THE NEW DOUBLE-DECK-TURRET BATTLESHIP KEARSARGE.

(Continued from first page.)

This is evident from a comparison of deck plans of the two types, when it will be seen that the Indiana is incapable of dead ahead or dead astern fire with her 8 inch guns, and that her maximum concentration of fire from the whole eight of them is four on either broadside. The Kearsarge, on the other hand, can not only concentrate an equal number of 8 inch guns on each broadside, but can swing each pair through an unbroken arc of 270 degrees ahead or astern. Experiments recently carried out at Indian Head on an improvised platform showed that there would be no inconvenience experienced in the 13 inch turrets from the blast of the superposed 8 inch guns.

Moreover the turning gear and ammunition hoists of the 8 inch guns on the Kearsarge have an unparalleled protection afforded to them by the 15 inch armor of the turrets and barbettes upon which they stand, whereas the funnel-shaped base of the Indiana's 8 inch turrets is plated with very light armor; and should a shell penetrate and burst within them, it would probably disable the guns altogether. From these considerations we think it is evident that the sacrifice of power in removing four of the 8 inch guns is more apparent than real; and that the disposition of eight guns in two turrets as against twelve guns in six turrets gives the Kearsarge slightly more power for attack and far greater endurance for defense than the earlier type of ship. As originally designed, it was intended that the 8 inch should be rigidly imposed upon the 13 inch turrets. This would necessitate their simultaneous training; but there are no structural reasons why they should not be given an independent motion, and we believe Mr. Irving Scott, of the Union Iron Works, San Francisco, has already put in a bid on a design of this nature.

Not only is nothing lost by the removal of these guns and turrets, but the equivalent weight has been put into a broadside battery of fourteen 5 inch rapid-firing guns, which is protected by a continuous wall of 6 inch Harveyized steel, with 2 inch steel splinter bulkheads worked in between each gun. This battery alone would render the Kearsarge a terrible engine of destruction. Each of the fourteen guns throws eight 50 pound shots per minute, each having a penetration of 13 inches of iron and an energy of 1834 foot tons. In one minute of a sea-fight one side of this battery alone could pour into the enemy fifty-six shots, or nearly 3,000 pounds of steel, at a velocity of 2,300 feet a second, and with a battering or crushing effect of 102,704 foot tons—a force sufficient to lift the ship itself bodily 9 feet in the air. The subjoined table gives a detailed analysis of the total broadside:

