Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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One copy, six months, postage included 1 60

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NEW YORK, SATURDAY, JULY 11, 1885.

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 497,

For the Week Ending July 11, 1885.

Price 10 cents. For sale by all newsdealers.

COTTON GINNING IMPROVEMENTS NEEDED.

There are now in the United States between twelve and thirteen million cotton spindles, the property invested amounts to hundreds of millions of dollars, and the product each year runs nearly into billions. Seven-eighths of the cotton spindles of the country are subject to all the inaccuracies incident to the original cotton gin of Whitney, and the other eighth is only exempt from these troubles by reason of their using the Sea Island cotton, which is longer and finer than the Upland or short staple varieties.

The competition between the various cotton spinning and weaving concerns demands the greatest production with the least waste. Curiously, cotton has grown steadily worse in quality ever since the war. Many causes have operated to produce this result, but it is principally due to the constantly diminishing acreage of the individual planters, who, instead of raising five hundred to two thousand bales each, now put into the market anywhere from three bales upward, fifty to one hundred bales being considered a large output. With our larger cotton spinning establishments, some of which work two or three hundred bales of cotton per week, the large number of different growings of cotton leads to peculiar results in the mill, which are shown by diminished production, owing to the mutilated and varying length of the fiber.

The ginning of cotton is apparently a very simple affair, but in reality it is not, and old ginnery hands are in demand at exceptionally high wages all through the cotton growing States. An additional difficulty results from the changing in many mills making finer sheetings and shirtings, to numbers finer than they had previously been spinning. This has called for a longer staple, and has led the planters to the growing of what is now termed "fine cottons," which are both longer and finer in their length. The culture of this cotton would be vastly more profitable could it be carried on to any great extent; but the usual process of ginning the Sea Island is very slow and tedious, and the common saw gin is entirely inadequate to properly gin these fine cottons. There seems, then, to be a very evident want of new ginning machinery for the "fine cotton," which necessitates a different application of mechanism from anything now in the market. The new gin must treat a longer fiber of cotton or "lint" than the saw gin is capable of handling, for in the latter the fiber must not be of a length much to exceed the distance between two saws, otherwise it is carried lengthwise across the breast of the gin and is mutilated by the teeth of the saw. Something which will obviate this difficulty would find a very large market at almost any price within reason. "Lint" coming from such a gin would find ready sale at considerably increased prices among the spinners, for the better grades of yarns and the finer classes of goods. This question is one for mechanical solution, and a considerable knowledge of the requirements of the cotton trade is necessary in order to handle it successfully.

There is a decided tendency to improvement in this respect, which is shown by the increasing number of patents taken out every year for improved methods for making cleaner lint or fiber, but it seems that quantity has perhaps been carried too far; while the mechanism has not been improved to any great amount, so that a machine is now called for which shall avoid the mutilation of these small fibers, which, when two or three hundred are pressed on the teeth of a saw, can hardly escape injury. When these fibers come to the spinning mills, the injury works decidedly to the spinner's disadvantage, in the very largely increased waste of these mutilated fibers and in a lack of strength, evenness, or regularity in the thread after it has been spun, and the trouble only ends when the cloth is finished.

Cotton may be materially injured by running the gin either too fast or too slow, but very little injury from the latter cause has ever been found when the cotton has been carefully examined after ginning. Most of it shows very clearly the harm that arises from crowding the gin, or attempting to do more than can properly be done by a gin of a certain number of saws. Another cause, and one of those to which attention should be most directed, is attempting to gin the cotton when it has been taken from the field before it is completely matured or when a considerable amount of moisture is present, so that it is damp to the touch; very great injury frequently comes from cotton which has been ginned in this condition.

