Every day brings more people to the World's Columbian Exposition, but, even with the greatest attendance, the grounds do not seem to be overcrowded. Even on such a day as June 15, which was German day, and brought an attendance of 200,000 within the grounds, there was no uncomfortable crowding, except in the vicinity of the German building, where the formal exercises of the day were held. The most discomfort from crowding is experienced by visitors who wait until the last minute before leaving the grounds. This is always a time when the majority of people are seeking transportation home, and no facilities could be so ample as to handle in a few minutes crowds varying from 50,000 to 150,000 or more.

In the Manufactures and Liberal Arts building there are always people watching the interesting exhibits in the department of horology, which faces Columbia Avenue just north of the clock tower. One of the most drawing exhibits in this department is that of the American Waltham Watch Company. The attractive feature of this exhibit is the automatic machinery in operation for making different parts of the works of a watch. There are ten of these automatic machines, each of which is of most remarkable mechanism, and which seems to have as delicate a touch and to possess the intelligence of a skilled workman. These machines are in operation adjoining the aisle, so that many people can be accommodated to observe them. Inside the pavilion is a large collection of historic and antique watches. Among the more famous of these watches are those that belonged to King James I., Oliver Cromwell, John Milton, Sir Isaac Newton, Queen Elizabeth, John Calvin, John Bunyan, Lady Jane Grey, and Robert Burns. This collection contains over six hundred watches. They represent all sizes and shapes, and are of great interest because of the variety of their mechanism.

Another exhibit in this department, which attracts a great deal of attention, is that of the Waterbury Watch Company. In this pavilion several bundred Waterbury watches are shown, both in cases and the movements. But what draws the crowd to this exhibit is the Century Clock, which has required years of work in construction and which has cost the company $80,000 to complete. This clock records the hour, minute, and second, gives the day of the week, the day of the month, the month of the year; records the movements of the tides in New York harbor, gives the changes of the moon, etc. Immediately under the dial is a large picture of the factory of this company, and under this picture is a reproduction of the train room in the factory. Here are represented twenty-six girls at work at lathes, pinion cutters, and other machines, reproducing in close detail every movement that would be seen in actual life. The figures are ten inches tall, finely carved from wood. On the right are four more rooms with figures in miniature, which are reproductions of historical or other scenes. These represent miners at work in a mine, digging rock; the development of the sewing machine, with a man and woman sewing by hand in the back of the room, while a mechanic—supposed to be Elias Howe—stands at a bench making a model of a sewing machine, and two women are operating modern sewing machines in the foreground. Underneath this is a telegraph and telephone room, with a man in the foreground in the act of telephoning; several operators at work at telegraph instruments, people coming and going with dispatches, messenger boys running in and out, etc. The other scene is an electrical one, with a Corliss engine operating a dynamo, and an electrician—representing Leo Daft—experimenting and watching the results of his experiments. On the left side of the clock is a saw mill scene; a scene representing a cotton plantation, with Eli Whitney testing his first model of the cotton gin, and bales of cotton lying about and colored men at work. Another scene represents the flax industry, with men and women whipping the flax and otherwise preparing it. The fourth scene represents an old style German watch factory in a peasant house, with two men at work at a bench, a maid serving beer and lunch at a table, etc. The figures in these scenes were all carved in this country, and reproduce movements of the human arm and hands with much accuracy. In addition to these scenes there are many carvings on the clock which represent important events in the history of the country during the past century, beginning with the signing of the Declaration of Independence. The machinery in this clock is operated by an electric motor one-half horse power, and the nine scenes, representing the several industries, are illuminated with miniature incandescent lamps. Another interesting exhibit in this department is that of the Ansonia Clock Company, which exhibits an infinite variety of clocks of all sizes, from the cheap nickel clocks to most expensive clocks, reaching hundreds of dollars in value.

