Financial Outlook for Our World's Fair.

The appropriations thus far made by sixteen States, for representation at the Columbian World's Fair, in Chicago, compare as follows with the amounts appropriated by the same States for the Centennial Exposition of 1876:

	1876.	1893.
Arizona	$5,000	$30,000
Colorado	10,000	100,000
Connecticut	25,000	25,000
Indiana	5,000	75,000
Iowa	20,000	50,000
Maine	10,000	40,000
Massachusetts	50,000	75,000
Minnesota	500	50,000
Montana	5,000	50,000
New Hampshire	16,500	25,000
New Jersey	24,000	20,000
Ohio	45,500	100,000
West Virginia	20,000	40,000
Wisconsin	22,000	65,000
Pennsylvania	1,125,000	300,000
Illinois	10,000	1,000,000
Total	$1,393,500	$2,045,000

In Arkansas, Kansas, New York, Oregon and Rhode Island, appropriation bills have failed; in Delaware, Kentucky, Maryland, Michigan, Mississippi and Nevada, the legislatures have either not assembled, or action is pending. These States made appropriations as follows for the Centennial:

Arkansas	$15,000	Mississippi	$5,000
Delaware	2,000	Nevada	20,000
Kansas	10,000	New York	33,000
Kentucky	5,000	Oregon	4,000
Maryland	15,000	Rhode Island	7,500
Michigan	7,500		

The following States, which did not appropriate a dollar for the Centennial, have made large donations to the world's Columbian Exposition:

California	$300,000	North Carolina	$25,000
Idaho	20,000	North Dakota	25,000
Missouri	150,000	Vermont	5,000
Nebraska	50,000	Washington	100,000
New Mexico	25,000	Wyoming	30,000

In 1876 the city of Philadelphia gave $1,500,000; Chicago has already voted $5,000,000. The United States spent $649,250 and loaned $1,500,000 to the Centennial Fair, which was afterward repaid. The government has voted to expend $1,500,000 on its exhibit at Chicago in 1893.

These figures show a total "in sight" thus far for Chicago of $9,275,000, against the entire amount of $5,166,750 contributed for the Centennial. Of the latter, the managers were responsible for the return of $1,500,000 to the general government, while it is safe to assume that some pretty liberal appropriations will yet be made for the Chicago Fair by the several States in which favorable action has not yet been taken.

Much Work Already Done at Chicago.

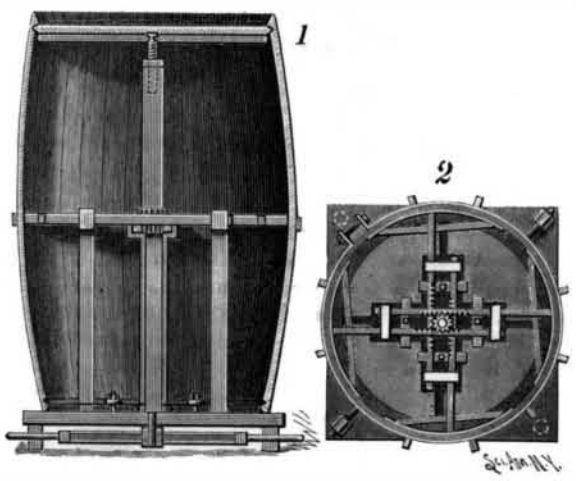
Work on the site selected for the Columbian Exposition at Chicago was begun about the middle of last February, and has proceeded in three stages—clearing the grounds of timber, collecting the black earth, and then filling in the areas from which the work was taken. About seventy acres covered with oak trees were cut away from ground five to twelve feet above the lake level. Then the black earth of the tract was collected and spread. Forty thousand cubic yards were put on the site of the natural island; 45,000 yards were deposited immediately around the island, and 120,000 yards on the territory south of the building sites. The first work done after the clearing of the timber was the filling of the building sites. The ground level or grade of the grounds is four and a half feet above datum, or about five and a half feet above the level of the lake. On the four and a half foot grade are the sites for the liberal arts, fisheries, government, agriculture, machinery, and electricity buildings. The horticulture, transportation, and woman's buildings are on the six foot level, the machinery and mines buildings on the seven foot level, while the administration building is fourteen feet above datum, or about ten feet above the grade of the grounds.

