the most remarkable of all the indices that point out man's inferiority. In the mammalian embryo the face is formed under the fore brain or cerebral hemispheres. In our faces the fœtal disposition is permanently retained, with changes, which when greatest are still inconsiderable. In quadrupeds the facial region acquires a prominent development leading to the specialization of the jaws and surrounding parts which brings the face to a condition much higher than that of the fœtus. Hence the projecting snout is a higher structure than the retreating human face. These facts have long been familiar to anatomists, but I am not aware that the inferiority of the human to the brute countenance has heretofore been considered a scientific conclusion by any one. Yet that inferiority is incontrovertible and almost self-evident.

The preceeding statements render it clear to the reason that man is not in all respects the highest animal—and that it is a prejudice of ignorance that assumes that the specialization of the brain marks man as above all animals in the zoological system. It does give him a supremacy by his greater power of self-maintenance in the struggle of the world, but that has nothing whatever to do with his morphological rank. There is nothing in morphology that anywise justifies assigning, as is actually done, an almost infinitely greater systematic value to the specialization of the brain and a specialization of the limbs, stomach, teeth, face, etc., hence it is impossible to call man even the highest mammal. It is also doubtful whether mammals would be regarded as the highest class of the animal kingdom, were they not our nearest relatives. Let us beware of claiming to be the head of organic creation, since the Carnivora and Ungulata are in many respects higher than we. I believe that it is just as unscientific to call any one animal species the highest, as to pitch upon any one plant to stand at the head of the vegetable kingdom.—*C. S. Minot.*

## Miscellaneous.

### APARTMENT HOUSES.

A Chicago paper says that there is every prospect that within five years New-York will have the largest and best-appointed apartment houses in the world. Every week some new plan is filed, and some of the later designs are conspicuous for attractive novelties that were never thought of when these great buildings were first erected. In one of the flat buildings going up on Madison avenue there is to be a garden on the roof; another proposes to have a Turkish or Russian bath for its inmates. The most magnificent scheme of all is that of W. H. Post, whose building, covering an entire block, is to be located near Central Park. It will have 200 suites of rooms, each occupying on an average 25 by 85 ft. space. Mr. Post proposes to invite its tenants to share the benefits of certain co-operative features. It is intended to supply some articles of food daily at wholesale prices. Coal will be bought by the boat-load and delivered; dressed meat or cattle will be contracted for at wholesale rates, and every effort apparently will be made to abolish the corner groceryman.

By far the most extensive improvement in the shape of apartment hoses is the forthcoming erection by Jose F. De Navarro, of ten mammoth houses east of Seventh Avenue, between Fifty-eight and Fifty-ninth streets. The houses will be nine stories high. Granite, brown stone, Ohio stone, Milwaukee and Philadelphia brick will be used. They will be in the Moorish style of architecture, and it is estimated that their total cost will be £600,000. Contracts have just been let for the construction of the four houses nearest Seventh Avenue. Edward Clark's family hotel, the Dakota, will be completed by next spring at a cost of nearly £300,000. It is to be eight stories high and will cover the entire front on Eighth Avenue, between Seventy-second and Seventy-third streets.

It is reported that James Gordon Bennett propposes to erect the finest hotel in the world upon the block bounded by Fifth and Madison avenues, Thirty-eighth and Thirty-ninth streets. Some of the buildings are too valuable to be removed, and they will be utilized in a sort of composite structure affording a great variety of apartments for the guests. The lessees, it is said, will be the gentlemen who now have charge of the Brevoort House.

The demand for suites of rooms in apartment houses is far in excess of the supply. It is understood that, although far from completion, the Dakota is bespoken to the extent of two-thirds of its accommodations.