The question of the proper ginning of cotton is one which is now before the cotton world. Some of the largest dealers have recently taken this matter in hand with a view of eliciting all the information possible. This question was considered so important some years since that very extensive trials were made in England and in India with a view to ascertain not only what different gins *could* do, but what they *did* do in regular working, in charge of those who attended to the ginning of different cottons from year to year, and a vast amount of information was obtained; but much of the machinery which was used in those trials, ten to thirteen years since, is now obsolete, which shows some activity in this direction. But American spinners and planters are now interested to obtain information regarding what is being done to-day, and are waiting for the appearance of an improved gin. This is a question for mechanics and inventors to solve, and there is without doubt a very large sale for a cotton gin which can accomplish a reasonable amount of output with the minimum amount of injury to the individual fibers, so that the spinner shall obtain cotton of greater value, greater strength in the manufactured product, and less waste and consequent loss in its manipulation.

EDGING BY FORGING.

In a forging shop recently the smith was dressing some cold chisels and some lathe tools. It was noticed that, by the help of his assistant, after drawing the tool to an edge, he cut off the very edges before hardening and tempering the tool. After observation showed that he had left an edge thickness of not less than one-sixteenth of an inch, somewhat more. The smith was an old workman, verging on being an old man; so he was asked the "reason why." In answer he took a bar of tool steel, heated and forged it, and made a chisel point. Then he hardened it, as usual, in clean water, scoured it, and drew it to a pigeon blue temper. A slight tap with a hammer drove the edge off as though it had been glass. He explained that good, high steel could not be hardened and tempered when drawn to a thin edge: that there was not material enough left in a fine edge to sustain an edge after hardening and maintain an edge after tempering. His plan was to harden and temper the solid metal and grind to an edge. Possibly his method was adapted only to "high" steel; and yet it is indisputable that when tools are forged to edge and hardened they frequently crumble until they have been ground and worn far below the forged edge.

There are steels that will take a cutting edge without fire and water hardening. Wood working tools, as plane irons, can be hammered to temper without ever touching water; but usually tool steel is amenable to treatment for cutting purposes only by fire and water. Sometimes it is necessary to dress tools to shape by the file, and in that case the tempering must be the finishing.

An instance may be related. It was necessary to make some miniature bobbins to hold flattened gilt wire to be spun around a core of silk thread, producing a gold yarn or thread for embroidery and braiding purposes. The bobbins were made of boxwood, and were so small that three of them would not weigh an ounce. They were run with great rapidity and needed to be exactly balanced, as they revolved around a central spindle. The tools for finishing these bobbins were of necessity made to accurate gauge, and after hardening and tempering could not be touched except to "finger stone" them to a polished edge. These tools were heated in the usual way, but instead of being plunged in water, were pushed through a cake of common beeswax on the top of a can of oil in which they were cooled. They required no tempering.

A mixture of beeswax and hard soap is handy for tempering small tools, or those that must be brought to edge as well as shape before being tempered. If the steel is good and has been properly handled, not overheated by the smith, very satisfactory results can be secured even when the tool is fairly edged down; and no after drawing to color will be required. But it is best, in ordinary work, to grind back from the hardened edge of any common machinist tool. A hammered edge—"cold tempered"—is a delusion; it will not stand for anything. Even in stone drilling it has been proved that those drills and chisels are best which are ground after the hammering. This is contrary to the old fashioned notion, but it is really fact; a ground and polished edge is better than any that can be given by hammer, fire, and water.

PROFESSOR FLEEMING JENKIN, LL.D., F.R.S.

The announcement of the death of Prof. Fleeming Jenkin, of the University of Edinburgh, which took place on the 12th ult., has been received with profound regret by the entire scientific world.

Prof. Jenkin was but little over 52 years of age, and was in the very prime of his power. His education was obtained chiefly on the Continent, his degree of Master of Arts being awarded to him by the University of Genoa in 1850. For several years after his graduation he was employed in locomotive and constructive engineering, but at a comparatively early age he became deeply interested in submarine cables and general telegraphy, a department in which he afterward achieved such signal distinction. He was connected with the laying of the first American cable, with various European and Asiatic cables, and almost his last professional work was done as one of the joint engineers to the Mackey-Bennett Cable Co. He was retained by the Government as professional adviser in testing the cables taken over under the Postal Telegraphs Act.

