NOTABLE EXHIBITS AT THE NEW ENGLAND FAIR.

Our front page illustration represents a number of notable inventions exhibited at the recent fair of the New England Manufacturers' and Mechanics' Institute in Boston, Mass. Fig. 1 includes two machines of interest to tanners and curriers—Warren's unhairing and fleshing machine, manufactured by the United States Patents Company, Salem, Mass., and Lockwood's automatic leather scourer and setting machine, exhibited by the Lockwood Manufacturing Company, of East Boston, Mass. The first named machine stands in front. Its construction and operation are clearly shown in the engraving. It is said to operate equally well on skins, kips, or hides; and though but newly introduced, it has been adopted by a considerable number of the leading tanners and curriers of the country.

The Lockwood leather scourer and setting machine enters upon its merit rather than as a novelty. It has been a good while in use, and has established a solid reputation for doing the best quality of work. Its manufacturers claim for it also durability, economy of power, and ease of handling.

Fig. 2 represents the cascade in the exhibit of the Follansbee Pump Company. The cascade had a fall of twenty-two feet and a width of ten feet, the depth of the sheet of water being four and one-half inches. This handsome stream was supplied by a Follansbee propeller pump having a capacity of 5,000,000 gallons a day. With these pumps, water is lifted by means of two series of propeller wheels running in opposite directions. The propellers are carried by two spindles running through the pipe, which is made zigzag to receive the alternating propellers. By this means the column of water is steadily lifted with great rapidity and economy and discharged as a solid stream. It is claimed that the propeller pump is of great capacity for its size; that it will raise water from any depth required; that it is simple in construction and relatively cheap, and that it will lift tan bark, sand, coal, grain, and rubbish without choking or loss of efficiency. It has done excellent and economical service in paper mills, tanneries, sewage works, mines, and quarries, and as a wrecking pump. One master of a wrecking steamer mentions having pumped fifteen hundred bushels of potatoes out of a vessel in less than an hour and a half. This with an eight inch pump. The capacity of a pump of this size, making 750 revolutions, is 1,800 gallons a minute, with an expenditure of 6⅔ horse power for each 10 feet lifted. A 4-inch pump runs 1,500 revolutions, and discharges 350 gallons a minute, with an expenditure of 1¼ horse power for each 10 feet of lift. A 16-inch pump uses 22 horse power for each 10 feet of lift and discharges 7,000 gallons a minute, or upward of 10,000,000 gallons a day. Any pump above 6 inches in diameter can have an engine attached directly to it.

Fig. 3 represents the Jewett Wrecking Car, exhibited by the Continental Construction Company The car is strongly built, and well adapted for doing heavy work. The mast, with its connected boom, is counterbalanced and mounted on a turn-table in such a way that it can be lowered for the passage of bridges or tunnels, and easily raised to an upright position for use. It is 35 feet in length, of great strength, and carries powerful hoisting gear. The car is fitted with patent grips to secure it firmly to the track, and on each side are four jack-screws, which are hinged to the car, and in transportation are simply lifted up and placed in "beckets." To secure a solid bed for the jack-screws, four pieces of timber are carried, which are provided with clamps to secure them to the track. These rest upon the ends of the ties when in use. It will be readily seen that these jack-screws give the derrick an absolutely firm foundation, and prevent any tipping of the car when heavy weights are lifted. Under the turn-table is a platform which is adjustable so as to rest upon the tracks, thus giving increased stability and taking the weight from the car. In fact, every possible precaution seems to have been taken to guard against any "give" in any part under any strain from any direction.

With the wrecking car is a tender or tool car, which provides ample stowage room for tools, and at the same time forms a receptacle for the head of the mast.

This wrecking car is well adapted also for use in constructive work, where a strong and handy portable derrick is needed.

Fig. 4 represents an exhibit of the Marine Bicycle Company, of Portsmouth, N. H. It is styled a marine bicycle, probably, for the reason that it has no wheels and cannot go to sea. It is a light double-hulled craft of the type commonly miscalled "catamaran," to be driven by a small propeller, set in motion by a treadle after the fashion of the driving gear of a velocipede. The hulls are like extremely slender racing shells, twenty feet long, seven inches wide, and eight inches deep, set three feet apart. The gearing is simple, and, with a proper propeller, the operator could probably attain considerable speed on smooth water.

What Gas is Formed when Carbon is Burned at a High Temperature?

Prof. Ledebur discusses the query whether the gas resulting from burning carbon at a high temperature is carbonic oxide (CO), or carbon dioxide (CO_2)?