Near this exhibit is the pavilion occupied by the Wm. Rogers Manufacturing Company. Here are shown knives, forks, and spoons in great variety, but the feature of most particular interest is that of the several operations required in making these. For instance, there is shown the steel bar from which the knife is made, and the results of the several operations through which this bar passes to become the knife ready to be plated. The making of spoons and forks is illustrated in the same way.

The Norway exhibit, in the Manufactures and Liberal Arts building, is remarkably instructive, and a study of it is like traveling in the country itself. The main structure is constructed of Norway pine, the design being representative of Norwegian architectural effects. An interesting feature of this exhibit is the large display of spoons, ornaments, and gold and silver trinkets manufactured of these metals and enamel. In much of this ware the enamel is transparent, and the filigree work is so fine and so beautifully done and the coloring in the enamel so rich in variety and effect that the exhibit is well worth close inspection. Many typical Norwegian things are, of course, shown. These include furs, mounted birds, traveling vehicles, native costumes, etc. On a raised platform in the pavilion is a stuffed reindeer harnessed to a sledge which is covered with skin from the hair seal, giving a truly Arctic effect. The ski, or snowshoe, so much used in winter in Norway, is shown in all stages of elaborateness. Not the least attractive part of this exhibit is a collection of photographs of mountains, fjords, villages, etc., which are beautiful specimens of photography, as well as of landscape scenery. Many richly colored photograph portraits are also exhibited.

In the gallery of the Electricity building are three exhibits which always have an interested audience about them. One of these is the exhibit of the American Electric Heating Company. Here are shown electric heaters in great variety for all purposes. Cooking is carried on the greater part of the time, showing the convenience and utility of this method of cooking. There are electrical water heaters, flatirons, ovens, etc. The exhibit of the Commercial Cable Company reproduces the writing and the method of cabling on ocean cables. The delicate devices used for this purpose and the difference in this method of transcribing messages from ordinary telegraphy cause much comment by people who had never suspected but what the two methods were the same. The exhibit of the Gray Telautograph Company adjoins that of the Commercial Cable Company. This remarkable invention was fully described and illustrated in the SCIENTIFIC AMERICAN of April 1. It can be seen in full operation, reproducing the writing sent by the transmitter.

In studying the exhibits made by Mongolian countries in the Manufactures and Liberal Arts building it is well to begin with Siam, and after studying this exhibit, take the Chinese next, and then the Japanese. The exhibit made by Siam is small and in its way is interesting. The pagoda it occupies is decidedly Oriental and is more fantastic and gaudy than other pavilions in the building. The exterior finish is composed of small diamond-shaped pieces of glass studded in gilt woodwork. The most attractive features of this exhibit are carved ivory and ornamental brasswork. In front of the pagoda are four huge tusks of ivory. So far as the art work of this exhibit is concerned, it is quite crude as compared with that shown in the Chinese exhibit. China, however, makes a comparatively small display, as the space it occupies is only about four times that occupied by Siam. This exhibit is rich in carved ebony furniture, much of it inlaid with pearl. There are several rich tapestries in silk, and beautiful specimens of carved ebony screens, carved ivory, etc. This exhibit is not made by the Chinese government itself, but by private individuals, which may perhaps in a measure count for its not being more complete. In itself it would be regarded as an instructive and choice exhibit, but when compared to the displays made by Japan, it appears almost rudimentary.

Too much praise cannot be given Japan for its exhibit in this building, and adjectives would be quite useless in attempting to describe it, because of the exquisite workmanship and touches of art that are seen in such abundance throughout the whole exhibit. The space occupied is very large, containing more area than the exhibits of other countries, with the exception of three or four of the larger nations of Europe. The collection and variety of bronzes of all kinds is superb and should not be neglected by visitors at the Exposition whose time is very limited for looking about. The display of silk goods, carved wood and ivory, porcelain, lacquered work, in short all Japanese wares, is very complete. The pavilion was constructed by Japanese artisans who were brought over for the purpose. It is a fine specimen of Japanese architecture and is one of the most attractive and ornamental structures in the building. It is of true Oriental type and is not built of staff. This exhibit faces Columbia Avenue and is in the north end of the building.