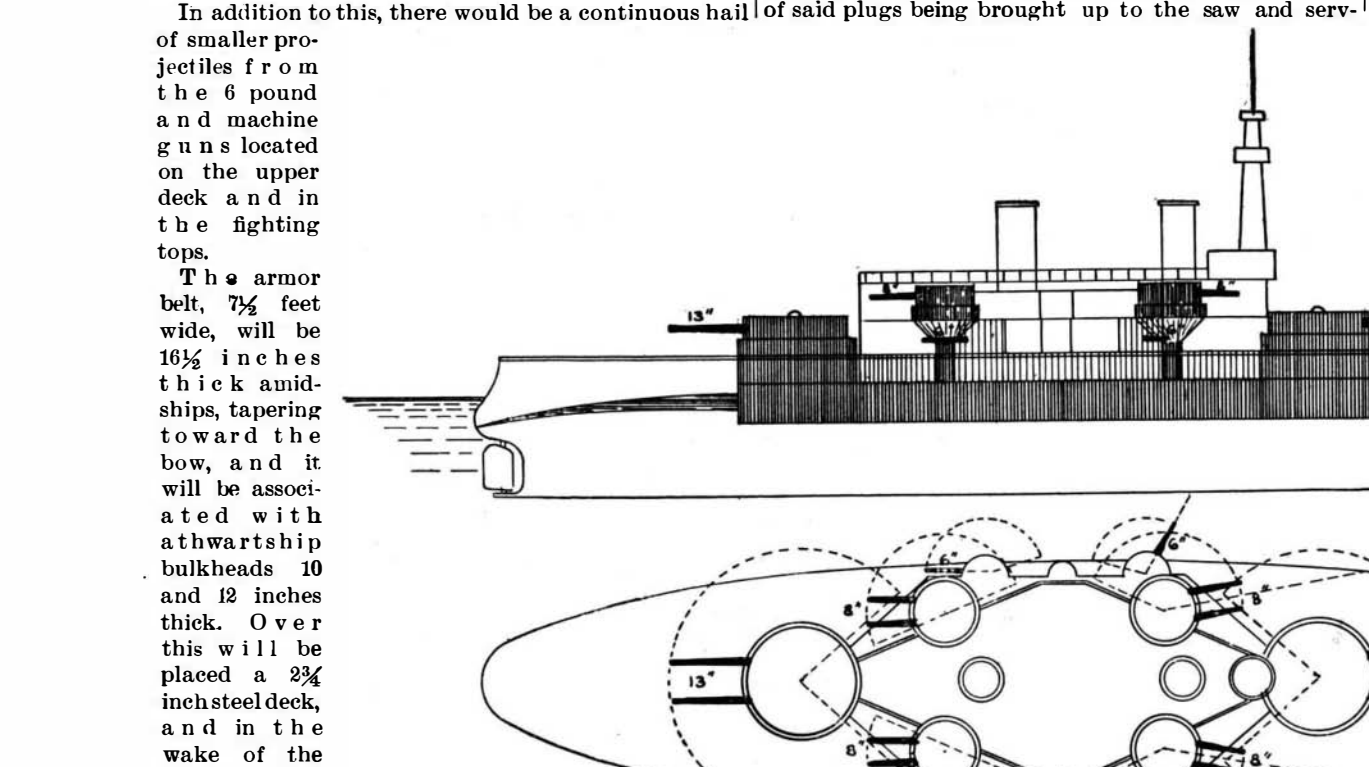
Number of Guns.	Diameter in Inches.	Weight in Pounds.	Velocity in Foot-Seconds.	Energy in Foot-Tons.	Total Energy.	Penetration in Inches at Muzzle.	Point of Attack in Enemy.
4	13	1100	2100	33,627	134,508	34·6	Belt and main turrets.
4	8	250	2150	8,011	32,044	21·6	Conning tower and casement armor.
7	5	50	2300	1,834	12,838	13·0	Thin armor, superstructure, and unarmored ends.

In addition to this, there would be a continuous hail of smaller projectiles from the 6 pound and machine guns located on the upper deck and in the fighting tops.

The armor belt, 7½ feet wide, will be 16½ inches thick amidships, tapering toward the bow, and it will be associated with athwartship bulkheads 10 and 12 inches thick. Over this will be placed a 2¾ inch steel deck, and in the wake of the engines and boilers will be a cellulose water-excluding belt backed by many feet of coal. Within the shelter of this inverted box of thick armor, with its cellulose and coal lining, will be located the "vitals," i. e., the engines and boilers.

The main dimensions will be: Length, 368 feet; beam, 72 feet 2½ inches; draught, 23½ feet; displacement, 11,500 tons; horse power, 10,000; speed, 16 knots; normal coal supply, 410 tons; complement, 520 officers and men; cruising radius at 10 knots with 1,210 tons of coal at 25 feet draught, 6,000 knots. The total cost not to exceed $4,000,000.

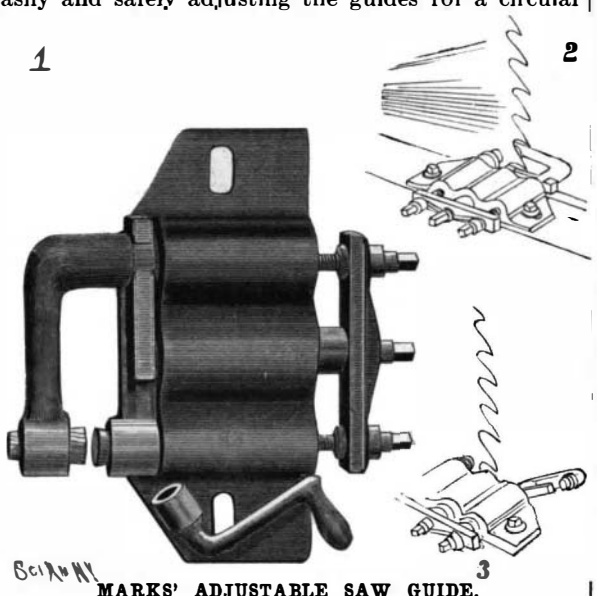
The unusual height of the smokestacks is in agreement with the latest practice, which tends to make all possible use of natural draught.



