

clay soil, with exposure to plenty of air and sunshine, is preferable, and the tree is in its maturity when from fifty to one hundred years old.

Elm is found in all the States east of the Mississippi, and the present supply is drawn very largely from Ohio. It is cut in the same season as hickory, but the method of seasoning differs in some respects. When required for hubs, it is usually cut in the required lengths, and a hole bored through the heart; the bark is then removed, and each block reduced to a true cylinder, with the hole for its center. From this point the practice differs in different works, but generally the blocks are then steamed for a short time, to assist in seasoning them without splitting or checking; and after this the ends are dipped, to the depth of about half an inch, in a mixture of hot linseed oil and tallow (or resin), as a further preventive of checking. They are then stored in open sheds, where they remain from two to four years to season thoroughly.

Locust is sometimes used for hubs, and possesses special value on account of its durability; but it splits easily, to prevent which it requires to be carefully banded close beside the spokes. The mode of cutting and preparing it is similar to that employed for elm.

Gum wood, known in some sections as pepperidge, is found mainly in the States along the Atlantic seaboard, growing but sparingly in the West; and south of New York State it is used considerably by carriage builders for hubs. In its qualities it is very similar to elm, being very difficult to split; but it has not the lateral strength of elm, and in driving spokes it is more liable to break between the mortises. The method of preparing it is very similar to that employed for elm, the only difference being that the blocks are not usually dipped, although this treatment would doubtless be beneficial; and its market value is about the same as that of the latter.

WHAT CONSTITUTES A GOOD WHEEL.

The excellence of a wheel depends, first, upon the quality of the material employed; second, upon the proper preparation of this material; third, upon the proper proportioning of the different parts, and fourth, upon exact and skillful workmanship in combining these parts into a perfect whole. Mr. William Thompson Casson lays down a similar standard in his article which appeared in a recent number of *London Saddlers', Harness Makers', and Carriage Builders' Gazette*, wherein he says:

"The gem of the wall exhibits at the Centennial is an English dog cart wheel, shown by Hoopes, Brother, & Darlington; and from whatever point of view we take it, whether regarding its appearance, workmanship, or material, it is a source of admiration; the spokes and rims are oak, but it requires an experienced eye to detect whether the oak is English or American. They also show landau, brougham, and other wheels of the English pattern, as specimens of their ordinary manufacture, leaving nothing to be desired. Those of the old school of wheel makers, who yet dispute whether any steam wheels can equal those of hand make, would be convinced of the superiority of the former by a close inspection of the wheels shown by this firm; every joint and shoulder is up and close, without having one part squeezed into another, simply because every tenon, shoulder, and surface is made with mathematical precision. From personal experience learned at the bench, this really seems to be the whole secret of wheel making— to have everything tight, true, and fair."

SHAFTS, WHIPPLETREES, AND SIDE BARS.

For shafts, hickory is commonly used by American carriage builders, and answers the purpose admirably. Lancewood, however, from the West Indies, would, without doubt, be preferable; but it is difficult to obtain, and very expensive. It is much to be regretted that not a specimen of lancewood in the rough is exhibited at the Centennial; and although it is used in connection with several of the carriages exhibited, it is so disguised by paint or varnish as to give, to those unacquainted with it, little or no idea of what the timber really is. The valuable qualities by which lancewood is distinguished are great stiffness and elasticity, and remarkable strength. Some builders claim, however, that lancewood is not so safe as hickory for shaft purposes, for the reason that, when it breaks, it is liable to break off short; and to obviate this danger, some foreign builders fasten strips of whalebone under lancewood shafts, by means of round-headed screws. For whippetrees, hickory is used almost universally by American carriage builders.

Wooden side bars, now so popular in connection with light road wagons, are made of various materials, hickory being preferred by the majority of the best builders, while locust ranks next in favor; and experiments have also been made with *bois d'arc*, Chinese chopstick wood (name unknown to us), and lancewood. Lancewood would doubtless prove the best for this purpose, and come into general use, were it not for its expense, and the difficulty of obtaining it in sufficient quantities; for it possesses those qualities particularly demanded for side bars—namely, stiffness, toughness, and elasticity.—*The Hub*.

NOTES ON THE AMERICAN INSTITUTE FAIR.

ENVELOPE MACHINERY.

