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Improved Steam Boiler.

The hindrance of the deposition of sediment and scale in a boiler, by a circulation of the water during the process of steam generation, and the utilization of a large amount of the heat, are objects worthy the attention of all who desire to render the use of steam power more general and effective than heretofore. Such is the design of this new boiler.

The accompanying illustration shows a vertical section of the boiler, and the explanation can be readily understood by reference to its several parts as designated by the letters.

This boiler consists of a cylindrical shell, with an internal fire-box, also cylindrical, the two being connected together by stay bolts in the ordinary manner. From the crown sheet of the fire-box is suspended a water leg, A, the exterior surface of which is armed with a series of bent pipes, B, opening into its interior at both top and bottom. The products of combustion are carried off by vertical tubes, C, passing from the crown sheet to the top of the boiler, where the stack is commenced, with an inverted funnel covering the whole; or, in the case of boilers of large size, a smoke box is formed of brick-work communicating with the chimney at the side.

The bottom of the water leg is connected with the exterior water space by means of horizontal tubes, D, which assist the circulation of the water. Opposite the end of each of these, in the external shell, is a hand-hole, E, which may be used to clean them, or to draw out any scale or dirt from the bottom of the leg. A steam drum, F, of any convenient form, is attached to the top or at the side of the boiler, as the case may require.

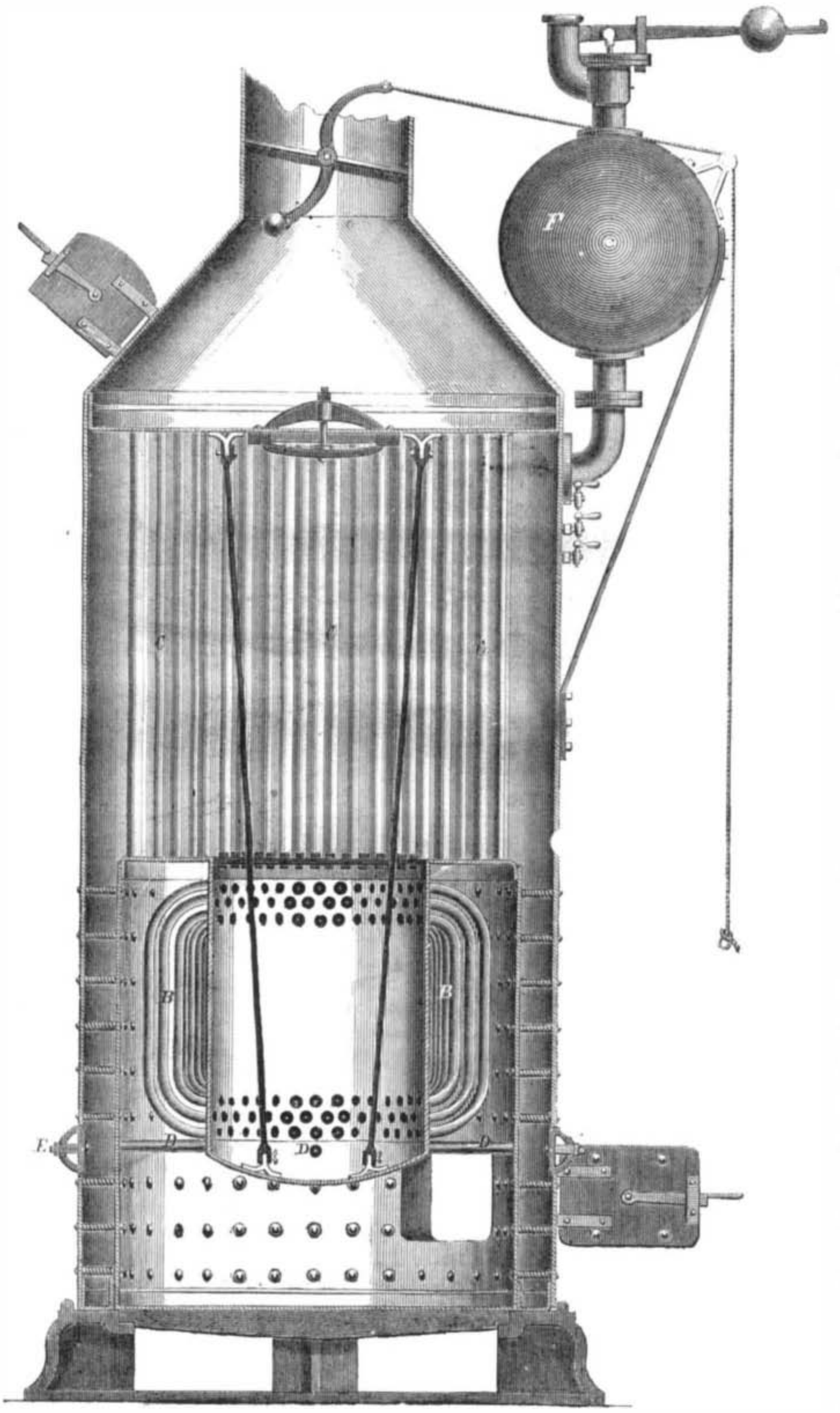
The principle of construction is equally applicable to large or small boilers, and it has been thoroughly tested, and with very satisfactory results, in both. It is readily repaired in case of the tubes giving way, by taking out the horizontal pipes which join the water spaces, and disconnecting the interior leg at the crown sheet. The connection at this point is made by means of a cast-iron ring with gasket and screw bolts, which, being in the water space, are protected from fire, and the joint can therefore be readily broken, and the whole leg, with its attached water pipes, dropped down into the pit below, where it can be worked upon on all sides. The horizontal pipes are easily replaced by means of the hand-holes in the shell.