Last week reference was made in these columns to the exhibits made by the Canadian Pacific and the London and Northwestern Railway in the Transportation building. In some respects the exhibit made by Germany in the railroad department is more complete, because of its variety, than that made by Great Britain, although historically it is not of so much value. Two locomotives are shown; one is a compound freight locomotive, the other is an engine for local service. Both engines are excellent specimens of workmanship, and attract much attention from their difference in design from the large display of American locomotives adjoining. A very elaborate passenger day coach is shown on the same track as the engines. This coach is constructed on the American plan, but is not over three-fifths the length of our usual type of coach. This coach is painted a rich blue on the exterior. It is constructed mostly of pressed steel and iron. Much of the interior finish is wood and bronze, while the draperies are silk. Two open cars are shown, such as are used for freight service. Very little wood is used in the construction of these cars, the truck and framework being almost wholly of pressed steel. These cars have a single pair of wheels to a truck. The regular type of German compartment coach is also shown on this track.

The statue of Columbus, designed by Bartholdi and made of silver, requiring thirty thousand ounces for the purpose, has been placed in position in the exhibit of the Gorham Manufacturing Company in the Manufactures and Liberal Arts building. The figure is fully life size, and stands immediately in front of the exhibit in this pavilion in the entrance way. In many respects this is the strongest statue of Columbus that has been shown in Chicago. It represents the discoverer first seeing land.

The inauguration of the great Ferris Wheel took place on the 21st June, and was a very happy affair. A large number of guests were invited, speeches were made by several distinguished persons, and many compliments were showered upon the engineer and projector of the wonderful machine, Mr. G. W. G. Ferris, of Pittsburg, Pa. Several illustrations of this remarkable piece of mechanism will be found elsewhere. The charge for a ride in the novel machine is 50 cents, for which the passengers enjoy two revolutions, occupying half an hour. If all the seats are full, the company take in $1,440 an hour. It is truly a wheel of fortune for its owners.

The loss of the British battle ship Victoria made a great sensation among the exhibitors and visitors at the Fair. When the news came, on the 23d instant, a sad interest was at once created to examine the splendid model of the vessel, which occupies a conspicuous position in the Transportation palace. Thousands of people flocked to see the model, which model is a large one and very perfect. There is a double stairway with brass railings around the model and platforms.

A new feature was introduced at the Exposition on Massachusetts day, June 17, which was a decided novelty. This consisted of a parade, in which all the concessions on the Midway Plaisance were represented.

The Laplanders led the procession, followed by the Amazons, whose color was superb. The Libby glass works sent a couple of hundred of their employes, each with his glass cane and badge of spun glass. The swarthy glass blowers from Murano followed. The Mongolian orchestra gave their usual rendering of discords, while stately mandarins rode on horses. A huge dragon nearly one hundred feet long was supported by twenty-five Chinamen, who caused the dragon to undulate in a becoming manner. Breton peasants in blouses and wooden shoes came from the French wine press. The Swiss guards attracted much attention. Amid a wailing of pan pipes and tom-toms came the Algerians, including the dancers. Then came the inhabitants of the most interesting part of the whole "conglomera," the Cairo street. Priests, with all the pride of their heritage of thirty centuries, carried aloft the sacred vessels and utensils of their heathen rites; the donkeys and camels followed with the veiled women, the wrestlers and the dancers. The Persians followed with their wrestlers, whose bodies were rubbed with oil, which brought the great knotted muscles into relief. A clatter of hoofs announced the approach of the Bedouins of the desert, who were mounted on little horses of the purest Arabian stock. They brandished long spears, and the noble carriage of these wild people and their magnificent horsemanship charmed all beholders. The procession became wilder as the South Sea Islanders approached, dancing their weird, awful war dance. The procession was an unqualified success, and was seen by thousands who occupied the line of march. The frequent repetition of this parade will give life and color to the Exposition and will doubtless induce many to visit the Plaisance who for lack of time might

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World's Fair Notes.