When a carbonaceous fuel is burned, the combustion is said to be complete if the gaseous products of combustion contain no combustible constituents, *i. e.*, consist of carbonic acid, nitrogen, and vapors of water. Perfect combustion can only be attained when there is an excess of oxygen, and is aided by a high temperature in the space where combustion takes place; and the higher this temperature the smaller will in general be the excess required to accomplish the combustion.

These facts, which are on the whole quite true, have led to a very widely extended but erroneous conclusion, namely, that a high temperature always favors the production of carbonic acid, a low temperature that of carbonic oxide. The first part of this conclusion is correct only in those cases where an excess of oxygen is present The second part relating to the formation of carbonic oxide gas, is entirely false.

High temperatures favor the chemical union of carbon and oxygen. This principle really admits of the conclusion that when there is a sufficient quantity of both substances present, a high temperature must favor the formation of carbonic oxide.

These are by no means purely theoretical deductions, but the results of observations that can be made at any time. Dr. Stoeckmann found, for example, that a generator, when running cool, produced 16 per cent of carbonic oxide and 12 per cent of carbonic acid, but when running hot it made 22 per cent of the former and 7 per cent of the latter.

A similar circumstance has been observed in the manufacture of water gas, as will be seen in the various communications of Dr. Bunte regarding this process. The longer the operation of blowing in steam is continued, and the cooler the generator becomes, the larger the proportion of carbonic acid formed. Something very analogous occurs in the blast furnace. Here, too, it can be observed that the higher the temperature, the more quickly and completely the free oxygen will disappear, and not only so, but the oxygen unites with the carbon to form *carbonic oxide*. Hence, a hot blast favors the production of carbonic oxide in the blast furnace. If the opposite view were correct, owing to the strongly oxidizing power of carbonic acid at a high temperature, a blast of hot wind would not favor the production of cast iron so rich in silicon and manganese as it really does.

More convincing than any of these considerations and deductions are Ledebur's experiments, in which carbon was heated to different temperatures in a current of air, and the products of combustion analyzed. Accurate tests proved that carbonic acid was formed at a lower temperature, and carbonic oxide at a higher one.

In these experiments, sufficient precautions were taken to make them accurate enough to draw practical conclusions from. A measured volume of about one liter of atmospheric air was conducted from a gasometer through a combustion tube filled with pieces of wood charcoal, and heated to different temperatures. The combustion tube was heated by gas, that used for a cherry red heat being of glass, and that which was heated to a yellow was of porcelain. After the combustion tube was a potash bulb to absorb the carbonic acid, and this was followed by a tube of copper oxide for the direct estimation of the carbonic oxide by burning it to carbonic acid, which was absorbed in a second potash apparatus.

The proportion of carbonic acid and oxide varied at different temperatures in the following very decided manner:

	Temp.	CO	CO_2
1. Below the melting point of zinc	About 350° C.	78·6	21·4
2. At the melting point of zinc	" 440° C.	72·4	27·6
3. Dark red heat	" 520° C.	71·4	28 6
4. Beginning of a cherry red	" 700° C.	62·6	37 4
5. Yellow heat	" 1,100° C.	1·3	98 7

The Mississippi.

Some interesting and extraordinary data have just been compiled respecting the Mississippi. It appears that it boasts no fewer than 55 tributary streams, with a total length of navigation of 16,571 miles, or about two-thirds of the distance round the world. Even this, however, represents but a small amount of the navigation which will follow when the Federal Government has made the contemplated improvements in the Upper Mississippi, in the Minnesota, Wisconsin, and other rivers, in which it is now engaged. But while the Mississippi has 16,571 miles navigable to steamboats, it has 20,221 miles navigable to barges. This navigation is divided between 22 States and Territories in the following proportions: Louisiana, 2,500 miles; Arkansas, 2,100; Mississippi, 1,380; Montana, 1,310; Dakota, 1,280; Illinois, 1,270; Tennessee, 1,260· Kentucky, 1,260; Indiana, 840; Iowa, 830; Indian Territory, 720; Minnesota, 660; Wisconsin, 560; Ohio, 550; Texas, 440; Nebraska, 400; West Virginia, 390; Pennsylvania, 380; Kansas, 240; Alabama, 200; and New York, 70. Nearly all sections of these States and Territories can be reached with ease. Louisiana, Arkansas, Mississippi, Montana, Dakota, and the Indian Territory possess more miles of navigable stream than miles of railroad, all of which are open to everybody who wishes to engage in commerce.

New Steamer for Lake Nicaragua.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. Chas. W. Pusey presented a paper upon the twin screw steamer Victoria. On November 7, this steamer sailed from Wilmington, Del., for Greytown, Nicaragua. This vessel is a light draught twin screw steamer for service on Lake Nicaragua, and of a class that is attracting some attention from those interested in the economical transportation of freight on bays and rivers where the draught of water is limited, and where the side wheel steamer is principally used.

