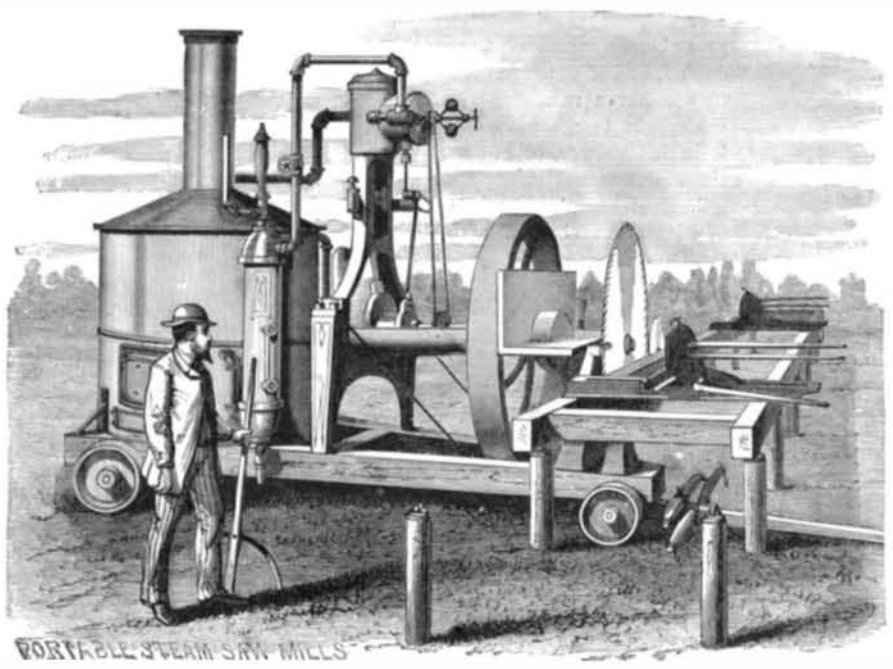
whether the hydrostatic test was sufficient alone, or whether the hammer test was not a necessary adjunct to the hydrostatic one, some indeed claiming that the hammer test alone is more reliable than the hydrostatic test. In this city the hydrostatic test alone is employed, and since so high an authority as Inspector Horton says that it may not discover an existing defect, but may induce a dangerous one, it is about time that it was supplemented with the hammer test. There is no doubt that the hammer test would have disclosed the defect in this boiler, and that Mr. Horton's views are entirely correct.

The writer endeavored to ascertain what amount of coal and refuse was found on the fire bars after the explosion, and how much was left on at 4:30 P.M. on Sunday, so as to see how much fuel consumption had taken place, but the bars had been cleaned.

Finally, as the safety valve was set to blow off at 60 lb., and the boiler was daily used at from 40 to 50 only, there is nothing to indicate that the boiler was, at the time of the explosion, capable of carrying, say, 55 lb., hence the explosion might occur when this pressure was reached without being relieved by the safety valve. This would leave the pressure to run up, under unusually favorable conditions, probably to but 30 lb. more than it sometimes was found at in the morning, which would easily be accomplished with no consumption or circulation of steam through the building taking place. The thoroughness of the crown sheet fracture is shown in the one-half of it presented in Fig. 6. The iron is what is termed three pile, that is to say, the mass from which it was originally made was composed of three thicknesses welded together, and it was defects in this welding, from the presence of dirt or other foreign material, which, when rolled out, formed these laminations. Now, in an unbent sheet the laminations would not form such serious defects, but in flanging or bending the edge, the laminations would tend to separate, and undoubtedly to some extent did so, weakening the plate at A, where the bend and the fracture took place.




PORTABLE STEAM SAW-MILL WITH HERRESHOFF BOILER AND ENGINE.

## AMERICAN INDUSTRIES.—No. 65.

### THE HERRESHOFF LAUNCH.

The remarkable little steam vessels turned out by the Herreshoff Manufacturing Company, of Bristol, R. I., have attracted world-wide attention, and in a very few years have earned a reputation which is truly enviable. These boats have not only been indorsed by the Bureau of Steam Engineering of the United States Navy, but their merits have been acknowledged by European engineers, and the English government has given its opinion in an emphatic way, by ordering a number of the boats to be used in the English navy.