(*Continued from page 3.*)

think it advisable to skip this thoroughly delightful part of the Exposition. There is more real harmless amusement and instruction for the average person to be had in the Plaisance for $5 than can be obtained for three times the money elsewhere. It is something to hear the orchestras of all nations, which run in a direct line from the German band down to the Chinese artists, who will certainly be lynched when the cowboys come.

The Russian pavilion was opened with all the pomp and ceremony incident to the practice of the rites of the Greek Church. His Eminence the Most Reverend Nicholas, Bishop of the Russian Greek Church of America, was the celebrant of high mass, and after an address the bishop dipped the gold crucifix in holy water and sprinkled the temporary sanctuary, and then, amid the eager gaze of thousands of spectators and the chiming of bells, he sprinkled each of the exhibits with holy water. The party then returned to the temporary church, and all present were sprinkled with the water and allowed to kiss the crucifix.

One of the engineering successes of the Fair is the transmission of power by compressed air. From the huge compressors in Machinery Hall the air is carried to the Transportation building, in a nine-inch pipe, at a pressure of eighty pounds to the inch. The stately Baldwin locomotives and other exhibits are run by the air thus delivered. In the Mines building live steam is provided, which runs a compressor, which in turn furnishes the power for nearly all the machinery in the building. One peculiarity which was noticed particularly when the locomotives were started was that all the stuffing boxes leaked, until repacked. The gain in comfort is remarkable, as the Transportation building would be insufferably hot, if the machinery were to be run by steam. As it is, the exhaust air assists ventilation. Compressed air is also used in the sewage system of the grounds.

The legislature of Illinois has passed a bill enabling the Park Commissioners to purchase the Art Gallery building at the close of the Exposition. It is noted as being one of the purest and most beautiful architectural designs in the world.

Correspondence.

Square Shafting Made of Sheet Steel.

To the Editor of the Scientific American:

Your illustration of the broken shaft of steamship Hecla in your issue of June 3 shows clearly the inconsistency of one solid shaft forging. Had the same consistency of iron been secured together in sheets of steel say one-half to one inch thick, the shaft made square, bolted or clamped together to prevent either twisting or buckling, with the bearings collared on the square, I will venture to assert the practical engineer will agree with me in saying the steel plates composing a shaft as suggested will be naturally stronger than a single forged body of iron. I claim also a square shaft when broken is more readily mended by clamps and bolts than the round shaft now in common use. My reasoning for this is the same in building a timber of several boards from different lumber when secured properly together is much stronger than one solid timber. G. W. K.

New York, June 8, 1893.

A Simple Method for Determining the Velocity of Projectiles.

To the Editor of the Scientific American:

It may be of interest to amateur riflemen to know the following simple method for ascertaining the effect of gravity on a bullet shot horizontally from a rifle to any distance:

Sight the rifle upon the target, keeping the sights plumb above the center line of the bore of the rifle. Mark where the ball strikes. Then reverse the rifle, so as to have the sights exactly *beneath* the line of bore. In this reversed position sight it on the target as before, and mark where the bullet strikes. One-half the difference in the elevation of the two bullet marks will represent the effect of gravity in drawing the bullet away from a straight line.

Divide the difference in elevation of the two bullet marks by 32 and extract the square root. This will give the time in seconds that it took the ball to travel the distance.

The distance divided by this time will give the speed of the bullet per second. J. A. G.

Grand Rapids, Mich.

The Litchfield Mill.

To the Editor of the Scientific American:

In your issue of June 10, I notice a communication from Mr. E. L. Otis, of Minneapolis, who good naturedly brings you to task for referring to the great mill which exploded in this city, March 21, as probably the largest flour mill in the world. Mr. Otis exhibits true loyalty to his own city, and grows indignant at the thought that outside of his famed flour-milling city of Minneapolis could exist the largest mill in the world. If the SCIENTIFIC AMERICAN had qualified its assertion by adding "winter wheat," no objection to the statement could possibly be sustained, for the Litchfield mill was, so far as we know, the largest *winter wheat* flour mill in the world, having a capacity of 2,000 barrels of flour a day. The product of this mill was all sold in Europe, not a pound being put upon the market in this hemisphere.

