boat are alike; or, in other words, she has two bows. She is nearly flat-bottomed, and, although after the trial they affixed a keel, they have since cut the first greater portion of it off, finding it superfluous. The floor of the boat is about the water level, and between the bottom and the floor are tight-water compartments. The first intention was to have small ports or scuppers pierced through the sides flush with the floor, to carry off any accumulated water in the boat; but, as she draws rather more water than was at first expected, this object has been frustrated. A light hand-rail runs round the gunwale, open at both bows, for the ingress and egress of passengers. The engine and boiler are placed about the center of the boat, in such a position that the passengers can freely walk round about them. The boiler is an upright cylindrical one, with one furnace; it is neatly incased in wood, with brass hoops, and the funnel has an external covering of brass, polished. The boat is propelled by means of a pump worked by the engine in any direction required. The following is the manner in which this is accomplished: Underneath each of the four quarters of the boat there is an aperture or tube open to, and always submerged in, the water in connection with the pump, but these waterways are not parallel to, or straight fore and aft the vessel, but run at a considerable angle from the pump in the center of the boat to the port or starboard side, as the case may be; thus we have four pipes in connection with the pump diverging from the center of the boat in the form of a St. Andrew cross, their apertures all open to the water. The pump is fitted with suitable valves, so that the water can be admitted by any of the apertures and expelled by the others. It will now be easily understood that by arranging the valves to allow the water to flow into the pump by the two stern apertures, for instance, when the pump is set in motion the water will be expelled with force through the two apertures at the bow, which will cause the boat to move stern first, and *vice versa*. Thus, without a helm, the boat can be propelled either backward or forward, broadside on, or made to revolve on its axis, simply by shifting the valves; its rate of speed is about five miles per hour. It has not yet been put on any station, as the trustees wish the ferryman to gain experience how to work it before carrying passengers, but it is expected it will be quicker, more easily steered and managed, and safer than the present laborious system of pulling with oars.—*London Engineer.*

[What a roundabout way this is? Why not put in a screw at once? pumps, valves, and pipes are much more liable to get out of order, and more costly to keep in repair than a propeller would be, to say nothing of the hull of the boat being pierced full of holes below the water line.—EDS.

THE "ST. JOHN" BOILER EXPLOSION.

The public has reason to congratulate itself we think, on the manner in which disasters are examined into of late, and the determination evinced to get at the root of the trouble. "Died by visitation of God" used to be a common verdict with coroners' juries, anxious to be relieved from an unpleasant duty, and "nobody to blame," has not been so long out of fashion but that we can recall many instances of it.

The boiler explosion on the steamer *Arrow* was rigidly investigated, and the cause disclosed. The boilers were old, worn out, and unfit for duty, and the proprietors of the boat were indicted for manslaughter. In the recent explosion on the steamer *St. John*, whereby many persons lost their lives, the boilers were entirely new, and were perfectly sound, except in one place, and that place was where they gave way, as the appended examinations of the principal witnesses will show:—

Capt. Peck, on being examined, said :—I am Captain of the *St. John*, and have been one for many years ; I have not had charge of an engine, neither am I acquainted with the management of them.

After some other particulars not essential to the point, a juror said:—

Did you notice any mark on the boiler where the fracture took place? A.—Yes, sir.
Q.—Was it a cut with a chisel? A.—Yes, sir.
Q.—Do you think that cut was made by the calker in chipping the sheet? A.—I think it might have been so made.
Q.—Do you think that cut weakened the boiler? A.—I think it did weaken it some.
Q. Was not the line of the fracture directly along the cut or chisel mark? A.—Yes, sir.
Q. Do you think that mark was, in any way, a damage, or that it caused the disaster? A.—I think it was the principal cause.

The first assistant, Joel Wright, was then examined, and testified that the boiler had plenty of water at the time of the accident. Some firemen were also examined as to the general conduct of affairs in the engineering department of the boat, and the Chief Engineer was also examined, and corroborated the testimony of the Captain—that the sheet tore along the line of the chisel cut before mentioned.

THE GOVERNMENT INSPECTOR AND HIS MAGNIFYING GLASS.

Mr. J. W. Hopper was the next witness. He testified that he was inspector of boilers and steamers ; examined the boilers of the *St. John* after they were placed in the boat, and found they were properly braced and safe. [The witness then described the mode by which boilers are tested.]