The works of the Herreshoff Manufacturing Company were established in 1864, and consist of several machine and constructing shops, in which are employed about one hundred men. The works are on the shore of the Narragansett Bay, whose waters present a ready field for experiments in naval engineering, and afford facilities for developing, by actual trial, the best models for steam and sailing craft.

The Herreshoff Brothers possess, by inheritance, great talent for mechanical construction, especially as applied to marine engineering, and this talent has been developed by practical experiment supervised by these indefatigable inventors. From first to last success has followed their efforts, and, judging from the present showing, a prosperous future is before them.

During the first years of the operations of this company the business was chiefly confined to the construction of sailing craft of various descriptions, principally yachts and smaller pleasure boats, which were known all over the Atlantic coast for the fineness of their models, and their yachts became famous for their fast sailing, the beauty of their lines, and excellence of workmanship and material. Among the best known of the yachts built by the Herreshoff Company are the Clytie, Kelpie, Quivive, Sadie, Orion, Shadow, Triton, Faustine. These, together with a number of smaller yachts, are all noted for their speed, and have taken many prizes in our club and open regattas. About five years since the demand for steam launches and steam yachts sprang up, and this company, ever on the alert to meet the wants of the people, turned its attention to perfecting and constructing this class of vessel. In this their success has been remarkable, and to-day they turn out the fastest, safest, and handsomest vessels that ply either in our own waters or those of any other country. The distinguishing feature of the Herreshoff system of marine steam machinery, is the safety coil boiler, which has been brought to great perfection and patented by the Herreshoff Brothers, and which is shown in two forms in our first page illustration. The boiler consists of a spiral coil made of iron tube arranged with proper spaces between the coils for the escape of the products of combustion. The coil is made of conical form and surrounds the combustion chamber, presenting an effective heating surface to the fire. The heated gases proceeding from this chamber are made to pass through the spaces of a flat coil at the top, which heats the feed water before its entrance to the boiler proper. The feed water is forced in at the cooler end of the flat coil, through which it passes to the top of the main coil, and descending, is finally discharged into a vertical cylinder, which is called the separator, and in which the steam and water discharged from the coil are divided, the water falling to the bottom, the steam being taken from the top and passed through a superheating coil located above the main coil, which completely dries and superheats the steam. Generally a single coil is used as the steam generator; but when the greatest economy is the main consideration, a double coil, in which one is placed within the other, is employed. Both forms of boiler are shown in the engraving.

The advantages possessed by the coil over the shell boiler in any of its forms are marked and are apparent almost at first sight. The coil is absolutely safe from destructive explosion, and weighs less than one-half as much as other boilers of the same capacity, and in point of economy its superiority is undoubted. It is capable of raising steam from cold water in from five to seven minutes. This is an important feature, especially in steam launches and torpedo boats, where time is an all-important matter.

The engines used in the Herreshoff system for marine purposes are of the compound condensing type, having feed and air pumps attached. The machinery of this system is especially noteworthy for its extreme lightness and for the judicious distribution of material, all of the parts having ample strength, and no portion being loaded with useless metal, which would rather detract than add to the efficiency of the machine. These engines use the steam with the highest economy, actual and prolonged tests having proved the efficiency to be at least 40 per cent greater than that of the non-expanding type. As to mechanical details of construction, finish, proportion, and general design these engines leave nothing to be desired.

Of the several steamers shown in our engraving, the one hundred foot size—of which a number have been built—is considered by yacht men as the most advantageous size for coastwise cruising. It can be handled by a few men, consumes a minimum of fuel, and, what is more important than anything else, the interest on first cost is small in comparison with that of the large iron steamers recently added to our fleet of pleasure vessels. The plan view in the front page engraving shows the arrangement of the interior of one of these yachts so accurately that no further description is required.

The maximum speed of the 100-foot yacht is 18 miles per hour, and in that time it burns only 200 pounds of coal. Three men manage the vessel easily. The 60-foot yachts are planned with a view to river, bay, or lake navigation, and are arranged to accommodate a number of persons for short excursions. Yachts of this size will steam 15 miles an hour, and in that time will consume about 90 pounds of coal.