A scientific explanation of this most disastrous, and at the same time most wonderful, explosion would not only interest Litchfield people, but your readers in general throughout the country.

HARRY E. KELLY,
Editor Herald, Litchfield, Ill.

The White Pine Aphis.

To the Editor of the Scientific American:

I send you by to-day's mail some specimens of a bug or beetle that is destroying the pine trees in this county, and any information that you may give, either by mail or through your valuable paper, will be appreciated by this community. You will perceive two small horns or teats on their backs that the common red ants nurse from. This I watched for an hour this morning. Would like a remedy for destroying them without injury to trees. By request of several citizens.

GEORGE A. MILES.

Ainsworth, Neb., June 6, 1893.

Reply by Professor C. V. Riley.—The specimens referred to by Mr. Miles were in extremely bad condition when received, but from the partially decayed remnants it is evident that they were a large species of plant louse belonging to the genus Lachnus and closely related to, if not identical with, *L. strobi*, Fitch, the condition of the specimens not permitting positive specific determination. This insect is known as the white-pine aphis, and is the commonest species of its family upon that tree in the Atlantic States. The lice congregate in colonies on the ends of the pine twigs, the bark of which they puncture. They are almost always accompanied by ants, which are attracted by the honey dew which the plant lice secrete from the little honey tubes referred to by Mr. Miles. The species has been observed in the past to be extremely abundant in certain years and comparatively rare in others. This alternation in the relative numbers of the Lachnus has been found to be due to the rapid increase of its natural enemies whenever the conditions favor and to the succeeding necessary decrease of the Lachnus itself. Later in the season a great many, if not the large majority, of the plant lice will be found dead, the dried remains clinging to the leaves and branches, and upon close inspection these dead bodies will be found to have a minute hole, from which a hymenopterous parasite has issued. Ladybirds, lace-wing flies, and syrphus flies are all active in preying upon them.

It is difficult to deal with any insect trouble of this kind upon large trees over extensive forests, but individual trees may be sprayed with ordinary kerosene soap emulsion diluted with from five to ten parts of water, and such spraying will undoubtedly have a good effect in destroying the bulk of the plant lice. Otherwise it is pretty safe to trust to the natural enemies which I have mentioned, and which will, in the course of the summer, effectually do their work. An interesting note has been published in one of the earlier numbers of *Insect Life* (Vol. II., No. 10, p. 314) upon the subject of the honey secreted by one of these pine-inhabiting species of Lachnus. I have sent Mr. Miles a marked copy of this bulletin for his information.

It is quite possible that some other agent is at work in the destruction of the pine timber referred to by Mr. Miles and that the Lachnus is only an incident. It would be well for him to have the trunks thoroughly examined for bark borers. Their presence may be known by the exuding pitch and by their exit holes, like shot holes, in the bark. Just now, also, another plant louse, *Chermes pinicorticis*, is proving very destructive to pines, especially white pines, in parts of Nebraska, and this is really more disastrous than the Lachnus. It is a smaller insect and attaches itself in more sheltered portions of the twigs and branches, covering itself with a flocculent material. There has been no experience on a large scale as to the best methods of ridding trees of either of these insects, so that the recommendation to use kerosene emulsion is from analogy as to its action on allied forms.

Nitro-glycerine Precautions.

To the Editor of the Scientific American:

In your issue of February 4, 1893, I note a communication from Mr. J. T. Pettee, of Meriden, Conn., on the subject of keeping nitro-glycerine and dynamite from freezing, thereby avoiding some of the terrible calamities frequently reported, where workmen are killed by an explosion which ensues consequent upon their thawing these substances out.

While, theoretically, Mr. Pettee is right in saying that nitro-glycerine and dynamite should be kept from freezing, the practical application would not, in many cases, work to a successful end. If the men who use these explosives cannot thaw them out properly, it cannot be expected that they will exercise anymore intelligence in keeping them unfrozen. But it is already an incontrovertible fact that it is extremely dangerous to transport nitro-glycerine in an unfrozen state.

