THE AMERICAN INSTITUTE FAIR.

The present exhibition at the American Institute, this city, is one of the best held for years; the exhibits of merit are comparatively numerous.

The Straight Line Engine Company, of Syracuse, N. Y., show an engine designed by Prof. John E. Sweet, in accordance with the axiom that a straight line is the shortest distance between two points. There is no packing except the piston rings, the valve and piston rods being of ground steel working through long Babbitt bushings, and the cylinder head and steam chest cover have ground joints. The connecting rod, eccentric rod, and rocker are of cast steel; crosshead pin and valve motion pins are steel, ground and case hardened. Crank and shaft, steel ground and polished. A single balanced slide valve is used, actuated by a single eccentric that is varied in its throw by the governor which controls the cut-off, and which is placed in the fly wheel. There are fewer pieces in the engine than common, and the working joints are reduced in number. The material is admirably distributed to receive the strains coming upon it. But little foundation is required, and the engine runs quietly at a high speed. It is stated that under no conditions will the speed vary more than two per cent.

The vise manufactured by Read, Gleason & Read, of Brooklyn, N. Y., contains a steel rack whose rear end is bent at right angles and which is attached to the stationary jaw by bolts. A steel nut having teeth on its lower side engages with the rack, and has its rear end inclined upward. A box is secured in the sliding bar, on the forward end of which are reversed inclines corresponding with the nut and between which the reduced end of the screw rests. The box also carries a concave piece fitting over the screw and pressed forward by a spring. By turning the screw to the left the nut is carried back, forcing the concave piece from over the end of the screw, and bringing the inclines together, thus raising the nut from the rack and allowing the front jaw of the vise to slide. A pin placed in the lower front end of the box slips under the end of the nut, when the nut is raised from the rack and holds it up until the inclines are separated, to allow it to drop square in the rack. When the screw is turned to the right, the nut is drawn back from contact with the pin. The vise is strong, the jaws can be quickly adjusted to any width, and the work is securely held. Vises which swivel horizontally and also universally are shown.

Located at conspicuous points throughout the building are clocks from the Pneumatic Clock Company, of 14 Murray Street, this city. They are all regulated by a central clock to which a simple air pump, consisting of a lever to each end of which a cylinder is suspended, open end down. Under each cylinder is a jar partly filled with glycerine. A small pipe runs through the center of the jars, one end reaching above the surface of the liquid and the other conducted to the different clocks. By the alternate motion of the lever the cups are, at every other minute, plunged into the glycerine, thereby compressing the air in the cups and tubes, causing the small cylinder of similar air pumps on each clock to rise and start the hands forward one minute. As the cylinder on the main clock is lifted every minute, the air is released and any expansion or contraction neutralized.

A one-ton wheel made by John G. Avery, of Spencer, Mass., has for a belt a thread of cotton passing over one of the lines of shafting. The journal which permits of this consists of a hardened tube fitting over the shaft and into a shell containing small hardened rolls. An internally hardened box goes over the shell. With modifications to suit conditions these may be applied to shafting, carriage and car axles, etc.

In the pump manufactured by the Hall Duplex Steam Pump Company, of 91 Liberty Street, this city, the valves of the steam chest admit steam to the opposite cylinder through cored passages. The valve of one engine is moved by direct connection with the piston rod of the other. Each valve is composed of two simple pistons, cast together, between which the steam is admitted, thereby forming a balanced piston valve. The ports are so arranged in relation to the valves that each engine makes nearly its full stroke before opening the ports to start the other. When one has completed its stroke it rests until the other has nearly finished, the pause allowing the water valves to quietly reach their seats, and obviating the shock and jar resulting from sudden checking. The steam pistons are cushioned upon the steam caught by their passing beyond the ports. The pump plunger has a central adjustable packing moving the length of the stroke, and performs its duty by projecting into and displacing the contents of the pockets at each end of the cylinder.

The Clerk Gas Engine Company, of 1012–1018 Filbert Street, Philadelphia, have on exhibition an eight horse power engine. The motor cylinder has a diameter of 6 inches and the stroke is 10 inches. Diameter of driving pulley 18 inches, with face 8 inches; speed 180 revolutions. The engine is 4¾ feet in height, weighs 2,700 pounds, and occupies a floor space 8 feet by 3 feet 5 inches. We expect in an early issue to describe the construction of this engine and the work it accomplishes.