The site is practically ready and the contracts for some of the main buildings are already awarded. The 600 acres of uneven park land has been transformed into a level plain. The most of the preparatory work has been done, except the dredging of the lagoon, the canal, and the basin. The landscape gardeners are already at work, and the contractors for the buildings can begin operations. The sites for the fisheries, government, woman's, horticulture, mines, electricity, agriculture, and machinery buildings are completed. On another page will be found illustrations of accepted designs for some of the principal buildings. The sites for the administration, transportation, liberal arts, and machinery buildings are progressing satisfactorily. When the preparatory work on the grounds is finished there will have been handled 1,000,000 cubic yards of earth.

The force which has been at work on the grounds since April 1 consists of about 600 men, 225 teams, and four dredging boats. Two more dredges will be put on soon, and this force is considered sufficient to finish the grounds within the specified time of the contract, which expires early in July. The dredges are now cutting the lagoon which is to surround the natural island. They are operated night and day, the force of men and horses being sufficient during the day hours to handle the earth thrown up. This earth is used to fill in the unfinished building sites and the dented area of the grounds. The greatest feature of the work yet to come is the excavation of the basin and canal. This basin will be about 1,500 feet long by 350 feet wide. It intersects the canal, which will be a half mile in length and 150 feet wide. The banks of the canal and basin will be architecturally treated, while the shores of the lagoon will be natural and receive landscape treatment.

AN IMPROVED BARREL MAKING MACHINE.

A simple and durable barrel making machine, designed to set up and hold the staves in proper position while the hoops are being driven on, is shown in the illustration, Fig. 2 being a sectional plan view taken on a line just above the middle through Fig. 1. In the center of the platform, set on lugs resting on the floor, is a vertically arranged shaft having on its lower end a wheel with projecting arms adapted to be moved by the foot or haud to turn the wheel. On the upper end of the shaft is a platform to support the head of the barrel, there being a screw in the upper end of the shaft to raise or lower the upper platform as desired. On the shaft near its middle is a gear wheel in mesh with racks sliding horizontally in bearings on the upper ends of posts erected on the base platform, and on the outer ends of the racks are ring sections held in place by braces adapted to engage the inside of the staves. About opposite, on the outside of the staves, is a ring supported on radially arranged rods sliding in posts extending upward from the platform, the ring being open and having lugs or flanges at its ends,



DRAKE'S BARREL MAKING MACHINE.

connected with each other by a bolt, whereby the ring may be loosened or tightened on the staves, according to the diameter of the barrel. On the base platform is a false bottom, made in sections, adapted to be moved inward or outward according to the size of the barrel, and clamped in place, the lower inner ends of the staves resting against the periphery of the false bottom, and being held in engagement therewith by an adjustable ring. To press the assembled staves firmly in position a tightening device is provided, consisting of an open ring of spring metal adapted to be readily passed over the staves when they are in position. The ring has lugs at its ends, one lug holding a pivot for a link carrying in its free end a friction roller engaged by a curved lever pivoted on the other lug. An inner segment is also attachable to this ring, and adapted to be moved inward from it by means of a screw, to adapt the ring to different diameters of barrels. In making a barrel with this machine, the head is placed on the top platform and the ring sections are moved to proper position by means of the wheel at the bottom, operating the vertical shaft, sufficient space being allowed between the outer ring and the ring sections for the staves to be passed through, to rest at their lower ends between the rim of the false bottom and the surrounding ring. The tightening device is then applied to draw the staves together and hold them until the hoops are driven on, the otherhead not being in the barrel until afterward, or until the barrel is filled. The machine has been patented by Mr. Henry T. Drake, of Wadesborough, N. C.

The New York "Herald" Sextuple Printing Press.

