AMERICAN NAVAL ARCHITECTURE.

THE STEAMER "HANKOW."

This steamer, erected by Thomas Collyer, of this city, is owned by Messrs. J. M. Forbes & Co., of Boston. She will soon assume her appropriate position on the route of her intended service—the river trade in the Chinese empire. This is the third boat constructed for this firm for the China trade, all of which have been successful. We subjoin full and correct particulars of her hull, &c.:—

Length on deck, from fore part of stem to after part of stern-post, above the spar deck, 212 feet; breadth of beam at midship section (molded), 30 feet 6 inches; depth of hold, 11 feet; depth of hold to spar deck, 11 feet 4 inches; draft of water at load line, 7 feet; light draft of water, 5 feet 6 inches; tunnage, 720 tuns.

Her hull is of white oak, hacmetac, &c., and very securely cross fastened with copper and treenails. The floors are molded 14 inches; sided, 4 inches. Frames apart from centers, 27⅔ inches; these frames are strapped with diagonal and double-laid braces, 3½ inches by ½ an inch, thereby securing great strength and durability.

The *Hankow* is fitted with one vertical, beam, condensing engine; diameter of cylinder, 48 inches; length of stroke of piston, 12 feet; diameter of water wheels, over boards, 29 feet; material of same, iron; length of wheel blades, 7 feet 6 inches; depth, 2 feet; number of same, 26.

She is also supplied with two return tubular boilers, located in the hold; length of boilers, 20 feet; breadth of same, 11 feet; and their hight, exclusive of steam chimney, is 9 feet; number of furnaces to each, 2; breadth of these, 4 feet 9 inches; length of grate bars, 7 feet; number of tubes above, in each boiler, 64; number of flues below, 10 in each boiler; internal diameter of tubes above, 5¼ inches; internal diameter of flues below, 8 of 12⅓ inches, and 2 of 15⅓ inches; length of tubes above, 14 feet; length of flues below, 7 feet 10 inches; diameter of smoke pipe, 64 inches; hight of same, above grate surface, 45 feet. The engine is fitted with expansion gear; point of cutting off, variable; the boilers possess a grate surface equal to 132 square feet, and a heating surface of 3,216 square feet.

In addition to these features, she is provided with one independent steam fire and bilge pump, and has bilge injections and bottom valves to all openings in her bottom. The depth of her keel is 4 inches. She has 2 masts and is schooner rigged. Ample protection has been made against fire, &c. The machinery was constructed by the Morgan Iron Works, foot of Ninth-street, this city. Capt. George W. Sand will command this vessel.

THE STEAMER "FIRE DART."

This steamer is intended for service on the Chinese coast. Her hull was constructed by Thomas Collyer, foot of Forty-third-street, this city; the machinery being supplied by the Neptune Iron Works. Her commander will be Capt. Henry W. Johnson. We append full and correct particulars of her hull and machinery:—

Length on deck, from fore part of stem to after part of stern-post (above the spar deck), 200 feet; breadth of beam (molded), 30 feet; depth of hold, 11 feet; depth of hold, to spar deck, 11 feet 3 inches; draft of water at load line, 5 feet 6 inches; area of immersed section at the above draft, 140 square feet; tunnage, 650 tuns.

Her hull is of white oak, hacmetac, &c., and cross fastened with copper and treenails. The frames are molded 14 inches; sided, 5 inches, and 26 inches apart from centers; these frames are strapped with double-laid and diagonal braces, 3½ inches by 7-10ths of an inch. The floors are not filled in solid.

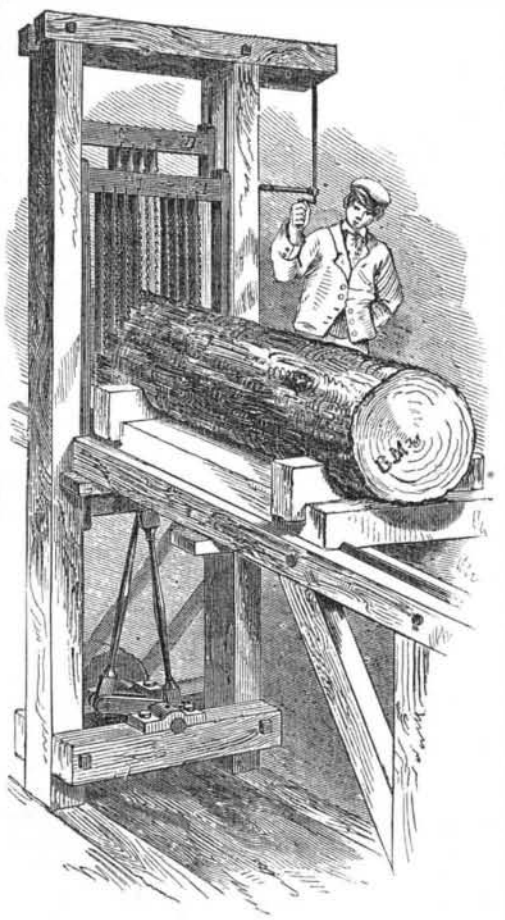
The *Fire Dart* is fitted with one vertical, beam, condensing engine; diameter of cylinders, 46 inches; length of stroke of piston, 12 feet; diameter of water wheels, over boards, 28 feet; material of same, iron; length of wheel blades, 8 feet; depth of same, 2 feet, and the number is 24.