The Herreshoff torpedo boats have features peculiar to themselves, which distinguish them from everything else of the same class, and have earned for them a well deserved reputation. They are at least three tons lighter than those of foreign make; they will go astern as fast as ahead, and can stop in half their length from full speed. They are capable of turning in a circle whose diameter is three times the length of the boat. All these desirable qualities are due to the lightness of the entire structure, including the boiler and machinery, and to the position of the screw, it being located under the hull at about one-third of the distance from the stern to the bow. The quickness with which steam can be raised is of inestimable strategic importance in naval warfare, as it admits of repelling sudden attacks of an enemy, the boat being always ready and capable of being put under full steam by the time its keel touches the water. These boats are fitted for the use of either spar or Whitehead torpedoes, and are supplied with four spars, two at each end, when the spar torpedoes are employed. By this means the efficiency of the boat is immensely increased, their remarkable quality of backing as readily as going ahead rendering the use of stern spars perfectly practicable.

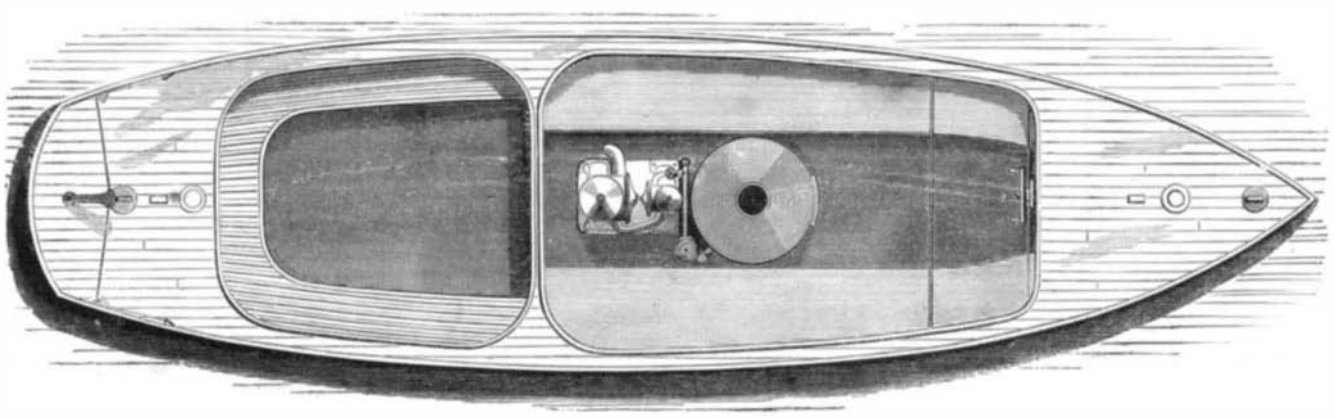
The length of the torpedo boat is 60 feet; width, 7 feet; depth, 5 feet 6 inches. Their weight when ready for service is 6 tons, and they are capable of steaming 23 miles an hour, developing 150 horse power.

In the whole range of the manufactures of this company, perhaps the most successful craft is the navy or government launch, shown in the engraving. It is 33 feet in length, 8 feet 6 inches in width, and is furnished with a folding tent or awning over the standing room, either or both sides of which may be raised to protect passengers from rain, spray, or wind. When not in use the tent folds down snugly on either side of the boat outside the rising. Either or both sides of the tent may be elevated, thus making an awning proper.

The general advantages of the Herreshoff launch are summed up in the preliminary report of Chief-Engineers Isherwood, Zeller, and Carpenter, from which we make the following extracts:

"The following general opinions, arrived at by close observation during long and exhaustive experiments, can be depended on.