A train of seven bevel and miter gears is shown from Brehmer Bros., of Twelfth and Noble Streets, Philadelphia. The gears are of different sizes and number, and the shafts are parallel and at angles with each other. The fit is remarkably nice, the back lash being reduced to a minimum, and only being perceptible in one instance, which is probably due to the setting up.

"Twenty-four O'Clock."

The endeavor to make a uniform time standard throughout the country gives especial interest just now to another proposed change, which has frequently heretofore been suggested. It is that of numbering all the hours of a day up to twenty-four consecutively, instead of using the "A.M." and "P. M.," as has always been the custom. One of the Western railroads, the Cleveland, Akron, and Columbus, has recently adopted this system, and issued time cards on the twenty-four hour plan, counting the day to begin and end at midnight, which it is said has been used with great satisfaction by the employes and the public. To change watches and clocks to accommodate the new system it is proposed to put the additional numerals in a circle on the dial just inside of those now on the face, reading the outside figures for the time up to 12 o'clock, noon, and those on the inside thereafter, up to "24 o'clock," midnight.

The sending out of "standard time" from the National Observatory at Washington to principal places in the country has now become a regular practice, and the authorities are ready and willing to telegraph the time regularly to any point in the United States to those who are prepared to receive it. The following is a description of time signals, 75th meridian, mean time, to be sent out by the United States Naval Observatory on and after November 18:

The signals to be sent out by the Observatory are wholly automatic, and consist of a series of short "makes," produced in an open telegraphic circuit by the beats of a mean time clock, the pendulum closing the circuit at each beat. The signals begin at 11 h. 56 m. 45 sec., and cease at 12 h. 00 m. 00 sec., 75th meridian, mean time. During that interval there is a "make" at the beginning of every second, except that in each minute the "makes" corresponding to the 29th second, and to the 55th, 56th, 57th, 58th, and 59th seconds, are omitted. Thus the first "make" after the pause of five seconds always marks the beginning of a minute, and the first make after the pause of one second marks 30 seconds. In order to distinguish the last minute and give time to manipulate switches to time balls, controlling clocks, etc., the makes cease after 11 h. 59 m. 50 sec., and until 12 h. 00 m. 00 sec., when there is a single make, and the signals cease. When these signals are received at points where the time of the 90th meridian is used, they will give the time from 10 h. 56 m. 45 sec. to 11 h. 00 m. 00 sec., or just one hour earlier than when representing 75th meridian time; otherwise the signals will be read in the manner above described. Seventy-fifth meridian time is 8 m. 12.09 seconds earlier than Washington time.

Low Prices for Iron and Steel.

It has been evident for some time past that our smelting works and rolling mills, working at about their full capacity as they have been, were competing so closely for the trade offering as to leave very small margins for any possible profit in the business. The situation was made yet more serious, as affecting many producers, by the reduction, early in the month, of the price of steel rails from $37 to $35 per ton for rails for winter delivery. Mill proprietors have, ever since the "boom" in prices in 1879, when rails sold at $85 per ton, been studying how to reduce the cost of production, and economizing in every direction, but it was thought that when the price had declined to $40 a ton, this was as low as the manufacturers could afford to run their mills for. That this is so with many of them is proved by the fact that at once we had announcements of the stoppage of rolling mills, and furnaces blowing out in different sections, although only very limited contracts were made for rails at $35 a ton. The proprietors had in most cases been running on steel rails at $37 a ton in the hope of an improving market, but this drop in prices, with the tendency in the iron market generally to lower figures, will undoubtedly cause the closing of many establishments during a part or the whole of the winter. In bar iron, pipe, nails, etc., although there is said to be no overstock on the market, buyers are only purchasing in small quantities, according to their immediate needs, apparently satisfied that in these, as in some other staple manufactures, prices are more likely to decline, or remain where they are, than to advance.

Natural Gas for Manufacturing in Western Pennsylvania.