She is also supplied with two return-flue boilers, located in hold; length of boilers, 27 feet; breadth of same (at furnace), 9 feet 9 inches, and their hight (at shell), exclusive of steam chimney, 8 feet, 9 inches; number of furnaces, 2 in each boiler; breadth of these, 4 feet 3 inches, length of grate bars, 7 feet; number of tubes above, 14 in each boiler; number of flues below, 10 in each boiler; internal diameter of tubes above, 7 inches; internal diameter of flues below, 6 of 12 inches, 2 of 14 inches and 2 of 16 inches; length of tubes above, 19 feet 6 inches; length of flues below, 14 feet; diameter of smoke pipe, 72 inches; hight of same above grate surface, 42 feet. The engine is fitted with expansion gear; point of cutting off, variable.

Ample protection has been made against communication from fire by the boiler, by zinc, felt, &c. The boiler possesses a grate surface equal to 120 square feet, and a heating surface of 3,259 square feet, the keel is 4 inches in depth. She has one independent steam fire and bilge pump, and bilge injections and bottom valves to all openings in her bottom; bunkers of wood; has 2 masts and is schooner rigged. This vessel is owned by Messrs. Augustine Heard & Co—an American house in China. She has been constructed of the best materials, which have been put together in a masterly manner. The model appears to be without fault, and it is hoped that she will equal any of her builder's previous efforts.

WESTON'S IMPROVEMENT IN HANGING SAWS.

Uniformity of resistance is very important in order to secure a good running of machinery, and there is perhaps no machine in which there are more frequent changes in the amount of resistance than in the reciprocating saw. As the whole of the cutting is done during the descent of the saw, and none while it is rising, the rapid alternations of great resistance with an almost complete cessation of resistance, sometimes produce vibrations which shake the whole mill. This difficulty is very effectually obviated by the plan here illustrated,



the invention of Charles Weston, of Salem, Mass., which consists in the employment of two saw gates, one just in the rear of the other, both operated by pitmans from a double crank on the same shaft. The front gate, A, has two or more saws to operate, upon the outer portions of the log, while the rear gate, B, carries the saws for cutting the middle portion of the log. As one saw is descending, and consequently cutting, while the other is rising, the resistance is rendered very nearly uniform; and all the jerks, strains and vibrations caused by the old mode of hanging are avoided.

The patent for this invention was procured through the Scientific American Patent Agency on the 8th of May, 1860; and further information in relation to it may be obtained by addressing Charles Weston & Sons, Salem, Mass.

TO MAKE STEEL FROM PIG IRON.

The last number of Newton's London *Journal of Arts* contains a report of an interesting patent trial had before Baron Wilde, at Liverpool, England, relating to the infringing of Rieppe's English patent for manufacturing the famous "puddled steel" from pig iron. The suit was brought by Jacob Mayer, steel manufacturer, of Prussia (the assignee of the patent), against Messrs. James Spence and F. Worthington, manufacturers of steel and tin plate. Ewald Rieppe—now deceased—was a German, and obtained his patent in 1850, and since that time puddled steel has become well known. The most distinguished patent counsel were employed on both sides, and men of great scientific reputation appeared as expert witnesses, who, as usual in such cases, contradicted each other. The evidence before the court was substantially as follows:—