### UNJUST STRIKES.

Some months since a labor trouble occurred at the starch manufactory of the Messrs. Duryea, at Glen Cove, L. I. The Knights of Labor not only declared the works on strike, but issued a circular "boycotting" the starch made by this firm. The Messrs. Duruya again and again denied the charges made against them on which the "boycotting" was based, and invited an investigation, but an officer of the Knights of Labor, known as the "Grand Statistician," wrote a letter sustaining the charges. Some time since the editor of a labor paper in Philadelphia investigated the charges and found them false and so stated, and immediately he was denounced as a traitor and his paper "boycotted." Now we see that at last a committee of the Knights of Labor have investigated the charges and found them untrue, and it is reported that they have expelled the "Grand Statistician." For even this tardy act of justice, so rare an occurrence among labor organizations, the Knights of Labor are worthy of commendation. It shows a wonderful advance in courage. A few years ago no officer of a union, no matter how just such an act might have been, would have dared to have countenanced such a withdrawal of charges as this, and, in many unions to-day it could not be done. But would it not have been better not to have had occasion for such an act of justice, by seeing to it that injustice was not done in the first instance? Is there not a too prevalent idea among workmen that all the right and justice is on their side and all the wrong and injustice on the other, and that a strike, because it is a strike, and without any reference to the facts, is always "just and right, and a demand for their rights?" There are labor papers in this country that never speak of a strike as anything but just. We have in mind a case where some workmen struck, and the union with which they were connected ordered them back to work, as the strike was unjustified, and yet journal after journal had notes of the tyranny of the manufacturers and the justness of the cause of the workmen. In many instances strikes are undertaken without judgment or reason, and persisted in from a foolish idea that it is cowardly or injurious to "back down." Such acts as this of the Knights of Labor will go far to lessen strikes, and when the leaders of unions or the cool heads dare speak out and condemn unwise and unjust strikes, they will be still less frequent.—*Metal Worker.*

A New Use for Old Tin Cans and Scrap Tin.—According to the *Berg-und-Huttenmannische Zeitung*, a better method for utilising old tin cans than simply to melt off the solder has been devised. E. Rousset first heats the tin, old or new, in an oxidising flame, which burns up all the pure tin and that combined with iron. When this is stopped the scraps of iron are seen to be covered with a brown and brittle crust, the upper layer consisting of oxide of tin, the lower of magnetic oxide of iron. It is passed through rollers and then forms a powder that contains both oxides. The iron that remains after sifting out the powder makes good wrought iron or cast iron, but is particularly fitted for precipitating copper. The oxide of tin, although mixed with oxide of iron, can be easily worked into tin, and the metal obtained from it is free from sulphur and arsenic. But will it not contain traces of lead?

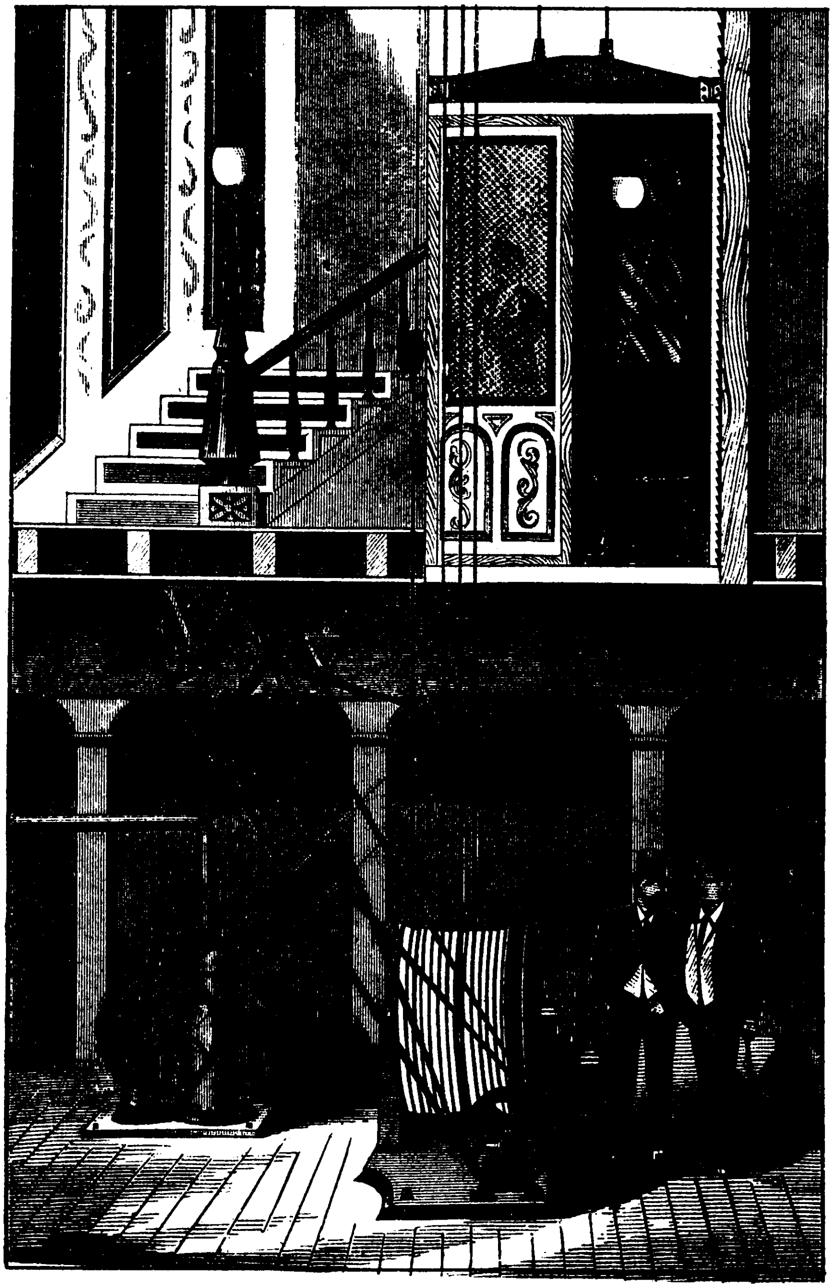
### THE AIR ENGINE AS APPLIED TO ELEVATORS.