Question by Mr. Fox—How were you appointed Inspector? A.—The Secretary of the Treasury appointed me.

Q.—What is necessary to be appointed? A.—I was nominated for the office by a Government committee appointed for the purpose, consisting of Hiram Barney, Ex-Collector, Mr. Thomas B. Stillman, and a Judge of the United States Circuit Court ; they recommended me for the office, and the Secretary of the Treasury appointed me

Q.—Were you examined as to your fitness for the office by them? A.—No ; I was employed before that as an engineer on a revenue steamer.

Q. Did you run the engine on the steamer? A.—No, my assistants did ; it is usual for them to do so.

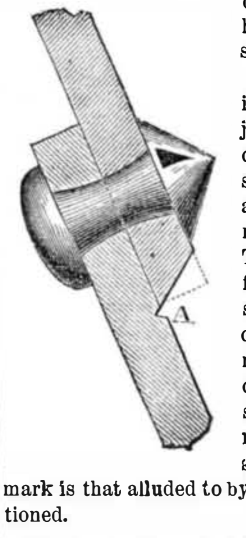
[The witness then testified that Mr. Secor's boilers were braced in the same way as the boilers of the *St. John.*]

Question by Mr. Fox—You say you made a very careful examination of the boilers of the *St. John* after they were placed in the boat—did you see a chisel cut on it? A. No, I did not ; I examined it with a magnifying glass, and did not see a chisel cut on it.

Here Mr. Fox took the piece of the boiler with the chisel cut on it, and exhibited it to the witness, remarking—"You say you failed to discover this chisel cut with a magnifying glass, which I observed several feet off. How is that?"

[The witness made no answer, but subsequently gave it as his opinion that the explosion was caused by a bad plate of iron. He then left the stand.]

As many of our readers do not know the nature of this technicality, we give herewith a diagram representing it.



When two sheets of boiler iron are lapped to form a joint, the outside sheet is chipped off on the edge, as shown by the dotted lines, and afterward calked or riveted tight on the edge. The tool used is an ordinary flat chisel, made thin and sharp, and unless common care is used by the work man the lower corner of the chisel will rest on the lower sheet and cut a slight channel all the way along, as shown at A. This chisel mark is that alluded to by the witnesses above mentioned.

If any person reading this article has ever had a pair of boots cut in the upper by the carelessness of the shoemaker in paring off the sole, he will know the nature of this damage done by the chisel. Since the skin of the iron is the strongest part of it, it follows that the plate is weakened to that extent by being so cut. In view of the fact that the rent followed the line of this chisel mark, it does not seem difficult to account for the accident.

The makers of the boiler, no doubt, took every precaution against disaster—it is unreasonable to suppose otherwise. Men who make boilers do it for money, and a desire to build up a reputation, not to have them explode. Moreover, as these boilers were built by the pound, and not by contract, every additional sixteenth of thickness in the plate was just so much in their pockets.

We have always endeavored to get at the real cause of these disasters, and are wary of the theories which are so volubly uttered on all such occasions.

It will be found in most cases that honest examination into boiler explosions will reveal the cause, whether it be bad workmanship, flaws in the material, or neglect. The true way is to try and find some mechanical or other defect—not to mislead engineers and the public into supposing that, in spite of all the care in building or running steam boilers there is some mysterious agency which will defeat all their efforts at any moment.

The jury returned the following

VERDICT.

The jury found that, at the time of the explosion, the boiler was in a weakened condition, from the force of the hydrostatic pressure brought to bear in testing its capacity by the United States Inspector in the use of cold water, by insufficient bracing on the circular part, above the flat surface, by the effects of chipping and calking, and by the corrosion of the boiler on the inside, at the high-water mark ; but from the diverse views and opinions of the many witnesses who have testified before us, the jury are unable to say from which of the causes the explosion occurred, or whether from one or more combined. The jury find that this boiler was made of the best material, and braced in the usual manner of constructing such boilers by the best boiler makers, and approved by scientific and practical men : but the jury recommend that hereafter boilers be braced above the flat surface on the circular part. The jury recommend that steamboat boilers be inspected oftener than the practice now is, by competent inspectors, and that said inspections be made as often as once in three months ; also, that the hydrostatic test with cold water be abolished, and that warm water be used in its stead. The jury also strongly recommend and urgently adjure all boiler-makers to extraordinary care in construc ing steam boilers, and that especial pains be taken to avoid breaking the fiber of the iron by calking or by other means.