There is a remarkably ingenious machine at the Fair of the American Institute, which is said to make 3,000 envelopes per hour. A similar apparatus is in operation in the Government building at the Centennial, but there it is not among the machinery, and is thus out of the route usually followed by those who make mechanism an especial study. It is one of those devices which even the practised eye can

not appreciate at a glance, and when at work it goes through its multitudinous manipulating performances so quickly and yet so deftly that the observer instinctively finds himself watching the envelopes come in and the envelopes go out as if a natural phenomenon were taking place, the internal operation of which it were useless to try to fathom. The motion of the apparatus is mainly obtained through cams, and these act on rubber rollers on the extremity of the rods moved. The envelope blanks, previously cut out, are placed on a table. Beside and above the latter is a paste slab whence mucilage runs to distributing rollers, and these in turn cover movable rollers, which are thrust forward to apply the gum to the undersurface of a stamp or plunger. The plunger now descends and takes against the parts of the envelope to which paste is to be applied, and then rising carries the envelope up with it. Now a carrier shoots under the envelope, takes it away from the stamp, and conducts it rearward under a square plunger which, descending, pushes the paper through a square hole, thus bending up its edges preparatory to folding. No sooner is the envelope through the orifice than four little doors or shutters clap over it and neatly fold the edges. Next it falls between arms on a long endless chain which moves very slowly rearward, the envelopes going down one way and coming up the other. This travel is long enough to enable the paste to become dry, a process facilitated by a little rotary fan under the chain, which keeps up a draft of air. Lastly, as each envelope returns to the table of the machine, fingers rise on each side, remove it from the chain, and place it on a small platform which, turning, deposits the envelope neatly on edge beside its predecessors. Then the young lady who presides over this wonderful machine quickly runs her finger over the requisite number of envelopes to form a pack, surrounds them with the usual ornamental strip of paper, and the process is ended.

There is one good feature about the American Institute Fair which occurs to us here, and that is that it offers excellent facilities for the undisturbed study of its contents. It is useless to attempt to examine intricate machinery at the Centennial, owing to the now almost constant crowd; and to post oneself in front of an object with a note book, and to ask questions of the exhibitor, or, worse yet, to try to sketch, is, especially in the latter case, to constitute oneself the center of a throng whose curiosity impels each individual member to ask questions on his own account, or else to constitute himself a critic on the efforts of the amateur pencil. Nothing delights us more, however, than to see the interest manifested by the people in machinery and invention, and in that view we can forgive the annoyance. It would not be a bad idea, though, for enterprising exhibitors to hire artists to sit and sketch their exhibits by the week, by way of advertisement. But this is wandering from the American Institute Fair, where—and here is a contrast to the Centennial—an exhibitor the other day set an engine racing for our inspection, at a most remarkable pace, and no one manifested the slightest interest in the proceeding. People passed, instinctively wagged their heads, as they always do, in time with the machine, and proceeded onwards. The engine in question, we found, presented some features not wholly new, but well worth examining.

THE BALANCE ENGINE.

It has two pistons in its single cylinder. From the front piston and through boxes near the edges of the cylinder cover extend two piston rods, each connected to a crank on the driven shaft. From the rear piston a single main piston rod passes directly through the front piston, then through the middle of the cylinder cover, and connects to a crank formed by making the inner sides, of the two cranks already mentioned, twice as long as the outer sides. That is, imagine a W with the middle angle twice as high as the side strokes, and consider a crank at each angle. The main piston rod would then be attached to the angle at the apex, and the two smaller rods to the angles at the base. The cranks, it will be observed, are set in the same plane, and not quartering, as is usually the case. The steam ports enter the cylinder at the middle and at the ends, and the stroke of each piston of course equals half the length of the cylinder. The steam enters between them and forces them apart, and then enters at the ends and carries the pistons together. Now the sum total of all is that the power is applied to the shaft just as the two hands are to the handle of an auger, and the reciprocating parts are balanced; while the engine—despite the very indifferent workmanship—runs at high speed with little vibration.

THE HARRIS STEAM PUMP

is quite new, and has a positive action. The main piston, on arriving near the end of its stroke, raises a poppet which admits steam to the valve piston and at the same time closes its communication with the exhaust. This throws the steam valve, which admits steam, to the other side of the main piston, causing it to make the return stroke. The instant the piston moves from under the poppet it drops to its seat, closing the steam and opening the exhaust on that side of the valve piston, which, together with the steam valve, remains at rest until the other poppet is raised to admit steam to the opposite side. There are no outside connecting valves, etc., and the water end is of the double acting plunger pump pattern.

AN INGENIOUS MECHANICAL MOVEMENT

will be found embodied in the Vanhorn & Cranston paper-cutting machine in the main hall. The arm which draws down the clamp to hold the paper, prior to the knife rising from beneath, is pivoted to a long hand lever, near the lower end but above the fulcrum. Hence, when the lever is pulled down, the clamp is carried downward until its further mo-

tion is prevented by the paper under it. The lever then changes to one of the first order, having its fulcrum on the clamp rod pivot, while the former fulcrum now is the pivoting point of the lever end to the carriage which supports the knife. Consequently, further forcing down of the lever lifts the carriage with great force, and the knife is caused to cut the paper. The device is very simple, and so constructed that the greatest power is applied just where it is needed.

