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## BELTS--THEIR ELECTRICITY--HOW TO LAY OUT BELT HOLES THROUGH FLOORS.

A correspondent asks our opinion as to the danger of fire from the electricity generated by swiftly-moving belts, and another inquires how to lay out the holes for belts running through floors. We will endeavor to give replies to both questions, drawn from our experience and observation. No doubt some of our correspondents—practical men—may furnish valuable additional facts or theories drawn from practice.

We believe that many mysterious fires occurring in factories where belts were used to transmit power, would be no longer mysterious if the facts were known. But there are recorded facts which leave very little room to doubt that buildings have taken fire from this cause. Where fire itself in any form was not used in the building and even matches not introduced, there seems to be no adequate reason for doubt that either spontaneous combustion of fibrous material saturated with oil, or the action of electricity, was the cause of the fire.

As to the former we well remember a case, some thirty years ago, when some boys discovered a fire in a waste house connected with a cotton factory, caused solely by the heaping of oil-saturated cotton waste on the floor of an open-sided building, formerly used as a dry shed, through the sides of which the air had a free passage. A church, also a few years ago was destroyed in a town in Rhode Island by the flying particles of cotton waste which had spontaneously ignited in a storage building for waste. No fire was ever carried into the building, yet the spontaneous combustion of the saturated waste caused a serious loss of property by conflagration.

But extensive fires with great loss of property have been occasioned by the element of electricity generated by the running of belts. It is probable that the destruction of Colt's pistol factory in February, 1864, at Hartford, Conn., which involved the loss of one human life and much valuable property, was caused by the electricity generated by the main belts. The fire was first discovered under the cupola in the center of the building which was the locality where the great or main belt ran. Many a time we have elicited heavy sparks from that belt when the hand was held several inches from it. On a visit to the large machine-building establishment of Pratt, Whitney & Co., in the same city, passing under the main belt, which ran diagonally, we felt the electricity like particles of gravel rattling on the hat. To test the force of this element Mr. Pratt, with one hand presented to a gas burner and the other grasping ours, while we held another near the belt, succeeded in lighting the gas. If the amount of electricity developed by a running belt is sufficient to light a jet of gas it certainly is sufficient to start any other fire under favorable circumstances. Belt holes through floors should present smooth sides to prevent the lodgment of light particles which may act as tinder. It would be well also to place a simple apparatus near the belt, at the ceiling of each floor through which it passes, to convey away the electricity. It may consist of a horizontal comb, or a series of metallic points, arranged across the belt and in close proximity to it, and from this comb lead a wire of sufficient size to a tub or tank of water or any other wet spot. Probably this would convey the dangerous fluid away as fast as generated,

The plan for designating the point where a belt hole should be cut is very simple. Probably it is well understood by mechanics generally, but a brief statement, with directions, may be of interest and value to some of our readers. The shafting and arrangement of a factory is a matter of great importance, and he who undertakes it should thoroughly understand his business. An error committed here will continue to multiply itself and be a source of future annoyance. Cutting belt holes by "guess-work" or the "rule of thumb" is not very creditable to the mechanic. It defaces and injures the building and causes unsightly patching and repairs to the floor.

If a belt is to be carried from a pulley on an overhead shaft to another on the floor above, the distance from the center of the shaft (pulley) to the ceiling (under side of the floor) should be taken and noted. Next, get the distance through the floor; then between the floor itself and the center of the shaft in that story. If one pulley is directly over the other you have all the data, the diameter of pulleys and width of belt being known. But if the belt is to take a diagonal direction the relative positions of the pulleys must be found. A line measured from the side of the wall to a plummet dropped from the shafts on both floors will be generally sufficiently accurate to give the relative positions of the pulleys to be connected. Now from these data make a diagram either on an unoccupied floor, full size, or on a drawing board or sheet of paper, to a scale, and by transferring these measures, as represented on the diagram, an ordinary mechanic may easily bore the holes, and saw and chisel them to size. When the auger holes are bored it is a great assistance to stretch a twine, as a belt from one pulley to the other. It will be of much value as a guide to dressing and trueing the holes.