We, of course, do not know what passed in the secret deliberations of the jury, but we shrewdly suspect that the same juryman whose searching cross-examination we report, used his influence to get in the significant words, "*by the effects of chipping and calking.*" After these the remainder of the verdict is of no consequence.

Rescue of Shipwrecked Mariners.

The Boston *Courier* gives the following account of the rescue of the crew of a schooner lately wrecked on the south side of the Island of Nantucket:—

"By means of a gun provided for such emergencies by the Massachusetts' Humane Society, a line was thrown over the vessel, and, after considerable delay, owing to the exhausted condition of the shipwrecked crew, a rope attached to the line was hauled on board and fastened to the masthead. When this was done, a chair made for the purpose was run off on a hanging block, and one of the crew got in to be hauled on shore. When his weight began to press on the small line from the masthead to the shore, it began to stretch and he to sink down toward the top of the raging billows beneath him. When a little more than half way to land, the small line of the vessel used to veer him along the line and pull the chair back, got foul, and, for more than an hour, there the poor fellow hung, the line stretching, and the waves ready to swallow him in case it parted. At last he was drawn within a few yards of the nearest breaker, in which he was submerged every time the vessel rolled toward the beach. A rope was thrown to him by men wading up to their necks in the breakers, and he was dragged to land. In a similar manner, after toilsome exertions, continued all day long, the other shipwrecked mariners were rescued, the last man reaching the shore just at sunset."

"Hands Off."

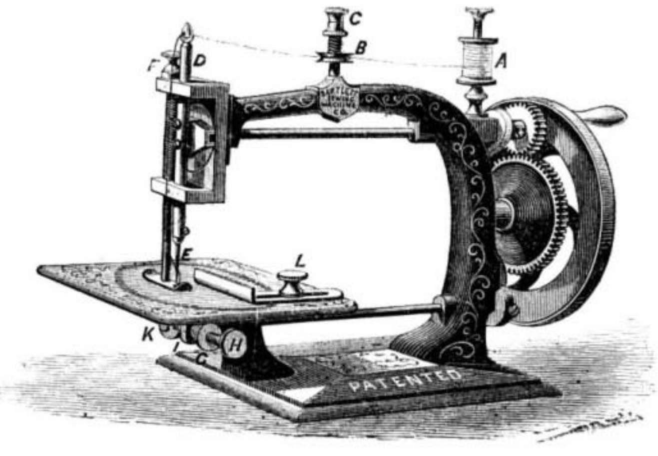
The futility of placing this notice on goods at fairs is well set forth in the spirited paragraph subjoined, cut from the Minneapolis *State Atlas:*—

"The people are very curious, and inspection is the order of the day. The great placards, 'Handle not,' might as well have been turned wrong side out. You can never keep the hands of the briarean public off anything. They were on the delicate embroidery and snowy quilt; they left the furs with a new gloss; they fumbled the stockings, the pin-cushions and tanned skins; they dirtied the picture glasses, and felt all the rough spots in the oil paintings; if the book covers were lifted once, they were lifted a million times; the bright stoves soon got dingy faces, and the oil on the machines was carried off on a thousand fingers. How many digits were punctured by the needles on the Grover & Baker, and Wheeler & Wilson, would be a hard sum for Greenleaf himself. The vegetables had to 'take it;' hard potatoes got soft; fresh melons went rotten under the pressure, and the smell of onions was upon all. The only real iron-clads were the pumpkins, which couldn't be dented except by a hammer. Segars were much sought after, and, apparently, the awarding committee on these articles was very large.

The New Sewing Machine.

The engraving published herewith represents a new sewing machine. The objects its originator had in view in its production was to supply the great want existing for a really good practical sewing machine for family use, obtainable at a moderate price, simply constructed, readily understood, and easily operated and kept in working order.