The New York *Herald* has recently installed a sextuple printing press, built by the well-known firm of R. Hoe & Co., of this city. The press is really an aggregation of three duplex presses. The paper, which comes of double the width of a newspaper, is fed from three rolls. Each roll, where an eight page paper is in question, supplies paper for two parallel series of imprints. The feed device is what constitutes one of the most important features of the machine. A small roller with endless belt is caused to press against the periphery of the roll of paper. As the roller and belt rotate at uniform speed in a direction to deliver paper from the great roll, a uniform speed of delivery or feed is secured, whatever the diameter of the roll of paper. The papers are printed, cut apart, pasted if required, folded, counted, and delivered by the press. The speed is very high; as many as 90,000 four-page papers can be produced by it per hour. This is twenty-five copies per second. The press consumes 25⅞ miles of double width paper per hour. It weighs about fifty-eight tons.

Loftus Perkins.

By the death of Mr. Loftus Perkins, which took place on April 27 last, at Kilburn, the Society loses one who took a very active interest in its work, and was the representative of a family which has for long been closely associated with it. Mr. Perkins' grandfather, Jacob Perkins, an American by birth, who spent a large portion of his life in England, was a prolific and ingenious inventor. Jacob Perkins took out no less than 19 patents in the days previous to 1852, when each patent cost something over £200. The subjects dealt with included steam engines, marine propulsion, cooking, the artificial manufacture of ice, artillery (the steam gun), and, perhaps the most important of all, the method of engraving by pressure, by which the identical plates from which postage stamps are printed were for a long time produced. Jacob Perkins received three gold and two silver medals from the Society of Arts, of which he was a member, for his inventions. His son, Mr. Angier Mark Perkins, was also a member of the Society, and as an inventor, hardly less distinguished than his father. He developed the system of heating by high pressure water, in connection with which the firm of A. M. Perkins & Son has long been known. He also applied the same principle to the construction of fixed and portable baking ovens, which are largely used, the latter especially for commissariat purposes.

Mr. Loftus Perkins, the son of A. M. Perkins, and subject of this notice, possessed his full share of the hereditary genius of his family. His most important inventions were in connection with high pressure steam engines. To him must undoubtedly be given the credit of being the pioneer in the use of high pressure steam, and indeed the pressures which he used with perfect safety have never been attained by any other inventor. He appears to have been the first to enunciate and employ the principle of using steam at a pressure such as that of 500 lb. on the square inch, and expanding it several times, so as to obtain a very large amount of power from a very small amount of steam. One of his engines was placed in the steam yacht Anthracite, and after the engine had been made the subject of a very careful and elaborate test by Sir Frederick Bramwell, the Anthracite crossed the Atlantic to New York and returned, steaming the whole way—the very smallest steamer which has ever done this. The object of the experiment was to show, in a striking manner, the great economy of fuel obtained by the use of the Perkins engine and boiler. The high pressure engine was, however, not a commercial success, for whether from ill luck, or from whatever cause, it did not appear to work satisfactorily except in Mr. Perkins' own hands, or in the skilled hands of those trained by him. He also applied the high pressure engine to traction on common roads, and an experimental engine, constructed for the purpose, made many successful road journeys. The latest subject to which his attention was devoted was the artificial reduction of temperature for industrial purposes. The Arktos, or freezing apparatus, invented by him was fully described in the fourth lecture of Mr. H. Graham Harris' Cantor course on "Heat Engines other than Steam." The apparatus is one of the class in which ammonia is employed, a great reduction of temperature resulting from the vaporization of the liquid ammonia produced by liquefaction of the gas after it has been driven off from its solution by moderate heat. The special feature of the Perkins apparatus was that there were no moving parts in it. The incessant labor which he devoted to the perfection of this invention brought on a severe illness about a year ago, and from this he never recovered, though he had the satisfaction of seeing the invention in perfect working order before he broke down.