Therefore, the proper point to aim at is to insist that, if frozen, it must be *thawed out properly*. Upon this point, the laws should be most stringent, and the responsibility for non-compliance should be placed, not upon the ignorant workman, who is only a machine, but upon *those who have the work in charge*.

Apropos of the subject under discussion, I will quote below from an able series of lectures by Prof. Charles E. Munroe, of the Columbian University, Washington, D. C., formerly chemist to the Torpedo Corps, United States Navy, whose practical experience and experimentation with and analysis of every known form of explosive for a period of over twenty years make him the best authority in matters of this kind:

"When frozen, nitro-glycerine may be conveniently and safely thawed by placing the vessel containing it inside another containing water not hotter than 100° Fah., but these precautions should be strictly observed, as most of the accidents which have occurred with nitro-glycerine and explosives of which it forms a part have resulted from foolish and criminally careless attempts to thaw the frozen material by other means. Frozen explosives should never be put into the vessel containing the water, or brought into contact with any heated surface, except as directed above. Nitro-glycerine and its dynamites are extremely tricky when pure and when fresh, and if kept at normal temperatures they are not liable to undergo decomposition; but when subjected to the extreme heat of summer, followed by the excessive cold of winter, for a number of years, they are very apt to become unstable, hence dangerous, unless handled and used with extreme care.

"Many foolish persons suppose that since it is reasonably safe to ignite a cartridge of unfrozen dynamite, it is equally safe to warm it upon a shovel, or in an oven, or in a tin vessel over a fire, or in various other ways, which usually lead to a verdict of *accidental death*, but would be more properly designated as *suicide* or *manslaughter*. It cannot be too strongly impressed upon the minds of those handling them that if dynamite or other nitro-glycerine preparations are gradually warmed up to a temperature approaching their exploding points, they become extremely sensitive to the least shock or blow, and once that point is reached they do not simply ignite, but they explode with great violence; and further, that owing to the poor conductivity of the mass, a portion of it which is in contact with the source of heat may become raised to this temperature, while the rest of the mass is much below it."

The proper way to prevent the loss of life occasioned by this careless way of thawing out nitro glycerine and dynamite would be, it seems to me, to embody the subject matter above in a set of formulated rules receiving the sanction and pressure of the law in each and every State, whereby the verdicts of *accidental death* would be changed to their proper signification, *suicide* or *manslaughter*—suicide where an individual is concerned, manslaughter where a corporation is responsible. SAMUEL RODMAN, JR.,
Late 1st Lieut., U. S. Army.

Chicago, Ill., June 1, 1893.

The American Association for the Advancement of Science.

The forty-second annual meeting of the American Association for the Advancement of Science is to be held in Madison, Wis., from August 16 to August 23, inclusive. By the courtesy of the Regents the sessions will be held in the buildings of the University of Wisconsin and in the assembly chamber of the capitol. Lanterns for projecting views and slides are provided in several rooms, and one room is kept for general lantern use. To it any section may adjourn when lantern facilities are required. The outline of the programme has been published and indicates a full employment of the time of the meeting. F. W. Putnam, Cambridge (office Salem), Mass., is the permanent secretary.

Paint for Iron and Steel.

The invention refers to a new material, called "siderosthen," for the coating of iron and steel surfaces, with a view to prevent the formation of rust upon them. The compounds used for the manufacture of this paint are the tar obtained from works producing fat gas, "goudron," which is a mixture of about 85 part of refined Trinidad asphalt and 15 parts of refined asphalt oil, or, instead of the "goudron," sulpburmay be used. If "goudron" be employed, this is dissolved in the gas tar, in suitable quantities, and this mixture can then forthwith be employed for the purpose in view. If sulphur be used, 8 per cent of it is mixed with the gas tar, and this mixture is then heated to about 100° C.