For nearly ten years past natural gas has been utilized for manufacturing and lighting purposes in only a few instances, although several abundantly-yielding wells, and a large territory from which it was known gas could be drawn, have been familiar topics among the manufacturers of Western Pennsylvania. Recently, however, attempts are being made to utilize this natural gas on a large scale by the iron and steel and glass manufacturers. All the window glass manufacturers of the Southside, Pittsburgh, Pa., have closed a contract with the Niagara Gas Company to supply their factories with natural gas. The company is now operating in Washington County, and representatives of each factory have been negotiating there for the drilling of gas wells and laying of pipe. The manufacturers have leased about twenty thousand acres of land in that county, in the neighborhood of the McGugin well, the largest natural gas well in the world. They expect to arrange for the drilling of several wells on their territory, the work to begin at once. The Edgar Thomson Bessemer steel works, at Braddock, Pa., have also been completing arrangements to run their whole plant, in which 100 boilers are in use, by natural gas to be obtained from a gas well at Murraysville.

Getting Foreign Help to Make U. S. Cannon.

It seems strange that, while the principal European nations have been making such vast strides in the manufacture of, and in furnishing their armies, forts, and war ships with far heavier guns than ever before made, these, too, being mostly of steel, our own government has done little or nothing in this direction since 1865. At that time we were far in advance of the rest of the world in this respect, and it was our little Monitor which gave the impulse to this great rivalry among the powers of Europe, in the making of heavy armor as well as big guns. These facts have been referred to many times, but they are again brought vividly before the public mind by the recent return of the Government joint ordnance foundry board from a visit of inspection to Europe, to get more full particulars of what our neighbors abroad were doing.

Under an appropriation of Congress at the last session, contracts were made for various alterations in some of our heavy guns, but steel of suitable masses and the requisite quality for making the new guns desired was not obtainable among our own manufacturers, nor had any of them the necessary machinery for the work. The large guns to be manufactured are after the plan now principally favored in France, a breech-loader with cast-iron body, steel tubes and steel bands, and for these, of 8 and 10 inch caliber, the tubes and jacket have been ordered in England, of Sir Joseph Whitworth. The steel hoops, being of comparatively small mass, will be manufactured in this country. Our present 10-inch Rodman smooth bores, of which many are being converted into 8-inch muzzle-loading rifles, have thus proved very efficient, and it is recommended that the work of alteration be continued; but of the bulk of our ordnance, it is stated there is hardly a piece worth keeping, one member of the board stating that "we have nothing at all in this country to compare with the guns abroad."

The board that has just returned from Europe were not allowed to visit the Krupp foundry, although such permission would have been given had they agreed to purchase cannon of him. They saw the Krupp method, however, at Aboukoff, near St. Petersburg, where the fluid steel process is used, as at the works of Sir Joseph Whitworth at Manchester, England, but not the forging by hydraulic process. Their investigations elsewhere included visits to the government and principal private works in both England and France. The ordnance departments abroad all seem to be in an unsettled condition; they are all united that steel guns must constitute the principal ordnance of the future, but the work of changing and making all over new is great, and there is no unanimity of opinion as to what is really the best of the many kinds and patterns of guns being constantly brought out.

Interesting Experiments with Hot Gases.

In November last, Dr. Werner Siemens presented to the Berlin Academy of Sciences, a paper from which it appears that gases heated to a temperature at which steel begins to melt do not emit any luminous rays, if proper care has been taken to subject them only to heating and not to chemical action. Dr. W. Hittorf, of Muenster, has since then recalled the fact that he made observations of this kind in 1879. When causing the electric spark, produced by the 1,600 cells of his battery, to pass between two platinum electrodes, he noticed the positive terminal surrounded by a yellow red light and the negative by a blue glow, but the rarefied gas between the terminals was quite dark, although hot enough to melt any metal rod held in it.