The hull is of iron and is 136′ 6″ length over all, 26′ beam, and 7′ deep above cross floors. The model is the same as that of several side wheel steamers built for service on rivers and bays in South America and Mexico. She has one fore and aft bulkhead in center, and four athwartship, all made watertight. The compartment aft is fitted for water ballast to trim the vessel. The frame is of angle iron. The machinery consists of two compound engines with cylinders 12″ and 21″ diameter x 18″ stroke, fitted with jet condensers. The engines are independent, each driving a propeller wheel 6′ diameter. She has two steel boilers of the locomotive type, fitted for burning wood and constructed for a working pressure of 100 lb. per square inch. The finished draught of water, with five tons of coal in bunker, was 4′ 6″ aft, and 3′ 6″ forward. On trial trip, with a draught of 5′ 4″ aft and 2′ 10″ forward, she made a speed of 10 knots per hour, with 119 revolutions per minute, 94 lb., 26″ vacuum; total indicated horse power, 246. During the trial the ballast tank was filled with water.

When she sailed for Greytown she had a cargo of 105 tons of coal, also merchandise and stoves amounting to about twenty tons more, the draught of water being 6′ 3″ aft and 5′ forward. Under these conditions, going down the bay she made 9½ knots per hour with 80 lb. steam pressure and 108 revolutions per minute.

American Steamboat Builders in Russia.

Several Americans who went to Nijni Novgorod, from Pittsburg, Pa., to build boats to run on the river Volga, have had very good success. The plan was to take out engines and erect the boats on the spot from native timber. The first one launched did so well that others are to follow, and the business may acquire considerable magnitude. One of the party who has just returned says:

"The steamers which up to a short time ago were used exclusively were wholly made of iron, and so heavy that even in five feet of water they could traverse but a very small portion of the river. The Amazon, the engines of which I was sent over to put together, even in four feet of water, is able to cover more miles than are the iron boats in nine feet. The introduction of wooden boats is going to revolutionize the river trade."

It now seems possible, says the *American Ship*, that American steamers on the Volga, which is ordinarily navigable for 2,000 to 2,300 miles, may be in demand throughout the empire. Steamers from the United States, formerly running on the Yangtsze, effected great changes in China, and similar agencies in Russia may work similar results.

The Keely Motor again.

A Philadelphia paper says that the Keely motor will be heard from on December 10, that being the date mutually agreed upon for the presentation of all patentable points to the stockholders. We suppose, adds *Iron*, that the fluctuation in the price of stock will go on as it usually does just before any promised revelations on the part of the inventor, but we can only repeat to would-be buyers the well-known advice given by *Punch* to those about to marry. That Mr. Keely has developed a remarkable force is evident, but that he knows what to do with it is quite another matter We shall be pleased to hail Mr. Keely as a benefactor to the world of mechanics, but we prefer his proving his title before we pay respect.

Patent Barbed Wire Fences.

The following table shows the quantity of barbed wire that has been sold each year from 1874 to 1882, inclusive:

Amounting in 1874 to	10,000 lb.	made and sold.	
" in 1875 to	600,000 lb.	"	"
" in 1876 to	2,840,000 lb.	"	"
" in 1877 to	12,863,000 lb.	"	"
" in 1878 to	26,655,000 lb.	"	"
" in 1879 to	50,337,000 lb.	"	"
" in 1880 to	80,500,000 lb.	"	"
" in 1881 to	120,000,000 lb.	"	"
" in 1882 to	160,000,000 lb.	(est.) "	"

Anæsthetic Properties of Carbonic Acid.

Dr. Brown-Séquard has recently (*Nature*, p. 557) made the interesting discovery that in certain animals complete local anæsthesia of the larynx, accompanied by incomplete general anæsthesia, may be obtained by directing on to the upper part of that organ a rapid current of carbonic acid during a period of fifteen seconds to two or three minutes. The anæsthesia lasts from two to eight minutes after stopping the current. Dr. Séquard proposes to experiment on the human subject by introducing carbonic acid through the mouth or nostrils. This singular action of the acid may perhaps throw some light on the sedative action of aerated waters in vomiting and nausea.

The Sand Industry.

A large amount of capital is invested in the north side of Long Island in the sand trade, and the industry is fast assuming large proportions and is constantly growing. Four years ago there were but eight firms in the business, with a capital of not over $80,000. To-day it is estimated that over $2,000,000 are invested in the island. From recent estimates, it is safe to say that 4,500 tons of sand are taken from the north shore of the island daily Vessels are loading night and day, and the sand is delivered at all points for building purposes. The revenue from the industry is estimated at over $100,000 yearly to Port Washington alone.