"1. As regards the hulls of the launches. The models of the Herreshoff launches and the distribution of their weights have been so perfected by long and intelligent experience and experimenting, as to scarcely leave room for improvement, the Herreshoff Manufacturing Company having for many years made a specialty of designing, constructing, and testing steam launches, steam yachts, steam torpedo boats, and similar vessels. The material is of the best quality, well seasoned, and carefully selected. It is so distributed in the construction of the hulls that the required strength is obtained, with the least weight; the thoroughness and perfection of the fastenings being depended on, instead of masses of material poorly secured. The workmanship cannot be excelled in neatness, finish, and skill. These hulls combine the maximum of strength with the minimum of weight, which is the end to be attained in this class of vessels where lightness is of the first consequence for stowage on board ship, carrying capability, small draught of water, and speed. In all these particulars of model, construction, combination, strength, finish, lightness, quality of materials and workmanship, the Herreshoff steam launches are incomparably superior to the navy launches, a superiority resulting from the fact that the latter are only occasionally designed and built at the navy yards, and then by persons whose skill and experience lies in the designing and constructing of large vessels, and who devote little or no attention to what is considered as comparatively a small matter, but which, if the highest excellence is to be attained, requires much special training and experience.



PLAN OF 33-FOOT LAUNCH.

"2. As regards the machinery. The system of machinery employed in the Herreshoff launches is quite original in most of its details. It is diametrically opposite to that which is used in the navy launches and is in every particular greatly superior to the latter. In the navy launches a single cylinder is employed, and the starting and stopping are consequently uncertain and slow, with the risk of damage and accident from running into wharves and vessels, and also loss of time.

"In the navy launches steam of high pressure (80 to 100 lb. per square inch above the atmosphere) is used almost without expansion, and it is generated in a type of boiler whose strength is only moderately in excess of the pressure. This steam is not condensed, but is exhausted direct into the chimney of the boiler to cause sufficient draught for generating the disproportionately large quantity of steam required with this system.

# SCIENTIFIC AMERICAN

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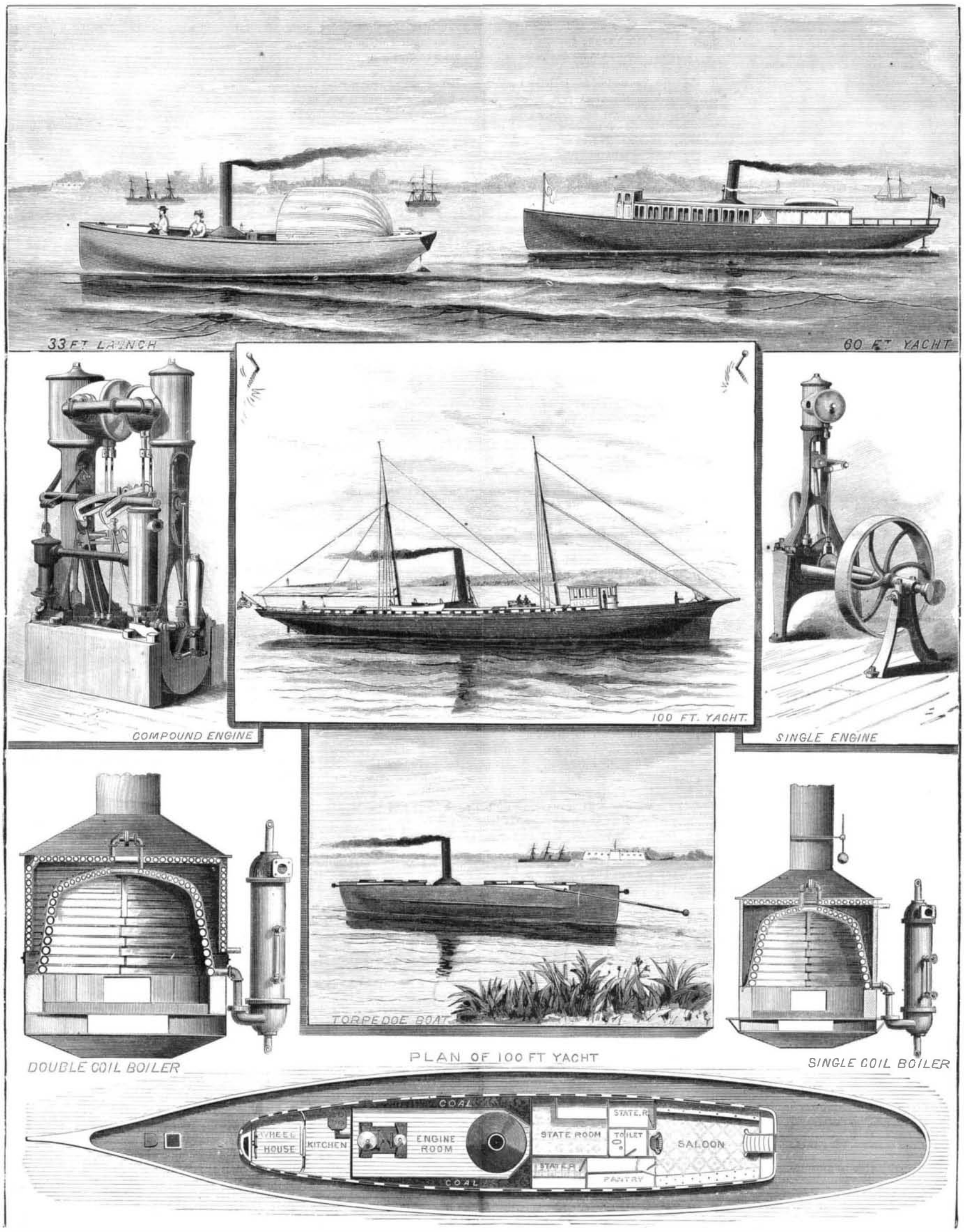