The common method that had before been practiced in the making of steel was by reducing pig iron to wrought iron—which contains less carbon than steel—then carbonizing this wrought iron again in close crucibles. The object of Rieppe's invention was to stop the decarbonization of pig iron in the puddling furnace, at that point where it holds the exact amount of carbon in steel, and thus do away with the old round-about process of cementation. In the specification of Rieppe, the invention is described as follows:—"I employ the iron puddling furnace in the same way as for making wrought iron. I introduce a charge of about 280 pounds of pig iron and raise the temperature to redness, and as soon as the metal begins to trickle down in a fluid state in the furnace, the damper is to be partially closed to temper the heat. From twelve to sixteen shovelfuls of cinder (oxyd of iron) taken from the squeezers, are now put in on the top of the molten iron, and the whole is then uniformly melted down. A little black oxyd of manganese, some common salt, and dry clay (technically called "physic"), in powder, are now placed among the mass. Up to this point, the process is the very same as that for making puddled iron, but at this point, 40 lbs. of pig iron are put into the furnace near the fire bridge, upon an elevated bed of cinders, and when this melts and trickles down, and when the other mass of 280 lbs. also throws up a well-known blue flame, the 40 lbs of the pig iron are raked into the mass, and the whole mixed together. The entire mass now swells up, small *grains* are seen to form in it and then break through the cinder on the surface."

This is the grand criterion point claimed as Rieppe's invention; this is the sign or discovery made by him that the melted mass is now steel, that the requisite quantity of carbon has been expelled, and that a sufficient quantity for steel remains. This, then, is the point at which to arrest the decarbonizing process, and is an important discovery, because everything in the management of the furnaces depends upon the appearance of the iron. As soon as these *grains* appear in the puddling furnace, the damper is shut down about three-fourths, and the mass is thoroughly stirred. The blue jets of flame now gradually disappear, the peculiar *grains* fuse together and form a wax-like mass, which is then gathered together in a ball, taken out and rolled or hammered, and is the *steel*. Such is a description of Rieppe's process for making steel from pig iron in a puddling furnace.

Mr. Wm. Clay, of the Mersey Steel Works, Liverpool, stated that he manufactured steel by license under Rieppe's patent; he did this without difficulty; but unless he wanted very hard steel, for tools, he never added the extra forty pounds of pig iron. He manufactures puddled steel on a large scale, and has been engaged in the business all his life. but never knew how to make it from pig iron until he read the specification of Rieppe.

Dugald Campbell, an analytic chemist, of London, Dr. Frankland and Mr Homersham had been appointed by the court to examine the works of Messrs. Spence & Worthington, and report how the process was conducted in them. Mr. Campbell stated that a common puddling furnace was employed with the exception that it contained two fireplaces and no dampers in the chimney. When the decarbonization of the pig iron was to be stopped in the furnace, instead of doing this by shutting down the damper to exclude the air, the air was excluded by shutting the ashpit doors.

He considered that the process of the defendants

was substantially the same as that of Rieppe, and he was not aware that steel had ever been made in a puddling furnace before this patent was taken out. Dr. Frankland and Mr. Hobersham, as well as several other witnesses, gave similar testimony for the plaintiff.

The defense contended that they did not employ the same process, that Rieppe's specification was vague; and besides this, his patent was void, because the process was quite old and had been practiced in England long before 1850. Dr. Lyon Playfair, professor of chemistry in Edinburgh, was then called. He had given great attention to the manufacture of steel, and had published a work on the subject. The average quantity of carbon in cast iron is 3 per cent; in steel, from ½ to ¾ per cent; in wrought iron, rarely more than 2-10ths per cent. The process of making steel fromore had been known from the days of Aristotle, and from cast iron, for several centuries. He had read Rieppe's patent and thought steel could not be made if the temperature (cherry-red) mentioned in it were adhered to. Redness, in scientific works, is used for a temperature of about 1,000°, Fah.; cast iron melts at 2,700°, Fah. In his judgment Spence's process was different, because two fires were used and the furnace was kept at a strong white heat, which was a great advantage over the process where the damper was shut down and the temperature lowered.

Crace Calvert, professor of chemistry in Manchester, also a witness, agreed with Professor Playfair; but the most important witness was Mr Joseyh Beezley, iron-master at Smethwick, Birmingham, who produced a specimen of steel iron, and said it was made by him in a puddling furnace before 1850 (the date of Rieppe's patent). He asserted that he had made some hundreds of tuns of it before that date. He regulated the heat of the furnace with a damper, and used cinder, slack and *physic*, and obtained as great a heat as possible in the furnace. The process adopted by him was similar to that of Rieppe, only he employed a higher temperature in the furnace, and this was an advantage.