SIDE VIEW AND DECK PLAN OF THE INDIANA TYPE OF BATTLESHIP.

AN ADJUSTABLE SAW GUIDE.

The accompanying engraving shows a device for easily and safely adjusting the guides for a circular



MARKS' ADJUSTABLE SAW GUIDE.

saw, for which a patent has been granted to Mr. Alphonso Marks, of McComb, Ohio. It consists of a stout pocket or holder, which is flat on its under surface, and is provided with slotted holes whereby it may be bolted down upon the frame of the circular saw. It is provided with two transverse circular openings, in which the shank portions of the guide jaws are adjustably held. These shanks are hollow and receive two adjusting screws, which are threaded in the ends of the shanks, and are held by means of fixed and loose collars and nuts in a suitable crosshead. This crosshead is provided with a hollow circular portion which is adjustably held in a transverse opening located in the pocket or holder and between the shanks of the guide jaws. The crosshead is adjusted relatively to the pocket by means of a screw. By this arrangement either of the jaws may be adjusted by means of its own screw, to suit the thickness of the saw, or both jaws may be simultaneously adjusted by means of the center screw actuating the crosshead. The two jaws are prevented from rotation by means of projecting arms or lugs, which bear upon the flat base of the holder or pocket. The outer jaw is L shaped, and it is provided at its outer end with a square opening which receives a wooden plug, a similar plug being provided in the opposite jaw, the ends of said plugs being brought up to the saw and serving to guide the same. By this arrangement the plugs can be easily replaced when necessary. The adjustment screws are operated by a suitable key or wrench which may be laid away when the saw is running.

On the Combined Action of Light and Water in the Liberation of the Perfumes of Plants.

It is light, and not oxygen, as it has been assumed, which is the principal cause of the transformation and destruction of odorous substances, but in many cases these two agents seem to act in concert. The action of light makes itself felt in two different manners: on the one hand, it acts as a chemical power, capable of furnishing energy to all the transformations through which the odorous products pass from their elaboration to their total resinification; on the other hand, it exerts a mechanical action which plays an important part in the general life history of plants; and this property explains the mode of the periodical liberation of the perfumes of flowers. The intensity of the perfume of a flower depends on the equilibrium which is established at every hour of the day between the pressure of water in their cellules, which tends to drive outward the perfumes already elaborated contained in the epidermis, and the action of light which combats this turgescence. The whole physiology of perfumed plants flows from this simple notion. It is thus explained why in the countries of the East the flowers are less odoriferous than with us, why the trees, the fruits, even the vegetables, are sometimes filled with odoriferous products more or less resinified. It is also explained why in those countries the vegetation is thorny: the vegetation in those countries has too much light and too little water.—Eugene Mesnard, in Comptes Rendus.

A DESTROYING VACUUM.

BY JOHN C. BARROWS, M.A., OF ST. LOUIS, MO.

A storm, unprecedented in its destructive and deadly results, which swept through the cities of St. Louis and East St. Louis between 5 and 6 P. M. on May 27, furnished abundant material for th news gatherers who hastened there to thenumberof several hundred. Both the amateur and professional photographer have been busy about the scenes of greatest havoc. Few, if any, however, have yet begun to study the devastated districts to ascertain and analyze the meteorological phenomena of what most of them have heralded to the world as "a regular Western cyclone," and others, including the local signal service officer, as "a straight blow of wind."