**THE HERRESHOFF TORPEDO-BOAT, STEAM LAUNCH, BOILER AND ENGINE.**—[See page 99.]

"In the Herreshoff launches the engines are by preference of the compound type and of the simplest design; the two cylinders are connected at right angles, and the control of the vessel is thus made complete, there being no time lost and no uncertainty in the starting, stopping, and backing. There are no independent cut-off valves, the difference in the areas of the pistons of the two cylinders giving, without that complication, an expansion of from four to five times, so that all the economy possible from this source is attained. The boiler is practically inexplodible, being composed of a coil of iron pipe from two to three inches in outside diameter according to size of boiler. The steam pressure carried, however, is comparatively low, ranging for ordinary use from 40 to 60 lb. per square inch above the atmosphere; the engines being made strong enough to run under a pressure of 150 lb., or as much as the boiler can be made to furnish. This boiler has a forced circulation, is absolutely safe both on account of its strength and of the very small quantities of steam and water which it contains; it is operated by natural draught, which, however, can be increased by a small steam jet thrown into the chimney whenever there may be a demand for the maximum quantity of steam. The economic vaporization is as good as that of any other marine boiler. This boiler, owing to its forced circulation, with the feed water entering at the top of the coil while the steam is drawn off at the bottom, can be successfully employed with the highest rate of combustion given by a powerful fan blast delivering the air into a closed ashpit; that is to say, with a combustion of 50 lb. of coal and over per square foot of grate surface per hour; being in this respect the only boiler composed exclusively of tubes that can be worked at exceptionally high rates of combustion. In all other boilers of this kind the rate of combustion is limited by the fact that as soon as the quantity of heat thrown in a given time on the tubes reaches a very moderate amount, the water is driven from the iron, which, deprived of that protection, speedily burns out.

"The coil boiler is the lightest ever constructed for its power, and the weight of water contained in it is the least. This boiler is the peculiar feature of the Herreshoff system and the only part patented.

"The engine is condensing, the steam from the cylinder being exhausted into a surface condenser of the simplest design and lightest execution, formed by a copper pipe secured to the outside of the hull just above the keel. By this means the boiler is supplied with fresh water, and the slight quantity lost by leakage is restored from a small tank situated beneath the boiler.

"The continuous service of the launch is thus limited by only the weight of coal it can carry, and not by the weight of water it can carry. The bunkers can easily and quickly be refilled from other vessels at any locality, but the filling of tanks with fresh water can only be done where fresh water can be obtained.