In 1865 Prof. Jenkin was called to the Chair of Engineering in University College, London, and three years later he was appointed to a similar chair at the University of Edinburgh. As a teacher he met with the same success which had attended his engineering

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practice, and the high standard of professional education which he disclosed at his inaugural address was fully maintained during the seventeen years of his connection with the University. He was the joint patentee with Sir William Thomson of several valuable improvements in apparatus for submarine telegraphy; being likewise the sole patentee of a number of ingenious engineering inventions, and was much consulted in regard to cases of disputed patents.

Under the encouragement and advice of Sir William Thomson, Prof. Jenkin began to write on scientific subjects so early as 1859, and many of his contributions possess a permanent value. His paper on "The Application of Graphic Methods to the Determination of the Efficiency of Machinery," in 1880, secured the Keith Prize of the Royal Society, and was thoroughly original. He was also the author of an excellent manual on electricity and magnetism, and wrote a history of bridges for the Encyclopædia Britannica. Many of his contributions on miscellaneous topics also attracted marked attention, and showed unmistakably the master's hand.

LIFE-SAVING FIRE APPLIANCES IN NEW YORK.

The officers of the New York Fire Department seem fully to realize the heavy responsibility devolving upon them in a great city, where buildings of ten and twelve stories are not at all uncommon, where apartment houses of even fifteen and sixteen stories are permitted, and where hundreds of people are daily crowded together in one building, and subject, in case of fire, to the same horrible fate. It is true that of late they have been somewhat aided by the loud demand for fireproof buildings, which has forced landlords and contractors to pay some attention to at least the appearance of safety; but in many cases this has been but a pretense in deference to the popular outcry, while in others, with the most honest intentions, the effort has failed. There is, of necessity, so much of combustible material, even in the so-called fireproof structures, that no substitute has yet been found to take the place of civic precautions.

In view of these unavoidable dangers, the department has been giving particular attention to its life-saving corps, and the resulting proficiency in this direction is very creditable. But in this effort, though they have done so much in perfecting the appliances for safety and rescue, their success, after all, depends in a large measure upon the coolness and bravery of the men who have the apparatus in charge. Their victory has been a moral rather than a mechanical one, for the members of the corps have distinguished themselves by their courage in facing appalling dangers, sometimes for the privilege, often for but the bare chance, of saving human life. The desirable spirit of emulation which has been created among them has been materially fostered by the generous public sentiment which is always ready to appreciate and to applaud a brave action. The expression of this appreciation, in the hands of one or two of our public spirited citizens, has taken the practical form of medals of honor, given under such circumstances that any man might covet their possession.

One of these, the Bennett medal for 1884, was recently presented to Foreman John Binns for his bravery in rescuing a lad, under particularly trying circumstances, at the burning of the St. George apartment house. Another, the Stephenson medal for 1885, was awarded at the same time to Foreman David Connor for having the best drilled and disciplined company. The presentation was made at Washington Square by Mayor Grace, and was made the occasion for an entertaining display by the life-saving corps, some of the French officers from the Isere and La Flore being among the spectators.

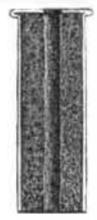
A five story apartment house, facing on the square, was selected as the theater of action. The corps displayed admirable ease and rapidity of motion in scaling the building, passing from window to window, and descending on the ropes, carrying a "rescued" comrade. Single descents from roof to pavement were made in a quarter of a minute, a very fair speed for vertical open air traveling. In ascending the ladders, some delay was noticeable from the unavoidable slipping of the feet off the rounds. This, perhaps, might have been avoided had the men worn leather stockings or moccasins instead of stiff soled boots. The method of firing a life-line over the building was also successfully shown. Similar experiments at the Palisades, it will be remembered, were illustrated in the SCIENTIFIC AMERICAN for May 23.