Does the storm's work fit either theory? The results are in many respects unusual, and I believe without recorded precedent. There are abundant indications that over an area half a mile wide and two miles long the destruction was not primarily and chiefly due to the force of a gale or hurricane. Nor does the fact that during the space of a few moments the direction of the wind changed to several and almost opposite points, as is testified to both by numerous eyewitnesses and by many unmistakable results thereof, appear to explain the most serious class of damage wrought to buildings.

I shall not attempt to give a new and scientific explanation of the meteorological phenomenon which appears to have visited the area from a block west of Jefferson Avenue east to Main Street, and about a mile wide, but for lack of an existing term, and for the purpose of this brief paper, will call it a vacuum storm.

To indicate that the conclusion that this in some features was not an ordinary cyclone, and that it was not "a straight blow" that was reached by the orthodox Baconian method, and that the observations were not made to fit a previously conceived theory, it may be well to state that the first object to attract

the attention of the writer as unusual was a small two story brick house, the four walls of which were piled outside of and on their four respective sides of the foundation, the light inside partitions still standing in place, the floors being in fairly good condition and most of the contents of the rooms intact. The roof, a flat one, had been shifted to one side a foot or two, but still covered what was left of the house. The natural question was, In what manner, and how could force be so applied as to blow out the four outside walls of a house, lift the roof a little and then drop it back again, and scarcely disturb the contents of the house, even the silk lamp shade? The only answer seemed to be, the force was exerted from inside.

It then for the first time struck me as strange that most of the broken glass and even the window frames for blocks around were blown out and lying on the sidewalks or in the side yards.

A few hundred feet west stood a house with peaked roof and side walls in place, but with the gable end of the front wall thrown out, from the ceiling of the second story to point of roof, revealing a formerly tight attic. What had exploded in that attic to blow out that brick wall? The windows in lower stories were mostly broken and the glass lying on the outside. Near by was another similar house with gable end of wall intact, but with part of the roof off. Thinking these results might be due to my being in the center of the path of a twister, where a partial vacuum is always created, I went three blocks to one side at right angles to the path of the storm. It was still much the same, the force which had wrecked the buildings seemed to have come from within. A five story massive brick building, used as a trunk factory, had almost its entire south wall piled on the ground beside it, exposing the floors and roof untouched; and, stranger than all, piles of light empty trunks stood on several floors near the missing wall. Only seven had fallen out, the proprietor said, and they fell just outside and did not blow away. Pressure from within had evidently forced out this enormous wall, but once that pressure was relieved, the lightest objects were left undisturbed. If it had been thrown out by wind entering windows from opposite side of building, the piles of trunks would all have been blown out.

Four or five blocks west, board sheds were standing untouched in a marble yard, while a little further southwest, on Jefferson Avenue near Chouteau Avenue, was a strong brick building used for a furniture storage warehouse whose walls from floor of second story up were all blown out and the roof gone. Here again were piles of light articles—even feather beds left entirely exposed, yet not blown away. Was it true, then, the more openings a building had, the less likely it was to have been destroyed? Observation with this question in mind showed that such was the case, except outside the area before described; there the opposite was true and the damage seemed to have been due to lateral pressure of a gale, the greater damage wrought by wind blowing from each side toward the before mentioned strip, which for convenience we will term the vacuum territory.

DESTRUCTION CAUSED BY LATERAL FORCE OF WIND.

It appears that many roofs were lifted and many windows, or, in their absence, walls, forced outward by pressure from within suddenly exerted. Several houses were observed in which the lath and plaster on ceilings of upper floor were torn off in patches, there being no floor to attic, and roofs and walls in place and unbroken. Was this done by the pent-up air of attic forcing an escape? In the vacuum territory roofs without eaves or overhang seem to have fared no better than those which offered such a hold to the wind. In this district there are apparently about as many east walls down as west walls and as many north as south. Some walls fell in and not out, but many of these were forced in by other walls falling against them, others by trees or telegraph poles falling upon them. Some were blown in, it is true, but inquiry of occupants disclosed the fact that in some cases these walls were blown in after the roof had been lifted off and its lateral support removed, or after an adjoining wall had gone out, which, being at right angles, had formerly braced it. A wall left unsupported in this way would naturally fall an easy victim to the terribly severe winds which continued for some minutes. Roofs, too, dragged the upper part of some walls toward the inside of houses. But such cases are clearly

RAILWAY POWER HOUSE AFTER THE STORM.