Mr. Perkins was born in 1834. Following the example of his grandfather and his father, he became a member of the Society, which he joined in 1877. From 1881 to 1883 he served upon the Council. Among those who know him he was regarded with feelings of the warmest affection, for his kindly nature, his genial manners, and his generous character endeared him to all with whom he came in contact.—*Journal of the Society of Arts.*

THE best way to bore rubber stoppers is to use a sharp-edged brass tube as thin as possible, and lubricated with soap and water. The hole will be a little smaller than the tube. It may be done by hand, or the tube may be chucked in a lathe. The tube is to be rotated and pressed against the stopper.

Water and Wind.

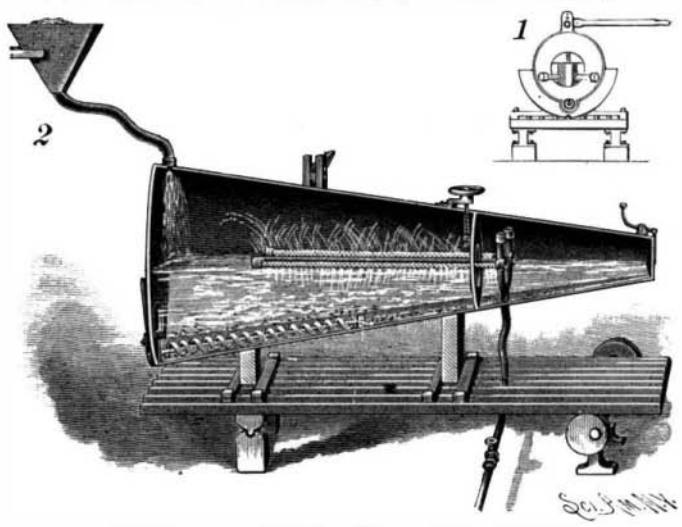
The latest news from Germany shows that a definite contract has been made for transmitting power electrically from the falls of the Lauffen to Frankfort-on-the-Main, a distance of 112 miles, for service at the electrical exhibition which is to be opened at that place on June 15. At Hartford, Conn., a similar transmission of power is successfully made for a distance of 22 miles for lighting purposes. In several places in both Europe and America, electric power is transmitted distances of five to ten miles.

At Coronada Beach, Cal., a company has invented and successfully applied an apparatus to a section of the surface of the sea, by which its ceaseless motion is converted into electric energy; and this is transmitted through a cable to the point where it is needed for the usual service of an electric current.

Thus, not only is the application of electricity rendering available a multitude of water falls in stream and tide which have hitherto been useless for mechanical purposes, but wind power on every hill top can be gathered in by the blades of the windmill, and thence conveyed to the more accessible plain. It will not be long ere fuel of all kinds may be to a large extent superseded in dwellings, and its uses performed in a better manner by the new household servant—electricity. Thus, possibly, we may be saved from the tyranny of the coal mine and the wood pile, and from their final exhaustion, by the utilization of an exhaustless power which everywhere pervades the universe.—*Practical Electricity.*

AN IMPROVED ORE CONCENTRATOR.

The illustration represents a concentrator recently patented by Messrs. Fred Manuel and Kenneth M. Reeves, of Helena, Mont., which is designed to be very effective in operation and readily separate the concentrates from the tailings. It consists of a conical cylinder mounted to rock on a series of longitudinal strips on the top of a table, which can be raised and lowered at the small end of the cylinder, where the tailings and water are discharged, the pulp being introduced through a flexible tube from a hopper near the larger end of the cylinder, as shown in Fig. 2. The two rockers, of which one is shown in transverse section in Fig. 2, have each, in the middle of their under side, a V-shaped notch engaging one of the longitudinal strips of the table, whereby the cylinder is returned to the proper place as it is rocked to the right and left, there being also transverse guide strips on the table on each side of each rocker. The table, under the small end of the cylinder, is raised or lowered by eccentrics on a transverse shaft, having on one end a belt wheel or other means of turning the shaft, or jack screws may be employed instead of the eccentrics, the table at its other end being fulcrumed on recessed supports. At one place on the top of the cylinder are brackets, as shown in Fig. 1, pivotally connected with a pitman, through which, by means of suitable machinery, the cylinder is rocked on the strips, giving a continued series of jarring motions designed to effectively agitate the pulp. The small end of the cylinder is opened by a gate hung on a lever under the control of the operator, and in the cylinder, near this end, is arranged a water feed pipe, connected by a flexible tube with a suitable source of supply. Segmental and