Though probably of less value, the part of the display which excited the most decided interest was the practical illustration of the use of the life blanket. The jump from the second story window, made by one of the corps, was comparatively a simple operation, but when made from the third story was a less enviable feat. The force generated by a body of perhaps 160 pounds weight falling through this distance is not inconsiderable, and the stretched canvas, though held by a score or more of stout, strong men, yielded almost to the point of touching the ground. A part of the performance which, presumably, is not ordinarily given, was the rebound, which sent the jumper up into the air almost to the second story again before his role was completed. The effect was quite amusing, for the figure bounding through the air in a sitting posture had a decided resemblance to "Uncle Jonathan traveling by telegraph," which used to be shown in the children's zoetrope.

This easy dexterity, however, means hard work. The strong muscles and steady head result but from constant practice, and their successful proficiency comes only from daily and persevering effort.

AN ACCELERATING CARTRIDGE.

Among the very recent inventions is that of A. S. Lyman, the veteran inventor, of this city, of what may be termed an accelerating cartridge. It consists of an ordinary cartridge shell firmly packed with powder meal, through the center of which is a longitudinal perforation, as shown in the cut. Powder meal is used



in order to compact the explosive into a single piece or block, and prevent the nearly instantaneous ignition which takes place with granulated powder.

When this new cartridge is fired, the ignition begins within the walls of the perforation, slowly at first owing to the small surface exposed to fire producing a low gas pressure, by which the ball is started; but as ignition proceeds the perforation enlarges with increasing ratio, the charge burns with augmented rapidity, and the gas pressure steadily rises, expending nearly its whole effect upon the ball.

The few experiments thus far made with this novel invention have yielded remarkable results, and they indicate a coming revolution in the range and penetration of projectiles. From a small smooth bore gun, 4 feet in length, five-sixteenths inch bore, with a powder charge of nine-tenths of an ounce, made in the new form, a projectile 9 inches long, weighing 3½ ounces, has been driven into a target composed of 9 plates of boiler iron, each one-fourth inch thick.

Eight of the plates were pierced, the forward end of the projectile then curved upward, boring up within the body of the ninth plate, and making an aggregate penetration of iron by the projectile of over four inches. It is estimated by the patentee that with a three inch gun and 40 pounds of powder a projectile may be sent through a solid iron armor plate three feet thick. Should these expectations be realized by actual experiment, it would seem as if, in the naval battles of the future, the elements of light vessels, great speed, and rapid firing qualities would become prominent.

As to land defenses and military operations in general, radical changes would necessarily follow from the introduction of small arms and artillery having the extraordinary ranges and power which this new invention promises.

Car Builders Discussing Car Couplers.

At the recent annual convention of the Master Car Builders' Association, held at Old Point Comfort, Va., the question of automatic freight car couplers came up for the usual amount of discussion. There were ninety-four members present, representing railroads running nearly half a million cars, besides several railroad commissioners from the different States, who were seeking information to guide them in recommending legislation on the subject. Notwithstanding the Massachusetts law, and the tests made in Boston last fall, to promote the adoption of a uniform automatic freight car coupler, the inherent difficulties of the subject are such that but slow progress is being made toward the end sought, and any legislation by other States in the same direction seems to be of at least doubtful expediency until there can be some uniformity of opinion as to what action should be taken. The provisions of the law of New York State are different in that they apply only to new cars, as follows:

"After July 1, 1886, no couplers shall be placed upon any new freight car to be built or purchased for use, in whole or in part, upon any steam railroad in this State, unless the same can be coupled or uncoupled automatically, without the necessity of having a person guide the link, lift the pin by hand, or go between the ends of the cars."

It was urged at the convention that, to enforce the adoption of automatic couplers by legislative enactment, before some uniformity of action could be practically determined upon, would create such confusion that the danger to trainmen would be increased instead of diminished. Representatives of the Fitchburg, the Chicago and Alton, and the Lake Shore spoke favorably, though tentatively, in favor of automatic couplers they had been introducing, though the latter company had "not been going very fast," but were nevertheless "anxious to end the hazardous business of coupling with link and pin." The whole subject was finally referred to the Executive Committee, "with power to arrange for and conduct a public trial at some central point, to employ one or more experts, and to request the co-operation of the railroad companies in making trials and in furnishing the funds for conducting the same, the Executive Committee to make report of the results and to make recommendations at the next meeting of the Association."