The stitch made by it is elastic, which experience proves to be best adapted for all the varieties of family sewing, and is made from the spool direct as purchased at the store. It is self-fastening, yet can be taken out, without injury to the fabric, when necessary. The needle is readily adjusted, and is like that used by Mr. Howe, only shorter, and consequently stronger and less liable to be broken. The feed is the well-known "four-motion under feed," as used in the Wheeler & Wilson, Grover & Baker, and other first-class machines. It is now considered the only really reliable feed. The length of stitch is varied by simply turning the thumb-screw, H, in or out, securing it in place by the jam nut, C. The tension is laid directly upon the thread by passing it between two highly polished steel disks, B, instead of applying the pressure upon the spool which, from the unevenness of these spools, is found very unreliable. The spool, A, rests loosely upon the upright rod, and may be removed and replaced by another without disturbing the tension—a very valuable feature, especially when the thread gives out in the midst of sewing a seam. The pressure upon the foot resting upon the cloth is obtained by a coiled spring upon the rod. The foot is raised by lifting the nut, F, and held at rest by a pin fitted to the nut in such a manner that the foot may be thrown entirely around and away from the needle when desired. A gage is attached to the plate of each machine adjustable to different widths of sewing and tucking by the screw, L. In short, all the motions are obtained by the simplest mechanism, which, in practice, is found to be durable and noiseless.



BARTLETT'S SEWING MACHINE.

The machines are made adapted both for the treadle (foot-power) and hand use. The annexed engraving represents the machine as adapted for hand use, and although they can be worked upon any house table without being secured, a clamp will be furnished with each machine to be used, if desired. Those for treadle use are made without the gear wheels, and with a smaller pulley or fly-wheel attached directly upon the main shaft for the belt.

These machines sew with double or single thread, and the stitch is far superior to that made by the cheap machines. It did not rip upon being tested, and the general appearance of the machine is satisfactory.

Mr. Joseph W. Bartlett, long and favorably known in the sewing-machine and needle interests, and a resident of this city, is the patentee. Full particulars in relation to machines or agencies will be promptly given by addressing The Bartlett Sewing Machine Company, No. 569 Broadway, New York. The manufactory is at Winchendon, Mass. Page Brothers, Agents, Toledo, Ohio.

On the Practical Results Obtained from Blast Furnaces by the Use of Hot Blast of Very High Temperature.

One of the most valuable papers read before the British Association, at its meeting this year, was one by E. A. Cowper, on the subject above stated. It will be seen that the blast is heated by a cellular mass of brick work on the principle of Siemens's furnace. This plan of obtaining an intense heat is destined to play a great part in the arts, and we wonder that it has not attracted greater attention in this country.

"It is not proposed to detain the meeting with a history of the numerous attempts which have been made to raise the blast for blast furnaces to a very high temperature, nor will the author occupy much time in the description of the means by which the desired result has been obtained, as a full account of the apparatus was given at the meeting of this association held at Oxford, though the paper on the subject was not printed in the Transactions.

"In 1861, experimental stoves only, on the new plan, had been erected and worked for heating the blast for one tweer out of the five used for one blast furnace. Such satisfactory results were, however, obtained, that it was clear that the difficulty of procuring blast of very high temperature had been overcome, and Messrs. Cochrane & Co., of Woodside Ironworks, Dudley, and Ormesby Ironworks, near Middlesbro'-on-Tees, forthwith erected large stoves on the new plan for a complete blast furnace, and it is now proposed, with your permission, to lay before the section the results obtained during upward of four years' practical working with these stoves.

"The effect of heating air on the new plan, was that a temperature of blast of 1,150° Fah. was obtained, instead of only 600 or 700° as with cast-iron pipes in the common stoves; there was no loss of blast from leakage, owing to cracked or damaged cast-iron pipes; the iron produced was of rather better quality; twenty per cent more iron was made from the same furnace, and fully 5 cwt. of coke was saved in the blast furnace per tun of iron made.

"The details of the construction of the new stoves will be readily understood by reference to the drawings.

First, There are two stoves, which are heated alternately and used alternately in heating the cold air; these are filled with brick work 'set open,' or with small spaces between the bricks, and form 'regenerators,' on the principle of Mr. Siemens's 'regenerator furnaces,' as now so largely and successfully used in glass-houses, gas works, iron works, etc., both for obtaining great heat and economizing fuel.

"The outside of the stoves are of thin wrought-iron plate lined with fire brick, the iron skin being necessary to retain the blast under pressure, while the fire brick resists the heat.