The judge called attention to this evidence and stated that unless the plaintiff could convince the jury that Mr. Beezley was telling an entire falschood, which he did not believe was possible, it was fatal to his case. The solicitor-general (Sir Wm. Atherton), for the plaintiff, admitted this, and rather than allow it to go to the jury for a decision, he selected to be non-suited.

TUNGSTEN.

The article on "tungsten steel," published on page 256 of the present volume of the SCIENTIFIC AMERICAN, has excited considerable attention, and many persons have expressed a desire to know something more than is there stated about this metal.

Tungsten is a distinct metal, one of the known simple substances, like gold, silver, copper, &c. It exists in the form of tungstic acid in several minerals, the most important of which are the tungstate of lime and *wolfram*—the tungstate of manganese and iron. Its name—tungsten—meaus "heavy stone in Swedish. Tungstic acid parts with its oxygen easily, and may be reduced in a glass tube by dry hydrogen gas at a red heat The metal is obtained in the state of a dense dark grey powder, which requires a very intense heat to fuse into globules. When melted it has the color and luster of iron, and is not altered by exposure to the air. Wolfram is found in the tin ores of Cornwall, but its tungsten can only be separated by a chemical process Sulphate of soda is mixed with the ore and a small quantity of charcoal dust added, and the whole kept at a red heat for some time in a furnace. The tungstic acid combines with the soda forming the tungstate of soda. This product is now removed, while hot, into tanks containing water; this quickly dissolves the tungstate of soda, which is then run off into receivers and crystallizes by evaporation. It has been proposed to use this tungstate for dyeing, as a substitute for that common mordant, "stannate of soda," but it has been seldom employed, as yet, for this purpose. Tungstate of lime makes a very good white paint, so does the tungstate of lead. Fused with sulphur, to make the sulphuret of tungsten, it forms a dark substance which has been proposed as a substitute for black lead. Metallic tungsten combines with several metals forming peculiar alloys, and forms a great number of salts by chemical combinations.

PEASE'S IMPROVED OILS.

The readers of the SCIENTIFIC AMERICAN have no doubt noticed, in the advertising columns of this paper, for several years past, a modest advertisement of F. S. Pease, of Buffalo, N. Y., relating to a patent oil sold by him for both lubricating and burning purposes. We have often heard the article highly spoken of by persons who had used it for a long period, but who had no selfish interest to promote in recommending it.

Often having inquiries from manufacturers and railroad superintendents for information concerning lubricating materials, we have taken some trouble to inform ourselves relative to the oil manufactured and sold by Mr. Pease, and the following we have learned respecting it, which we communicate through these columns for the benefit of those who have occasion to use lubricating material. This oil has been in use on the New York Central for over five years, on the Buffalo, New York and Erie for over six years, on the Toledo and Wabash for over four years, on the Buffalo and Erie, and a number of other first-class roads, and recommended by them in point of economy and durability for railroad purposes. It has been in use for several years on our government steamers, and is endorsed and recommended by the United States government for lighthouses, signals and engine use. A dynamometer test was made at the American Institute with the greatest care, by an instrument as accurate as mechanism could make it, arranged for testing the friction of metals and oils. These oils proved themselves equal to the best sperm, and they granted to the exhibitor a medal. Chemical tests by Headly show that these oils have no acid reaction; that they stand the greatest degree of heat without change; that of melted lead 600° Fah. and higher without change, and consequently were unaffected when other oils were burned or dried up. In burning, some parties testify that they proved themselves equal, if not superior, to the best sperm, the heating of the lamp being much less and the burning far better than sperm; but this statement should be taken with some degree of allowance. In a trial made with the car oil, as the manufacturer terms it, on the New York Central Railroad, a sleeping car was run over 10,000 miles with only one oiling; the bearings remaining in good order and free from gum. This oil is equally superior for manufacturers, steam engines and mechanical works generally, from what we learn of it, as it is for railroad purposes; and while it is not a volatile oil, it is free from acid reaction, and will stand a great degree of cold or high degree of heat. Mr. Pease is in possession of folios of recommendations from users of his oil, some of them speaking of it in terms too flattering for us to believe.

Having thus called the attention of our readers to what we believe to be a good article, we refer them to Mr. Pease, whose advertisement appears in our columns from week to week, for further information.