DESTRUCTION OF GAS TANK AT FOURTEENTH AND GRATIOT STREETS.

HOUSE SHOWING BOTH WALLS BLOWN OUT UPON APPROACH OF THE VACUUM AREA.

FRONT WALLS FORCED OUT BY VACUUM WITHOUT. LAMP LEFT STANDING ON TABLE ON SECOND FLOOR.

CURIOUS EFFECTS OF THE ST. LOUIS STORM.—PHOTOGRAPHS BY B. A. ROBINSON.

the exception, not the rule; and, as before stated, the first in point of time, the primary and most potent energy responsible for the wonderful destruction of buildings in this district, would seem to have been exerted from within outward.

Several newspaper writers have claimed that the twisted trunks of trees in Lafayette Park prove the storm to have been an ordinary cyclone. That there were powerful whirlwinds formed and great numbers of them there is no doubt, but no one who has seen the path of a twister through a forest will liken it to the chaotic condition of the park trees. The axis of a cyclone leaves a narrow and clearly defined trail, which is entirely wanting as regards this storm.

Is it not possible that the atmospheric pressure over an area about a half a mile in circumference and rapidly moving eastward was reduced so largely and so suddenly as to account for it. A reduction of one and a half pounds of atmospheric pressure out of the fifteen pounds to the square inch, if effected instantly, would afford a bursting pressure of two hundred and sixteen pounds to the square foot of internal surface of a roof or wall, provided the inclosed air could not escape. Barometers have recorded such changes in the immediate vicinity of great storms within a very short space of time. May the change not have been almost instantaneous in this case?

The superintendent of the gas works, located on Gratiot Street in the path of the vacuum, when asked to describe what he saw, said that he first noticed the great circular tank "jump up a little way, then bob up and down a little," then the wind struck it, tore apart the great iron girders forming the crown which held together the great boiler iron posts surrounding the tank. These posts fell outward and lay surrounding the tank much like the spokes radiating from the hub of a wheel. As a gas tank is an inverted cup partially filled with gas and floating rim down in a huge cistern of water, it of course rises and falls with changes of atmospheric pressure, like the mercury in a barometer. That the superintendent saw it "bob up" suddenly I can account for in no other way than that the atmosphere was greatly and suddenly rarefied, and had the lower edges of the tank been fastened down, instead of being free to instantly rise through the water, the tank would have burst, just as many strong buildings did.

It would be interesting to note the condition of a self-registering barometer in this vacuum area—if such area there really was—but I have been able to find none. The local office of the weather bureau is a mile to the north. The destruction wrought in what has been termed the vacuum territory can be accounted for upon the theory that atmospheric pressure was here suddenly and violently reduced. The natural laws of pneumatics explain the details. But how could such a large partial void be created? Was there a huge whirlwind at work in the upper strata of the atmosphere which did not, as in the case of previous cyclones, extend downward to the earth? Or are we to look for its cause in the unprecedented splitting asunder and subsequent reuniting of a hurricane?

The path of the storm was widest at the place where the apparent results of a vacuum are noticeable. East of these the path narrows and the direct force of the wind in the direction of the storm's movement was vastly intensified, appearing to have reached its greatest fury about the time it struck East St. Louis. On the east approach of the Eads bridge a pine board was driven through a three-eighths inch iron plate and left sticking there, while equally incredible evidences of the terrific force of the wind in this locality are to be seen on every hand,

If this storm is without precedent let us hope it may remain without parallel. The possibilities for destruction of whole cities by sudden decrease of atmospheric pressure are too appalling to contemplate.

A FLORIDA TREE PALM.