"Second, There are provided for the purpose of heating the stoves valves, for the admission of gas and air into a central flue, where combustion takes place when a stove is being heated, the products of combustion passing up the flue and down through the mass of fire bricks forming the regenerator, and escaping at the bottom to the chimney, after the whole of the heat has been abstracted by the fire bricks, the temperature of the chimney being from 212° to 250°, or thereabouts, during the time a stove is being heated, viz., for a period of four hours.

"Then, when a stove is hot, the gas and air are turned off, the chimney valve shut, and the cold blast is turned on at the bottom of the regenerator, and passes up through the bottom courses of brick work in the regenerator, thus very quickly becoming heated; and passing in the heated state up through the remaining courses of the brick work, and down the central flue, through the hot-blast valve to the blast furnace; the process of absorption of heat by the air being so perfect that, as long as a few of the top courses of brick work remain hot, the blast is well heated, the variation in the temperature of the blast being only about 100° Fah., with four-hour changes.

"Third, The gas for heating the stoves is supplied from gas producers, similar to those commonly used by Mr. Siemens for his regenerator furnaces, and which have already been described before this Association. They consist of a simple brick inclosure or fireplace, with bars near the bottom, for the admission of a very small quantity of air. The gas is formed by the slow combustion of a very thick fire, supplied with poor coal or slack down a slope or hopper, the gas passing off from above the fuel through pipes to the hot-blast stoves. Gas, may, however, be taken from the top of the blast furnace for heating the stoves, provided proper arrangements are made to separate it from the dust which comes over from the blast furnace with it; and, judging from recent practical experiments, it is certain that there are several ways in which this may be done with perfect success.

"The late James Beaumont Neilson, who did so very much for the iron manufacture by his original invention of the hot blast, in 1829, was sufficiently long-sighted to predict the advantages that would flow from the use of blast of very high temperature, though, as it happened, he was limited to what could be obtained from passing the air through iron pipes exposed to a fire, as in common stoves.

"Mr. Neilson said:—'In the new regenerator ovens that had just been described the great capacity of fire brick for heat had been well taken advantage of, and a very important step in advance had been made by giving the means of raising the temperature of blast much above the extreme limit practicable with the old ovens; and he considered this would be productive of the greatest benefit in the working of the blast furnace. He had no doubt the make of iron would be considerably increased by the higher temperature of blast given by the regenerator ovens.'

"These anticipations have been fully borne out in practice during upward of four years' regular working of the stoves. The high temperature of the blast produces such an improved effect in the furnace that the 'burden' is increased so as to save fully five hundred weight of coke per tun of iron made; and there is less fuel supplied, so there are less impurities taken in, and the quality of the iron is improved, the tweer-breasts do not 'work hot,' or burn, or give more trouble than usual, as the burden is increased as just stated. The same furnace, is, of course, enabled to do more work, the 'make' being increased fully one-fifth; so that a given plant produces 20 per cent more iron per annum, beside saving nearly 3s. per tun for coke.

"There is less friction or loss of pressure of blast in the stoves than in common ones, and there is no loss of blast by leakage through cracked or burnt cast-iron pipes or joints. More stoves are now being erected on the same plan."

How to Cure Scalds from Steam.

All readers of the Scientific American, but more particularly engineers, should read and remember the simple remedy here given for a most painful affliction. Engineers are often exposed to burning by steam, and it fortunately happens that the materials here recommended as a sovereign cure are always at hand. The *Medical and Surgical Reporter* says:—

"Mary S., æt. 30, was scalded a few days ago with the steam from hot ashes. The scald is on the middle of the chest, and about one foot square. The surface is raw, and covered with lymph. It is only a superficial scald, embracing the cuticle, and, at some points, the true skin. It is covered with granulations. The pain she suffered for a few days was intense; she could not sleep at all, but when the ordinary white lead, mixed to a thick cream, with linseed oil, was applied, in her own words, 'it took her up to heaven.' She is doing well under its use. No danger exists from lead-poisoning, and if it did, sulphuric acid lemonade would be the only prophylactic needed."

Sulphuric acid lemonade, we take to mean water slightly acidulated with vitriol.

Water-proof Paper.—Dissolve 8 ounces of alum and 3¾ ounces of castile soap in 4 pints of water, and 2 ounces of gum-arabic and 4 ounces of glue in another half gallon of water. Mix both, heat, dip in the paper, then suspend until dry.

The temperature of the Lake of Geneva, at the depth of 1,000 feet, is always 42°.