Dr. Siemens' investigations induced Dr. Hittorf to repeat his experiments, employing two iridium bars (of equilateral section with a side of 3 millimeters and 6 centimeters long) from the well known platinum works of Mr. Matthew. These iridium electrodes Dr. Hittorf fixed in strong brass rods and placed them opposite one another in a glass tube of 6 centimeters length. By arranging his powerful battery of 2,000 cells in groups so as to decrease the interior resistance, Dr. Hittorf obtained most beautiful and curious effects, the anode melting, and the cathode maintaining its sharp edges, both however at white heat, while the gases—nitrogen, hydrogen, and carbonic acid were experimented with—remained perfectly dark. From these experiments it would follow that wherever a gas is perceived to be glowing we have to deal with a combustion or other chemical combination, and not with heat effects only; and it has been established by Mr. G. Wiedemann, that the splendid luminous phenomena of the Geissler tubes are of the nature of a phosphorescence, that is to say, of a slow combustion. That only flames and not heated gases are luminous, may strikingly be proved by a very simple experiment. If a cylinder of very fine platinum foil is suspended in the hottest part of the flame of a Bunsen burner in a horizontal panel, and looked at from a distance through a narrow tube, the platinum cylinder will of course at once begin to glow, but the air within appears dark.

The earliest observation of this kind was probably made by Wedgwood, who as early as 1792 pointed out in the Philosophical Transactions that a current of air blown through a strongly heated clay tube bent in zigzag shape did not emit any light. But the fact appears to have become quite forgotten, although Melloni, the foremost investigator of his time in the field of radiation, clearly distinguished in this sense between heated gases and flames.

THERE are fifty-one complete rolling mills, and two in process of construction, at Pittsburgh.

Magnetic Iron Sand in New Zealand.

From the report of the United States Consul at Auckland, New Zealand, it appears that the government of that colony offers a bonus of £1,000 ($5,000) to whoever will first produce, from native ore, in the colony, 200 tons of iron in blooms. In answer to this demand a furnace was established on February 8, at Auckland, the furnace being on the plan of the invention of Joel Wilson, of New Jersey. The managers claim that they can manufacture iron in Auckland much cheaper than it can be brought from England. The consul says that the United States government has granted as many as thirty-eight patents for electric separators of iron ore, and that one of these was successfully operated in the separation of iron sand obtained at Block Island, off the Connecticut coast, by the patentee, D. C. McCotter Arthur, who cleaned one hundred and twenty tons per day by means of his magnetic separator.

Similar means for procuring the pure iron free from sand have been tested in New Zealand, so far that a furnace on the American plan has been established at Onehunga, a few miles from Auckland.

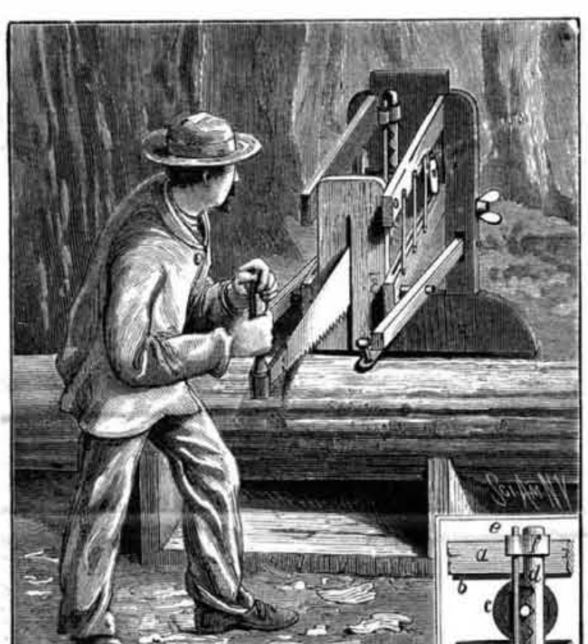
This iron sand is so pure that a portion sent to England was worked into steel for cutlery without the intermediary of puddling, being melted, cast, and at once forged under the hammer. The supply is absolutely unlimited, and cannot be estimated even by millions of tons. The ordinary yield of the sand is from fifty to seventy per cent of the mass. The magnitude of the deposits may be inferred, if not comprehended, by the statement that in the neighborhood of Waniku, in the province of Auckland, the area of this magnetic iron sand is so great that it extends from the shore miles in width and in length, submerging rocks, trees, shrubs, and covering even the tops of the distant hills.

The existence of this iron sand was well known to the earlier voyagers and later to whalemen and venturesome traders. On approaching the shore the masters of vessels that first visited these islands noticed a variation in the magnetic needle of their compasses, and attributed it to deposits of loadstone along the beach.