The illustration given herewith shows the application of the air engine, manufactured by the Sherrill Roper Air Engine Co., as a hoisting power to passenger elevators.

The engine known very favorably for some time as the Sherrill Roper air engine, by reason of its safety, extreme simplicity of construction and its economy of operation, is excellently adapted for this species of service.

A few words respecting the principles of its construction and action will serve to make this clear. In this engine the air of the temperature of the surrounding atmosphere is drawn into the air pump; from this it is forced directly into the fire, which is contained in an air-tight furnace. Combustion and expansion ensue, and as the result of the expansion of the air and of the combustion products, a considerable pressure is developed in the fire-chamber. The charge of gases is then admitted into the cylinder, in which it is utilized precisely as steam would be, and is exhausted through valves in the same manner.

From the above explanation, the engine, as may be imagined, is simple, and in its design the makers have made it also very compact. The heated air is conducted from the furnace through the shortest possible pipes, thus insuring the utilization of the gases of the furnace to the greatest possible extent, and reducing the loss of pressure by cooling to a minimum. To insure durability, the furnace is lined with heavy fire brick, and the air being brought into contact with the fire, there are no iron plates or other heating surfaces to be destroyed by burning out.



ELEVATOR WORKED BY THE SHERRILL ROPER ENGINE.

Again, the complete insulation of the cylinder by the partition and non-conducting material used, and its removal from externally heated pipes, protect it from a highter temperature than that necessarily acquired by the expanded air supplied to it, thus securing the greatest economy in fuel, and avoiding subsequent loss of expansion and power, by cooling before it has performed its work. These are points of advantage of vital importance to the success of a hot-air engine where limited expansion can be obtained, which will be appreciated by all who may take the subject into consideration.

In all that relates to mechanical construction, the makers have left nothing undone, in respect to the use of the best materials and workmanship, to commend the engine to public favor. They have succeeded in producing an exceedingly simple, efficient and economical engine, compact and durable, that requires but trifling skill to operate, and that is free from the unavoidable objections incident to the use of steam, and free from the danger of explosion. Their adaptability for every form of service where moderate power is required will be apparent without further explanation.

The application of the Sherrill Roper air engine to hoisting machinery is one for which it is especially well adapted. The illustration shows very well the engine and its relation to the hoisting mechanism, without the necessity of describing the latter, which, in the absence of an engraving showing details, could not be done satisfactorily.

We may add that the makers have provided numerous appliances for insuring safety in the operation of their passenger elevators and other hoisting machinery. They claim for their engine in its special service the following meritorious features: "It uses no water, cannot explode, does not increase the rate of insurance, will do the hoisting of an ordinary store for less than fifty cents per day, and can be attended by any ordinary employé without seriously interfering with his other duties. It is in construction strong, simple and durable; and long and successful operation in driving elevators proves it to be unequaled in this field."

The Sherrill Roper Air Engine Co., of 91 and 93 Washington street, New York, are the manufacturers.—*Manufacturer and Builder*.