"The use of condensing engines with surface condensers renders the Herreshoff steam launch of real military value, from the length of time it can continuously steam, and from its freedom from noise. When the engines are stopped temporarily, the steam is then blown from the boiler directly into the condenser and there condensed, the condenser, under the circumstances, cannot be overheated, as the outboard pipe is in continual contact with continuously changing outside water even when the vessel is at rest.

"The navy launch carries 960 pounds of coal in the bunkers, and 2,500 pounds of water in the tanks, and in smooth water can maintain a speed of 7 statute miles for four consecutive hours, after which the tanks must be refilled.

"The Herreshoff launch carries 1,120 pounds of coal in the bunkers, and can maintain a speed of 7 statute miles for twenty-eight consecutive hours, after which the bunkers must be refilled. But if there be added to the fuel weight the 2,500 pounds in water in the navy launch, then the consecutive steaming of the Herreshoff launch can be extended to ninety-eight hours.

"The maximum speed of the navy launch was 8·5 statute miles per hour, and of the Herreshoff launch 11 statute miles per hour.

"When the two launches were tried together in very rough water, against a strong head wind and sea, the superiority of the Herreshoff launch was much more marked than in smooth water. While the navy launch took in so much water over the bows as to endanger her safety, and to require constant bailing with buckets, the Herreshoff launch was dry. She was much better trimmed, lighter, more buoyant, and every way superior in nautical qualities to the navy launch, at the same time making double the speed.

"As regards economy of fuel, the Herreshoff launch develops the indicated horse power with less than half the coal required in the navy launch. In every particular the superiority of the Herreshoff launches to the navy launch was so marked as to be apparent to the most cursory observation. Their weight was one-half and their economy of fuel was double; their nautical qualities were much finer, their carrying capacity was greater, their finish and general arrangement were better, they were noiseless, and their capability of continuous service was enormously greater. The superior adaptability of the Herreshoff system to that of any other known to us, for steam launches, steam yachts, steam pinnaces, torpedo boats, small gun boats, etc., is so unquestionable, that after the most extensive experiments and thorough examination of the subject, we are constrained to recommend it, though comparatively new, to the serious attention of the department for such classes of vessels. The management of the boiler differs from the management of boilers of other types, but is soon acquired by the humblest intelligence, and we believe the engineering of the Navy should be familiarized with it as speedily as possible, as its use is certain to extend as its merit becomes understood."

In addition to marine work the Herreshoff company are at present giving particular attention to engines for electric light. The quickness with which steam may be raised, the freedom from danger of explosion, the lightness of both boiler and engine, and the perfection of the mechanical details, render this system valuable for this purpose, and admits of placing powerful machines in the midst of crowded cities without danger to life or property.

This system has also been successfully employed in working bridge draws, dummy engines, portable and stationary pumping engines. For saw mills it has peculiar advantages. Its safety, portability, and its quick and powerful steaming qualities, give it the precedence over other steam motors.

The entire range of the manufactures of the Herreshoff company exhibit careful and intelligent supervision, and workmanship that is in every way superior.

### Manufacturing in New York City.

Of late years Philadelphia has justly boasted of being not only the largest manufacturing center in the United States, but the largest in the world. If the chief special agent for the collection of manufacturing statistics for New York, Mr. Charles E. Hill, is correctly reported, our city now takes the first place in productive industry as well as in commerce and population. Mr. Hill estimates that the final footings will show the value of our manufactured products to be fully $400,000,000, or nearly $77,000,000 more than Philadelphia's product. This excludes the numerous factories situated in what are practically suburbs of the city, and operated by New York capital and brains.

## DECISIONS RELATING TO PATENTS.

### United States Circuit Court—Northern District of Illinois.

BARBED WIRE FENCES.—WASHBURN & MOEN MANUFACTURING COMPANY *et al. vs.* HAISH. WASHBURN & MOEN MANUFACTURING COMPANY *vs.* SAME.

Drummond and Blodgett, Judges:

1. An assignment purporting to convey all the right, title, and interest in letters patent "excepting thirty two or thirty three counties, heretofore sold and assigned," without designating the counties thus previously sold, is not so far ambiguous as that nothing passes thereby, the reservation being such as is capable of being made certain by competent evidence, showing what counties have been actually conveyed.