As a whole, the fair is interesting, and visitors to the Centennial, sojourning in this city, will do well to visit it. It is especially rich in household articles, and in new designs in furniture, etc. The machinery department is not so well filled as usual; but there are many novelties which will repay careful examination. The attendance is constantly large; and on Saturday and Wednesday nights which seem to be especially favored, the building is generally crowded.

Opening of the New York Aquarium.

The New York Aquarium, located on the corner of 35th street and Broadway, this city, was recently opened to the public. The tanks contain a large number of fish, including a white whale from Labrador, several shark, a huge sting ray, and terrapin, besides an interesting collection of zoöphytes. A laboratory for naturalists, with the necessary appliances for investigation, is provided; and in the piscicultural apparatus, the process of hatching and rearing salmon may be witnessed. On the opening night, President R. B. Roosevelt, of the New York Fish Commission, made an address on the objects of pisciculture.

A Disastrous Boiler Explosion.

A terrible boiler explosion recently occurred at Zug & Co.'s mills at Pittsburgh, Pa. The boilers in the nail mill blew up, demolishing that building and half the adjacent rolling mill. Some twenty men were killed and as many wounded. No cause is as yet assigned for the casualty. The boilers were in charge of a careful engineer, and it is stated that they were inspected some five weeks ago and were then in good condition.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN LIBRARY JOURNAL. Edited by Melvil Dewey, 13 Tremont Place, Boston, Mass. New York city: F. Leyboldt, 37 Park Row.

As its name indicates, this journal is devoted to the interchange of thought and experience among librarians, and with this aim it enters a field hitherto wholly unoccupied. We have a great many large and excellent libraries in this country; and there is a constant increase going on both in the numbers of these repositories of learning as well as in their contents. To render the vast mass of information thus accumulated accessible to the reading public, to keep his own particular charge up to the latest dates in constantly adding new works, and, perhaps above all, to constitute in himself a living index of what the book makers have done, is but a rough statement of the librarian's duty; and that these ends can be accomplished better by the union of librarians, which the present journal seeks to bring about, than by individuals, it is hardly necessary to suggest. The first number of the periodical, which is issued monthly, contains a number of interesting communications and papers, among which we note some sensible practical hints to starters of libraries, and a good many ideas for the care, indexing, etc., of books. There is, beside, a useful record of new publications, not merely in this country, but throughout the world. The journal is elegantly printed, the margins are luxuriously wide, and the present number has an illustration of the new Ridgway library building in Philadelphia. The subscription price is \$5.00 per year, or 50 cents per number.

THE COMPLETE AMERICAN TRAPPER. By William H. Gibson. Illustrated by the Author. Price \$1.75. New York city: James Miller.

We are inclined to think that the author's claim that "this is the most comprehensive work on the subject ever published" is a fair one, judging from the almost endless variety of traps and other devices to effect the capture of animals and birds which he illustrates and describes. He even tells us how to trap the hippopotamus, the lion, and the tiger; and from these great beasts he descends through the scale until he reaches a daintily delicate way of catching humming birds by a few drops of birdlime on the leaves of a lily. Trap making—or, to speak generally, the pitting of human reason against brute instinct and cunning—requires a special kind of ingenuity, which not many possess; and in gathering together all the curious devices described in his volume, the author has done excellent service in helping very many people to ideas which doubtless would never occur to them. The book contains 143 engravings—mainly representative of the apparatus explained—and is written clearly and well. It will be useful not merely to hunters and trappers, but will also serve to exhibit to inventors what has already been accomplished in this particular line.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED METHOD OF CONVERTING MOTION.

Hiram L. Joslin, Mankato, Minn., assignor to himself and Henry K. Lee, same place.—This consists of a reciprocating head working backward and forward among belts, and having clutches or pawls contrived to take hold of one side of the belt going one way, and the other side going the other way, so as to apply the power continuously in one direction.

IMPROVED BRICK MACHINE.

Ferdinand Michel, Dallas, Texas.—The table to receive the tempered clay is attached to the top of the frame from which it is fed into the molds. Followers enter the molds from below, and serve as bottoms to the mold when being filled. A weighted block withdraws the followers when the pressure is removed. By operating a lever, the followers may be forced up to press the brick, and to raise them out of the mold after being pressed. There are other ingenious improvements in the mechanical construction.

FEEDING APPARATUS FOR CARD-PRINTING PRESSES.

William M. Clark, Philadelphia, Pa.—As the card passes down beneath a shelf, its ends pass beneath the flanges of guide bars, projecting downward along the platen to guide the card to the place where it is to be printed. As the card reaches the place where it is to be printed, it is stopped by inwardly projecting curved points, which receive its lower edge. As the platen is drawn back, these curved points raise the card slightly as its lower edge slips from them, so as to release it, should it stick to the platen, and allow it to drop from the press. The arms which carry the points slide upon grippers so that they may be adjusted as the width of the card may require.