It is evident that by following or modifying these simple directions, holes for cross belts as well as straight belts, and, in fact belts of all sizes and directions can be laid out so that there will be no annoying and time-occupying alterations to be made.

## HOW TO SUCCEED---WHAT CONSTITUTES SUCCESS.

It is well enough to encourage the hard worker, he who is engaged soul and body in his business or labor, to cast aside for a brief period his work and be as though he did not. It is well that the worker should at times lay by his peculiar character and cease to be a worker. "All work and no play makes Jack a dull boy." There must be a time for pleasure as well as a time for distasteful work. But there is a time for work; and that is when there is work to be done. Then we expect to see the man or even the would-be man, work. It is well enough to say to the worn out worker, in the words of the old college song:

"Omne bene
Sine pœne
Tempus est ludendi."

but for those just harnessed for the race of life their time for playing ought to come after the time of labor. To them it should be "Tempus est labori." Youth and manhood is the time for working.

The young man who thinks he can carry his boyish pranks into the serious business of life is not a man, and defrauds himself and his employer. "After work, play." That should satisfy the most sanguine. "Business before pleasure" is the motto of the prudent man whose guide is experience, and it is sufficient for the novitiate in active life.

But it is despicable to see the young man just starting in life so wedded to his former enjoyments as to place them above present duties. Yet this is often the case. The young man, who to steer his own bark launches forth on the sea of life, too often looks back on the pleasures he leaves behind, and, forgetful of present duties, steers back to past enjoyments.

To leave this figurative style, one of the most serious annoyances of the master mechanic, and the employer in any business, is the unwillingness or want of earnestness in his apprentice or employé. The young man foolishly supposes that he can at the same time do his duty as a learner in his chosen business and fill his place among his fellow playmates. An eye singled to the matter in hand is necessary to success. No looking back after the hand is placed to the plow. Work while the day lasts; these are lessons hard to learn and harder still to practice.

Yet the stern and unpalatable facts are that there is work, hard, and perhaps unpleasant work to be done. Why should not the beginner learn from those who have traveled the road what is required of him? But in this case, at least, the experience of others is worthless. The beginner in any business insists that he is wiser than those who went before. The apprentice performs his task not as though it was a part of his duty and a portion of his honor, but as a "stint" to be got over as quickly as possible, with the least expenditure of mental or physical force, and when it is finished, feels not only a relief from the labor and a joy of the release, but an utter distaste to its certain return, and a hope that the occasion to renew the labor may be by some means delayed.

There is no royal road to success any more than to knowledge. He who would succeed must work, and after all there is more real enjoyment in work, which has a worthy object, than in play or pleasure, intended to kill time. We remarked a few days ago to a business man whose present means are amply sufficient, but who worked really harder than any of his numerous employés, that he ought to "take it easy." Said he, "I am never so happy as when I have more than I can do. I may wear out in working, but I dread to rust out in idling." He was right. His work was a part of himself, a part of his life, and it was always faithfully done. To apprentices especially, this earnestness and interest in their work is necessary if success is ever to be attained. Where the attention is divided between the shop and the base ball grounds it is more than probable the latter will receive the larger share. And is not this so-called "national" game exerting a bad influence on our habits as workers and our welfare as a progressive people? Is it not occupying the time and usurping the place of useful labor? In short, is it not becoming an employment rather than a means of enjoyment? We must confess to but little sympathy with those who continually prate about our utter devotion to labor and business as a people, and who continually urge to pleasure seeking. Good, honest work is exercise as much as hard and exhaustive games. It is more. It is useful and productive and fully as healthy.

## MICHAEL FARADAY.

A cable dispatch announces the death of Prof. Michael Faraday on the 27th of August.