OUR OBSTINATE CRITIC AGAIN.—The editor of the *Engineer* seems to have lost the power of directing aright the axes of both eyes towards one object. Failing in his attempts to overthrow the logic we directed against his apparant ignorance of the fundamental laws of chemistry, he swings out in a recent issue, right and left, striking at objects in every direction which appear to float before his visual organs. He contents himself with simply denying our teachings respecting the oxydization of iron—denounces our explanation of the Giffard injecor—manifests considerable flunkeyism over a short paragraph which appeared in the SCIENTIFIC AMERICAN about Lord Renfrew's visit to the Patent Office; and even takes up a palpable typographical error which ordinary professional courtesy might have caused him to overlook, and makes himself unhappy generally If the *Engineer* man is mad, we pity him; if not, we commend him to a more sound discretion, and to a better knowledge of somethings whereof he undertakes to write. We drop him to fight on his own hook.

A LITERARY CAB DRIVER.—A prize of $100 for the best essay on the effects of Sunday cab driving has been won by John Cochrane, a London cab driver At the meeting at which the prize was awarded, Cochrane told his audience that the essay consisted of 19,000 words, and was all written in the open air, on the top of his cab.

RECENT AMERICAN INVENTIONS.

The following inventions are among the most useful improvements lately patented:—

QUARTZ CRUSHER.

This invention consists in the use of one or more pairs of crushing rollers of peculiar form, in connection with a rotating cylinder provided with a bed of novel construction and with drags; all being arranged to operate in the most efficient manner to favor the separation of the gold from the quartz. The difficulty attending the operation of the ordinary stampers has been that the quartz, although crushed, is allowed to carry away particles of gold imbedded in it and covered by foreign substances, such as sulphuret of iron. The object of this invention is to obviate this difficulty by dragging or scraping, by a sort of grinding process, the gold which may be imbedded in the sands of the crushed quartz, so that such particles of gold may be exposed, amalgamated and saved with the general mass. T. A. Morris, of Green Bay, Wis., is the inventor.

VALVES FOR STEAM ENGINES.

H. E. Woodford, of Watertown, N. Y., is the inventor of an improvement in oscillating induction and eduction valves for steam engines, the object of which is to bring the faces of the valves as near as practicable to the bore of the cylinder, and so to prevent as far as possible the loss of steam in filling the passages. The improvement consists in so constructing and arranging such valves that while their axes of oscillation are transverse to the axis of the cylinder, the longitudinal profiles of their sides form arcs concentric with the latter axis.

OIL LAMP PRIZES.

On page 377 of the last volume of the SCIENTIFIC AMERICAN, we called the attention of inventors to the premiums of $4,500 for four improved lamps, offered by the oil merchants of New Bedford, Mass. A large number of inventors competed for the prizes, but the committee appointed to investigate the merits of the lamps have reported that none are entitled to the premiums. They, however, give the following prizes to the best lamps, to encourage the inventors to perfect and introduce them. For stand lamps, J. W. Taber, of New Bedford, $600; to Jared Parkhurst, of Baltimore, $600; to Wm. H. Topham, of New Bedford, $500; to A. D. Richmond & Co., of New Bedford, $250; to James Duff, of New Bedford, for solar lamp, $100; to O. P. Drake, of Boston, for stand carcel lamp, $100; to A. D. Richmond & Co., of New Bedford, for hand lamp, $100; to M. Burnett, $100; to James Beete, $100. The committee are of opinion that bleached whale oil, burned in the best manner, is a cheaper light material than any other oil in the market.

DAVIDSON'S BOAT-LOWERING APPARATUS.

On page 321 of our last volume, the reader will find an engraving and description of a new boat-lowering and detaching apparatus, the invention of Lieutenant Davidson, of Annapolis, Md. Commander Craven, of the practice ship *Plymouth*, has reported favorably as to its practicability. We make the following extract:—"The cry of 'Man overboard' was given when the ship was going at the rate of eight knots; the life buoy was let go, a boat was lowered, the ship brought to, the body picked up, the boat brought alongside again and hoisted up in her place, the ship filled away and was standing on her course under all sail in seven minutes and twenty seconds from the time the first alarm was given." The report further shows that the life boat was loosed from her grippings, lowered and detached in twenty-five seconds, without arresting the headway of the vessel. The boat was drawn up and secured again in one minute.

HAVE YOUR MODELS PERFECT.—We learn from R D. M. Edwards, of Tecumseh, Mich., that in our illustration of his Wool Folder in No. 15 (page 232) of the present volume of our journal, there was an omission of a board to be placed over the wool when the follower is pressed up against the wool from below by the treadle This omission resulted from the piece not being attached to the model sent us, from which the illustration was prepared. Other persons forwarding models for illustration will please take warning from this circumstance, and see that their models are complete