This deposit, the consul thinks, was formed by the action of the sea, of running streams, leaping torrents, and profuse rainfalls on cliffs, banks, and soil that hold in loose embrace the heavy particles of iron originating in volcanic rocks. The sand is of a bright blue, its attrition of particles preventing the settlement into the red oxide which would cement its grains, and it is in so fine particles as to be easily driven by the wind, forming on levels or easy slopes wavy, undulating ridges that simulate the waves of the sea.

CROSS CUT SAW FRAME.

The log is arranged on supports at one end of the base, and at the other end of the base is an upright frame fitted with guide grooves, in which the head of the saw frame can be shifted up and down when it becomes necessary to raise or lower the saw guides for altering the height of the saw, and can be secured in any position by a bolt and nut. Attached to the rear uprights are braces, extending upward and forward, to be employed for staying the logs by dogs. The bars for the support of the rails are pivoted to the braces at a point a little short of where the log rests. These bars, shown at *a*, in the small figure, are connected by stays, and between their forward ends is a vertical bar provided



SCHOOLEY'S CROSS CUT SAW FRAME.

with a slot in which a saw is free to rise and fall. The saw is connected at the end which runs in the guides to the axle of the wheels, *c*, by the notched handle, *d*, and the rod, *e*, which is pivoted at *g*, and secured to the upper end of the handle by a ring, *f*, so that by slipping the ring off the upper end of the handle the rod may be swung back to allow the saw to be set up or down as required. The handle extends up between the upper bars of the guides for holding the saw in a vertical plane. The wheels run between rails, *b*, on the guides.

This invention has been patented by Mr. Andrew Schooley, of Litchfield, N. Y

HOLLOW AUGER.

In the work of forming tenons on the ends of wheel spokes, and in similar work, the article is first pointed down with a knife or fore auger, as the hollow augers will not take hold upon the blunt end of the spoke. This is obviated by the hollow auger recently patented by Mr. James A. Rodman, of Lebanon, Texas. The head or yoke is made in one piece of a ∩-form, and is provided with a shank for being clamped in place. At the lower end of the head are the jaws, *a b*, Fig. 1, forming the hollow auger, *a* being what is termed the "off jaw," and *b* the jaw carrying the cutter. The two jaws are attached at one end by a pivot pin, so that they may be moved according to the size of tenon that is to be cut. Thin outer or moving ends are at-

RODMAN'S HOLLOW AUGER.

tached to the opposite leg of the head by a clamping screw which passes through a slot in the leg, so that the jaws may be held firmly, and a graduated scale is provided for adjusting. An arm having forked ends is pivoted to each side of the head, and at the lower ends are formed the flaring jaws of the fore auger, one of which is fitted with a cutter. These jaws come beneath the jaws of the hollow auger when the arms are brought together, and in this position they are held by the latches, *c c*, the ends of which catch into the jaws, *a b*. A spring, serving to spread the forked arms when they are released, is indicated by the saw-tooth line at the top of Fig. 1. In one of the arms of the head is a slot in which moves the stop, *f*, regulating the depth to which the spoke enters the tool and consequently the length of the tenon. In using the tool the jaws, *a b*, are set to the diameter of the tenon to be cut, the stop, *f*, is adjusted, the arms are brought together, and the latches caught. The tool being applied to the spoke, the fore auger bevels the end. When the beveled end reaches the triggers, they are raised, when the arms spring out, leaving the hollow auger free to act.

Roof Water as a Motive Power.

It has occurred to a gentleman resident in Georgetown, West Indies, that a possibly valuable source of energy is allowed to run to waste in the tropics in the shape of the water which pours off the roofs of the houses whenever there is a shower. The gentleman in question, in a lecture delivered recently before a local society, said that, "having been frequently struck by the great volume of water discharged from roofs during heavy tropical rains, it occurred to me that the power so wasted might be utilized in some way by converting it into electricity by the following means: The water from each roof might be conducted into one main downpipe, in which would work a small turbine wheel driving a dynamo electric machine, the electricity so developed by every passing shower to be stored in accumulators of the type of Faure's secondary batteries. These, as they became charged in variable time, depending on the rainfall, could be collected and stored at central depots, from whence the power could afterward be distributed uniformly, either by electro dynamic engines, or utilized directly for electric lighting!"