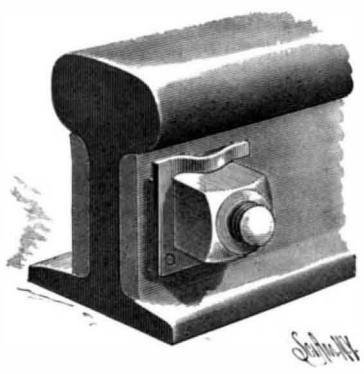


MANUEL & REEVES' ORE CONCENTRATOR.

longitudinal perforated pipes, with nozzles, extend from this water feed pipe on the inside of the cylinder, whereby the discharge of water in jets is designed to aid in the agitation of the pulp. Near the feed water pipe is a gate, adapted to be raised or lowered by a screw rod extending through the top of the cylinder, this gate being designed to retain finely pulverized ore floating on the top of the water, the lower edge of the gate being kept below the surface of the water in the cylinder. In a pocket in the bottom of the cylinder is a conveyer screw, the shaft of which has at its outer end a ratchet wheel engaged by a spring-pressed pawl fulcrumed on a lever, connected by a rod with suitable machinery for rotating the screw at intervals. The concentrates settling in the bottom are thus fed toward the large end of the cylinder, where they are discharged through a suitable opening provided therefor, the tailings and water flowing out through the gate at the small end of the cylinder.

A SIMPLE AND EFFECTIVE NUT LOCK.

In the device shown herewith, which has been patented by Mr. Samuel M. Churchill, of Lawtey, Fla., the lock is established by means of a washer having a spring tongue transversely of its face, by which the lock is formed. The washer is of a double thickness, being formed of two metal plates riveted together on one side, or, when applied to a wood surface, secured by a screw arranged to enter the wood. The plates



CHURCHILL'S NUT LOCK.

are of spring steel, the outer plate extending beyond the inner one, and this extended portion being partly divided from the main portion by a slit. A spring tongue is thus formed, in which is produced a curved middle portion. As the nut is screwed on or off, its corners ride over the curved projection of the tongue, forcing the latter down, but when screwed to place, a flat side of the nut is made to come in line with the slit, allowing the spring tongue to rise and bring its curved portion up against the side of the nut. As the main portion of the spring tongue does not project above the washer, there is no necessity to hold it down in putting the nut on or off, the operation being simple and quick, and the locking device automatic in its action.

Facts about Lime and Limestone.

With regard to the burning of limestone or carbonate of lime, pure carbonate of lime may be subjected to the intense heat of the oxyhydrogen blowpipe without losing its power of slaking when exposed to moist air, a fact but too well known to all who use the lime light. Even natural limestones of considerable purity can be exposed to the highest available temperatures without deterioration of the resulting hydrate; and I have myself exposed Buxton limestone to the intense white heat of a steel furnace, and subsequently found it to slake as well as the same stone burnt in the ordinary way. Should any of the limestone be insufficiently burnt, *i. e.*, should it still retain its carbonic acid, it will not slake, and the lumps can easily be separated from that which has been converted into a fine powder by the slaking process. The use of wood for burning lime has the great advantage that it does not introduce the deleterious sulphur compounds present in all mineral fuels.

The interesting experiments of Wolters and other observers have clearly proved that the presence of carbonic acid is not necessary for the setting of mortars, and that mortars will set perfectly well in an atmosphere quite free from carbonic acid. No doubt the ultimate hardness of mortars is much increased by the gradual absorption of carbonic acid; but the process is extremely slow, and as it requires several generations for its completion, we must not rely on it for modern work. Dr. Ziureck found a considerable percentage of caustic lime in mortar 500 years old, and a sample of mortar from a bridge over the Great Western Railway, which was removed last April, and was about 50 years old, still contained 27 per cent of the lime in a caustic state. Air-slaked lime does not absorb carbonic acid unless free water is present; this has now been known for more than twenty years, and yet some persons specify that lime shall be newly slaked.