2. The action of the Patent Office in reissuing a patent to assignees raises a presumption of title in the assignees named, and if the defendant wished to raise the question as to whether a reservation contained in an assignment included the territory in controversy, he should have raised it in his answer, or at least have put in proof tending to show such fact.

3. Evidence almost wholly made up of the recollections of witnesses revived after the lapse of many years, and contradicted in most instances by explicit testimony of other equally credible witnesses, leaves so much doubt as to the actual existence of the device as to make it unsafe to defeat a patent on the ground of public use thus sought to be established.

4. Evidence of the state of the art showing the prior existence of analogous devices for substantially the same purpose, but not fully exhibiting the device patented, operates to narrow the field for the exercise of inventive faculty and limit the range of the patents.

5. A device, in order to be patentable, must be the result of invention, but the mere mechanical adaptation of old things to new uses is not usually invention, unless in combination.

6. Invention appearing, the law does not attempt to measure its extent or degree.

7. Utility is suggestive of originality, and the fact of the acceptance of a device or combination by the public and putting it into extensive use, is accepted as evidence that it was the product of invention.

8. An inventor may, in his reissue specification, make his description more full and accurate; but he must not substantially change it so as to describe another device or cover anything not in the original.

9. The original patent was for "the method of providing the wires of a wire fence with a series of spur wheels," and a reissue was obtained for a "fence wire provided with spurs for the purpose specified;" *Held*, not to be a departure from the original invention, the only changes in the specification serving merely to give point or direction to the invention claimed.

10. Matter so described in the original specification that it might have been claimed in the original patent, may properly be claimed in the reissue.

## NEW INVENTIONS.

Mr. Rush E. Avery, of New York city, has patented a folding cot which can be folded or erected without attaching or detaching or coupling any of its parts. It is very convenient for transportation, occupying only a very small space when folded.

A safety attachment for watches has been patented by Mr. James Roberts, of Brooklyn, N. Y. A plate or ring, having scalloped edges, is slipped over the stem of the watch, projecting horizontally, and so nearly filling the pocket that when a thief attempts to extract the watch the projecting plate will catch in the lining of the pocket and alarm the owner. Or, if the thief attempts to take hold of the plate itself, the pressure of his fingers in the narrow space between the plate and the pocket will alarm the owner.

Mr. William Hoffmeister, of Mossy Creek, Tenn., has patented a double try-square. Two ordinary try-squares are joined together side by side, a suitable and adjustable distance apart, by a metal plate and screws or equivalent means, by which means the square may be made to straddle boards of different thicknesses. The scope of the tool is by this means much increased, and kinds of work performed with it which are not possible with the ordinary try-square.

Mr. Wilhelm Espig, of Berlin, Germany, has patented a billiard table, which provides means for adjusting the bed to different heights from the floor, and also for extending its frame for the reception of table boards whereby it may be converted into an ordinary dining table.

Mr. Francis Hopkins, of New York city, has patented an improvement in eyeglasses, the object of which is to obtain a firmer gripe upon the nose without tightening the spring, to prevent the glasses from slipping forward on the nose, and to hold them on the nose nearer to and on the same plane with the eyes. This is accomplished by forward projecting arms to which the spring is attached.

Mr. William H. Older, of Packwaukee, Wis., has patented an improved construction of buildings designed especially for barns upon prairies and other parts of the country where timber is scarce. A peculiarly constructed frame of timber and wire, the timbers being secured by bolts, is the principal feature of the invention. The outside may be covered with straw thatch, tarred paper, etc. A serviceable building can thus be constructed with little timber and at a small cost.

In a thill coupling patented by Mr. Levi B. Stuart, of Seymour, Conn., a grooved cushion and centrally grooved plate are claimed to provide a more durable and more easily adjustable spring to prevent rattling of shafts on their bolts than has hitherto been supplied.

A log tripper patented by Mr. Levi Gunter, of Gunther's Mills, S. C., consists of a novel arrangement of levers and an improved hook, whereby a saving in power and labor for turning logs in saw mills is effected.