The Oreodoxa regia, or royal palm, is common in Cuba and extends into southern Florida. Our illustration, for which we are indebted to Garden and Forest, represents a young tree of this species near the shores of Bay Biscayne, from a photograph of Mr. James M. Codman, of Brookline, Mass. These trees, according to Prof. Sargent, are often one hundred feet high, with a trunk largest near the middle, but otherwise generally resembling the palms of our southeastern States, and being equally graceful and beautiful. The tree is said to be "the most beautiful of the palms of the United States." It is of an exclusively tropical species, its growth being confined to the shores and keys of the extreme southern part of Florida.

THE ROYAL PALM (OREODOXA REGIA) OF CUBA AND SOUTHERN FLORIDA.

The Oreodoxa, according to Prof. Sargent, is an American genus of about four species. Three are lofty trees, the loftiest, perhaps, of all the American palms, and true princes of the vegetable kingdom, while the fourth is a humble inhabitant of the high slopes of the Andes of Ecuador, only remarkable as one of the most alpine of all palms. The largest species, Oreodoxa oleracea, the cabbage palm of the Antilles, sends up a slender trunk nearly two hundred feet in height, surmounted by a long, green, polished cylinder of petiole sheaths and a crown of long, arching, graceful, pinnate leaves frequently twenty feet long and six feet wide. Its tall, pale stem and beautiful head make this palm a favorite in gardens, and it is planted in all tropical countries and often in long and stately avenues, as in the Botanic Garden of Rio de Janeiro, which owes its fame to its palm avenue. Economically, Oreodoxa oleracea is one of the most useful of the American palms. The bud of young leaves, like that of the palmetto, is eaten as a vegetable; the sheathing bases of the leaf stalks, which are eight or ten feet long, are used by the negroes as cradles, and are split into surgeons' splints; from the inner coat of these sheaths vellumlike paper is made, and mats are manufactured from their fibers. A kind of sago is obtained from the pith of the stem and oil is pressed from the seeds. The long stems are split longitudinally and, freed of the spongy interior, are used as gutters, while from the hard rindlike exterior rim beautiful canes and many small objects are made.

Another genus, Pseudophœnix, is monotypic and confined to two of the southern keys. It is a small and not particularly handsome tree, with long, arching, pinnate leaves and large orange scarlet, usually three lobed, fruits. The flowers of this species, of which there are probably not more than two or three hundred individuals in existence, unless it grows elsewhere than in Florida, are still unknown.

The last of our genera, Thrinax, is exclusively West Indian and Floridian, with a few species of small trees and shrubs distinguished by large, handsome fan-shaped leaves often silvery white on the lower surface, minute flowers, with calyx and corolla confluent into a short cup, and small fleshy or dry fruits. The Florida species are not well known, and there are probably four arborescent species on the keys, although at present no other North American trees are so little known as this group of palms.

THE observations of such a keen observer as Mr. Gladstone are always interesting. An item connected with vegetable physiology has been recently published in a letter by Mr. Gladstone to a correspondent who called his attention to the fact that plants derive most of their nutriment from the atmosphere. Mr. Gladstone, in the course of his remarks, wrote: "Within a hundred yards of my window stood a great beech, now, alas! victim of the gales. Some thirty years ago, an arm, 7 feet or 8 feet from the ground, and about 60 feet long to the end of the twigs, was nearly torn from the branch. I always reckoned that not less than four-fifths of the area which on a clean sawing would have been found to unite it to the tree were torn off; it held on by the remaining one-fifth; but nearly the whole weight of the arm was borne by the ground, on which there lay 12 feet or 15 feet of it, after some stumpy props had disappeared. It never took any sort of root, and the bark remained entire below as well as above. Under these circumstances the leaf came regularly all along the arm for at least twenty-five years, so well that it was not possible to distinguish between it and the tree. I used to look out for signs of failure, but could discern none, and the process might have continued to all appearances without change for a long time."

Reduction of Cost of Copies of Patents.

By a recent act of Congress the Commissioner of Patents is authorized to furnish inventors, solicitors and others with printed copies of patents at a reduced cost. After July first next, where the number and date of a patent are given, this office will supply printed copies of patents at cost of ten cents each.