This is in direct contradiction, both to the practice of the ancients and modern scientific observation. There is a reason for the use of pulverized marble. Marble, even in the finest particles, is crystalline in structure; and it is a fact, well known to chemists, that a particle of a crystalline substance will often produce crystallization, when added to a mass of identical chemical composition, but amorphous in structure. It is, therefore, highly probable that the presence of these crystalline particles in mortar may cause the carbonate of lime, which is slowly formed, to assume the crystalline structure; and, as this is the final and most permanent form of all mineral substances, the result is, no doubt, favorable as regards the permanence of the mortar.

With regard to the admixture of glue with *whiting*, this could hardly be very desirable; but *caustic* lime would have a very different chemical action on the glue. I have used for many years for painting woodwork, out of doors, a mixture of blood and caustic lime, which mixture is much more desirable than a wash of lime or even Portland cement; and yet the blood alone is a very unstable substance.—*Walter F. Reid, F.I.C.*

The Next Advance in Telescope Making.

Why, asks the *Pall Mall Budget*, is it so difficult and expensive to construct an immense telescope? From the time of Galileo to that of Clark, steady work has been done, and each step has given us a larger object glass. The pupil of the eye is one-fifth of an inch in diameter, and can grasp but a limited amount of light. A 25 inch object glass will enable the eye to take in over 15,000 times more light, and with such a glass the moon can be seen as though it were only 80 miles away; but if the size of the object glass could be further increased, the moon would be brought considerably nearer. To make a large object glass is the difficulty, and it is only after years of patient work of the most skilled men on earth and after repeated attempts that one can be produced which is accurate. Slight differences of specific gravity, changes of structure due to jarring, strains resulting from unequal pressure and changes of temperature, are all capable of ruining the work. Some one who is anxious to anticipate events has asked: Why not replace the glass, which is only a medium transmitting light at a different velocity from air, by a properly constructed electric field? It is conceivable that an electric field 50 feet in diameter could be arranged. Just what the nature of this field should be, with our present knowledge, we cannot say, but some day it will be known, and then the secrets of the other planets will be ours. Ether (says a technical paper) is now paramount with experimentalists; some day it will form the basis of all electrical text books. We seem to be on the verge of discovering something really great in the world of ether. The early experiments of Faraday, the marvelous mathematical researches of Maxwell, and the crowning experiments of Hertz, all show the intimate relations which exist between electricity and light. They have so entirely changed our views of science that it has been truly said that electricity has annexed the whole domain of optics.

SIMPLE AERIAL TOP.

Zip! up, up, she goes! "There! she's out of sight!" An instant of silence. "There she comes! down, down, down, there she is across the street." In the lively scramble a lucky youngster grabs it, and hastening to the vender, says, "Here she is, mister." "All right," says the vender. "I give you a penny every time you catch the aerial top."

This is a 42d Street scene: "Here is your aerial top, a regular sky skimmer. You can see it go out of sight. Only ten cents." Meanwhile, in the intervals of the jangle, the vender with his bird warbler imitated the canary, mocking bird, various animals, and Punch

AERIAL TOP.

and Judy. A new comer says, "I'd like to see it go up," and up she goes, down she comes, and another gamin gets his penny for securing the sky skimmer, while an occasional passer-by invests a dime in the interesting toy.

The object of so much interest was a simple three-armed wheel punched out of tin, with its arms widened at their outer ends and all inclined in the same direction, a little spool with prongs at one end which enter corresponding holes in the central portion of the wheel, a wire supporting the whole, and a string wound around the spool for giving the flier its impulse. The string is quickly pulled, and the rapid rotation of this aerial screw propeller causes it to leave its prime mover and fly skyward out of sight.