Although the difficulties are so great in the way of selecting the best automatic coupler, it is to be noted that the most of the leading lines are gradually adopting one or another style of such coupler; there can be little doubt, however, that the movement would be general and the progress of the change rapid if all were agreed as to what was the most desirable coupler to adopt. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 459, will be found illustrations and description of eight styles of automatic couplers, from among those which have thus far seemed to meet with most favor.

Typhoid Fever at Plymouth.

The following interesting account of the outbreak, progress, and cause of the dreadful fever scourge, which has abated only at intervals since last March, in a small mining town in Pennsylvania, we find in the July issue of the *Herald of Health*, published in this city. It is from the able pen of the editor, Dr. M. L. Holbrook, and teaches a lesson which should be a warning to people in many localities:

The town of Plymouth is situated favorably for health, being on a dry hillside, well exposed to wind and sun, on the banks of the famous Susquehanna River. But good air and sunshine are not always sufficient to secure good health. Like most towns of its size, it has no system of sewerage, and many of the vaults or closets are very imperfectly constructed. Every year, when the winter breaks up and the snow melts, a large amount of decaying matter which has been thrown out during the winter by the housekeepers is deposited on the ground, and pollutes both water, soil, and air. Most of the wells are shallow, owing to the peculiar geological formation of the region. These wells are generally abandoned, the houses being supplied with water by the water supply company of the place. This water is gathered into reservoirs from mountain springs and from an artesian well. It is ordinarily excellent, but liable to be polluted during freshets by surface water, which carries whatever filth it gathers from the soil in its course to the streams.

Plymouth has long suffered with typhoid fever, more or less; but between April 10, this year, and June 1 there have been over 1,000 cases. The origin of the outbreak has been investigated as carefully as could be, and, no doubt, correctly. None of those families suffered from the disease who used well water or river water, though neither were of the best quality; it was only those who used the reservoir water that contracted it. It was found that the reservoirs of mountain spring water had been polluted. It happened as follows: Between two of the reservoirs there was a farm with a house, 60 feet from a deep, narrow gully, through which a mountain stream passed to the reservoir. A farm hand employed here was taken with typhoid fever early in January, and owing to imprudence had a serious relapse, so that he was ill most of the winter. So long as the ground was frozen no harm occurred; but in March there was a thaw, and the drainage from the vault where the excrement from this sick man was thrown was washed into the stream in the gully, and soon made its way into the reservoir below. The epidemic began 13 days after the water in this reservoir was used.

The lesson we learn from this case is, that pure water is of the greatest importance; that even pure water may become fouled without its being known to the consumer, and that those persons who have charge of patients ill with such a dangerous disease as typhoid fever may cause a great many deaths by being careless as to the disposal of the excrement. It also teaches us another lesson concerning water supply companies, and the little care they seem to give the matter of constantly watching the sources from which their water is obtained, and doing all in their power not only to prevent contamination, but to purify water which has been fouled. It suggests, too, an entire change in the method of disposing of human excrement, and the desirability of having it composted and turned into a fertilizer rather than allowing it to accumulate for months and years and breed corruption. Most of all, it proves the necessity of enlightenment on the matter of household sanitation, the danger of ignorance on these subjects, and the thoughtlessness of the majority of human beings.

The question may be asked, How was it possible for so small an amount of poison to contaminate so large a quantity of water? This is easily explained if we accept the germ theory of disease. Each germ is a seed which, under favorable conditions, multiplies rapidly. A few germs in a congenial soil become millions in a few days. In this case, the water from the melted snow carried with the germs much soluble matter into the reservoir, and this served as a food on which the germs fed and multiplied, just as weeds do in a rich garden soil.

YOUNG ostriches are warmed out of their shells by incubators in California, and manifest great astonishment when they discover they are not in an African desert. They have not yet become accustomed to being born on this continent.

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