Mr. Samuel White, of Eau Claire, Wis., has patented an improved head block for sawmills which comprises improvements in the jacks or standards of the head blocks, the dogs for holding the logs upon the carriage, and the means for receding the jacks upon the head blocks.

Mr. Charles P. Batt, of Phœnixville, Pa., has patented a pendulum scale which consists in a novel combination and arrangement with each other of a pair of weighted levers, a pair of connecting bars, and a vertically operating scale-beam and indicator.

Mr. Edwin B. Hutchinson, of Detroit, Mich., has patented an improved account-book, which saves time and work in making up trial-balances from a ledger. The book is bound with half leaves that are ruled for an index, and fitted with a removable pad provided with leaves ruled in columns for account totals, arranged for two or more balances, which pad when in place forms, with the bound half leaves, a complete trial-balance book, into which the headings or names can be copied on the bound portion and the accounts carried out upon the pad leaves for two or more balances, and the pad renewed by another when exhausted, all with but one entry of the names or headings.

Mr. Ura H. Palmer, of Elizaville, Ky., has patented a wheat heater for flour mills, in which the grain is heated by the direct contact of hot air, the air being heated by a lamp and circulated in currents through perforated tubes, among which the grain passes by virtue of its own gravity.

Mr. Prosper Humbert, of Austin, Texas, has patented a three-wheeled vehicle which has one or more seats so arranged that the forward seat turns with the horses so that the driver is always directly in the rear of the horses, and holds the reins at the same length no matter how much the horses may turn to either side.

Mr. George B. Taylor, of New Brunswick, N. J., has patented a feed-water heater for steam engine boilers and locomotives. The heating chamber is formed of two plates attached to a frame, and its interior is divided into zigzag form by strips extending alternately from the top to the bottom, and from the bottom to the top. The heating is accomplished by the products of combustion as they pass through the smoke box.

Mr. Charles Niederauer, of La Grange, Texas, has patented a cultivator in which the standards may be adjusted to regulate the depth of the cultivators or plows to avoid obstructions. Each cultivator or plow standard has attached to it an adjustable segment, and the standards are all operated together by a lever and link connections. The plows are thus raised, while the main frame upon which the operator rides is not raised.

Mr. Gottlieb Kinsey, of Lock Seventeen, Ohio, has patented an attachment for reapers and mowers which is a substitute for ordinary reel, and which, while less expensive, is claimed to be equally as effective. It consists substantially in a rake which is automatically raised, swung forward, lowered, and drawn back as the machine advances to draw the grain or grass against the cutter bar.

Mr. Jacob Gilstrap, of La Plata, Mo., has patented a wind wheel of that class in which the access of wind is controlled by hinged valves regulated by the action of a governor. Instead of two cords and rings for connecting each valve to the governor Mr. Gilstrap uses only one cord to operate the valve in one direction, its movement in the other direction being controlled by a spring. By this means the number of parts is greatly lessened and a consequent reduction in friction results.

Mr. John Coyle, of East New York, N. Y., has patented a combined lampwick-trimmer and burner and chimney cleaner constructed of a brush, a square staple, and a serrated disk, whereby the charred portion of the wick can be removed, the wick and burner brushed off, and the inner surface of a lamp chimney cleaned.

Mr. William Jones, of Nashville, Tenn., has patented a machine for making rim tops of vessels. It operates upon a straight strip of metal, flanged at one edge, to convert it into a hoop of the desired dimensions and of such shape in cross-section as renders it peculiarly suited to form the flange for the cover of sheet metal vessels.

Mr. Bolivar J. Quattlebaum, of Williston, S. C., has patented a portable dental engine which may readily be set up in small compass and readily taken down and packed in small compass for transportation. The frame of the machine can be adjusted to form a case for the working parts when packed.

### Separation of Cobalt and Nickel.

Reichel gives the following new method for the qualitative separation of these two troublesome metals, especially when there is but little cobalt in the presence of a larger quantity of nickel. Both metals are precipitated with potassic hydrate solution and filtered. The unwashed precipitate is thrown into a test tube and heated with very strong pot ash until it boils. Under these circumstances the cobalt dissolves with a *blue* color, thus proving its presence in a very simple manner. Z. A. C.