The Value of a Compost Heap.

The gardener and farmer are not apt to sufficiently appreciate the importance of gathering into heaps vegetable substances of all kinds to convert into manure. *Land and Water*, calling the attention of its readers to the subject, suggests the following plan for a compost receptacle:

In some convenient place lay down a sound floor of concrete, and have a roof to cover it, but open at the sides. Upon the floor collect weeds and every other kind of waste vegetable matter, road scrapings, border edgings, in fact the greater the variety and the more of it the better. Keep it moist (not over wet), and turn it over occasionally—at the same time a little salt may be sprinkled over it with great advantage. When sufficiently decomposed this will form a most valuable manure, highly rich in nitrogen in such a form as to be readily taken up by the crops. Use the liquid of cattle and the domestic liquid waste from the house, and it will surprise many what a store of good manure will soon accumulate.

The Creosoting of Timber.

As is well known, the preservative properties of creosote are owing to its preventing the absorption of the atmosphere in any form, or under any change of temperature. It is noxious to animal or vegetable life; and it arrests all fermentation of the sap, which is one of the primary causes of dry rot and other species of decay in timber. The action of creosote—says Mr. Bale, in his work on "Saw Mills: Their Arrangement and Management"—may be thus described: When injected into a piece of wood, the creosote coagulates the albumen, thus preventing any putrefactive decomposition; and the bituminous oils enter the whole of the capillary tubes, incasing the woody fiber as with a shield and closing up the whole of the pores, so as to entirely exclude both moisture (water) and air. By using creosote, inferior porous timber and that cut at the wrong season, and therefore sappy, may be rendered durable. The Bethell system of creosoting is as follows: The timber is first thoroughly seasoned and cut to the required dimensions. It is then placed in a wrought iron cylinder, fitted with doors that can be hermetically closed by means of wrought iron clamps. The air and moisture contained in the wood are then exhausted from it, and from the cylinder, by means of a powerful air pump. The pores of the wood being now empty, the preservative material (creosote oil) is admitted into the tank. When the wood has received all that it will after this manner, more oil is forced into it by means of hydrostatic pumps, exerting a pressure of 120 pounds to 200 pounds per square inch. This pressure is maintained until it appears that the proper quantity of creosote oil has been absorbed by the wood, which is determined by a gauge. Timber intended for railway sleepers, bridges, etc., should absorb 7 pounds of oil per cubic foot; and timber required to be protected against marine insects, etc., requires at least 10 pounds of oil per cubic foot. The cost varies from 4d. to 5d. per cubic foot, according to the quantity of oil required.

Cable Telegraphy.

According to recent trials of the speed of working on the Jay Gould cables laid across the Atlantic from Penzance to Canso, in Nova Scotia, 1,000 code words were sent from Penzance and received at the Canso station in 81 minutes, including all repetitions and corrections. The 1,000 words consisted of 7,288 letters, which is about equivalent to 1,458 words of 5 letters each, the average number for the English language. The above rate of transmission is therefore equal to 18 words of 5 letters per minute.

IMPROVED VISE.

The vise herewith illustrated is constructed with two vertical jaws, each provided near the upper end with a slot. A bar having hook teeth on its bottom edge is pivoted in the slot of the outer jaw, passing through the other slot, the teeth of the bar projecting toward the front. On the rear surface of the inner jaw is a slotted plate, on the bottom cross piece of which the hooked teeth of the bar catch. A bar which has its upper edge toothed and its lower edge beveled is pivoted to the lower end of the outer jaw and passes through a slot in the other jaw. The beveled edge rests upon a grooved roller in the slot. An arm is secured

ANDERSON'S IMPROVED VISE.

to the inner jaw, and to its upper end is pivoted a lever, which passes through a slot, on one side of which is a ratchet plate. Attached to the lever just in front of the pivot is an arm, to whose upper end is fastened a spring, and also a pawl engaging with the teeth on the upper edge of the lower bar. When the handle of the lever is moved downward, the pawl moves the lower bar and consequently the lower part of the front jaw forward, closing the jaws upon the work. The ratchet plate holds the lever at any elevation

This invention has been patented by Mr. William T. Anderson, of Rock Hill, S. C.