Michael Faraday was born Sept. 22d, 1791, at Newington, Surrey. His father was a mechanic in such humble circumstances that young Faraday had little of the advantages of an education at school, At the age of fourteen he was apprenticed to a bookbinder. But he had learned to read and write, and thus the keys of knowledge were in his possession. He spent the leisure of his apprenticeship in reading and studying all the books on natural philosophy and chemistry which were accessible to him; his favorite amusement was to make experiments illustrating the teachings of his books. In the spring of 1812 he attended four lectures on scientific subjects delivered at the Royal Institution by Sir Humphrey Davy, who was then at the hight of his career. Faraday's tastes and aspirations were here confirmed and strengthened, and the character of his future pursuits was determined upon. In the December following he addressed a letter to Sir Humphrey Davy, modestly introducing himself, explaining his love of scientific studies, and offering his services as an assistant. The reply was prompt and favorable. Faraday at once became a favorite pupil, assistant, and friend. He was officially attached to the Royal Institution and took up his residence there. From that time forward the Royal Institution was the scene of all his labors.

The long list of his great scientific achievements begins with the discovery of the chlorides of carbon in 1820. It is an interesting fact that one of these substances has been found during the past year to be a valuable anaesthetic, and it is possible that it will supersede chloroform and ether. In 1821 he made the capital discovery of magneto-electricity, or electricity generated or induced by magnetism. During the last years of his life Faraday had the gratification of witnessing the application of his discovery, on the grandest scale for the practical production of light. His electrical researches were continued for a large portion of his life. His papers, originally published in the "Philosophical Transactions," constituting a complete and faithful record of all his contributions on electricity, were collected and published in 3 volumes, 8 vo. (1839, 1844, 1855,) under the title of "Experimental Researches in Electricity." It is chiefly upon this great work that Faraday owes his world-wide and lasting fame.

Many of Faraday's researches were eminently of a practical character. Thus he rendered important service to the manu facture of steel, glass, and india-rubber. He investigated and discovered new alloys of steel, and invented a new composition for optical glass. He found that carbonic acid and several other gases which had been supposed to be permanent were in fact a species of vapor, which may be condensed into the liquid or solid form by cold and pressure. In 1827 he published his "Chemical Manipulation," a work which has since passed through many editions and which is still a favorite with all chemists.

For nearly half a century Faraday has been one of the most eminent of men devoted to science. Learned societies and sovereigns vied with each other to do him honor. He bore his great eminence with childlike gracefulness. In his intercourse with men his artlessness and his love of truth won the admiration and esteem of all. No one ever felt jealous of his reputation, and no one ever disputed his title to his discoveries. As a lecturer he was charming by his earnest simplicity of action and expression; this is the universal testimony. His weekly lectures were one of the most attractive features of the London winter season.

Faraday has left an impress on human affairs which will endure forever. When our kings and presidents are forgotten, his name may still be a household word, for he has a place in history with Archimedes, Newton, and Franklin.

## LARGE RUBBER BELTS.

Where belts are not to be exposed to saturation in animal oil or to frequent abrasion, a combination of rubber and canvas has proved to be fully equal, if not superior to leather, and much cheaper. For large belts rubber is preferable, because the belt, whatever its length or width, is one—not pieces joined by mechanical means or connected temporarily—but solid and to all intents and purposes one continuous fabric.

In front of the office of the New York Belting and Packing company, 38 Park Row, New York city, we noticed, the other day, a belt measuring 39 inches in width by 185 feet long weighing 1,470 pounds, and said to be the largest ever made. It was what is known as a "six-ply" belt, that is a belt composed of alternate layers, six of strong canvas and six of gum. It is intended for a grain elevator at Buffalo, for the Niagara Elevating Company, and now nearly completed. Beside this belt, which is to be their main connection with the prime mover, they have ordered from the same concern one belt nineteen inches wide by one hundred and thirty-three feet long; one of eighteen and a half inches wide by two hundred and thirty-six feet long; six of eighteen inches in width by lengths varying from two hundred and thirty-six feet to only thirty-eight feet; one of seventeen inches, one hundred and fifty-three feet long; beside several others of varying widths and lengths.