The advantages of this arrangement are in the interior fire-box, in which no heat is lost by contact with brick-work; in the thorough circulation of the water of the boiler, secured by the water tubes surrounding the water leg; and by the horizontal tubes connecting the exterior and interior water spaces; in the entire consumption of the fuel, and exhaustion of the heat, caused by the ample size of the combustion chamber, as shown by the fact that the gas, when leaving the boiler, is comparatively cold, and in the superheating of the steam by the tubes at the top, passing through it for a short distance after leaving the surface of the water.

The effect of the circulation of water in this boiler is such that, in those which have been for some time in use, it was found that although the water used was impure, the interior of the boiler was clean and free from scale.

Those conversant with the subject will readily understand that the large fire surface and rapid circulation of water, secured in this contrivance, must produce great economy in the use of fuel, and this has, in fact, been found to be the result. In addition to this, the boiler has the great advantage of being compact and readily handled. It requires no brick-work to set it, and is therefore recommended for shipment to the South or to distant points, where brick and lime are difficult to procure.

It is also especially recommended for use in portable boilers for drilling, pumping, hoisting, etc. Address, for further information, James Connery, care Robt. H. Barr & Co., Wilmington, Del.



CONNERY & PENNYPACKER'S STEAM BOILER.

Locomotive Boilers.

At the meeting of the Mechanical Engineers, held at Birmingham on the 3d May, a paper was read by Mr. William Kirtley, of Derby, "On the Corrosion of Locomotive Boilers, and the Means of Prevention." Mr. Kirtley alluded to the corrosion which occurs in boilers made with lapped-joints, and attributed the grooving action which takes place to the fact that neither the plates themselves nor their attachments to the fire box and smoke-box are in the direct line of the strain that is put upon them by the pressure of the steam. The furrowing action is most marked at the interior of the smoke-box end of the barrel, where it occurs most frequently opposite the edge of the outside angle-iron ring, when such a ring is used, and along the edge of the inside laps at the longitudinal and transverse joints. As stated the result of the strain produced by the pressure of the steam within a lap-jointed boiler is, that a slight springing or bending of the plates takes place at the edges of the joints each time that the pressure is applied, the continual variations in the pressure causing this bending action to be continually going on when the boiler is at work. By this action the coating of scale, which is deposited upon the plates by the water, and which, to a certain extent, would protect the plates from corrosion, is detached at the points we have mentioned, and a fresh surface is thus continually exposed to the action of the water.

To avoid the defects above mentioned, the boilers of the locomotives on the Midland Railway are now made with welded longitudinal joints, and the three rings of which each barrel is composed have their abutting edge turned in a lathe, and are united by double-riveted butt-joints, the covering strips being hoops shrunk on, and all the rivet holes being drilled after the plates and hoops are put together. The plates forming the rings are rolled with thickened edges, a long gradual taper uniting the thick edges with the main body of the plates. At the smoke-box and fire-box end of the barrel, the rings are flanged outward, so that no angle-iron rings are required to join the barrel to the fire-box casing and smoke-box tube plate. Special machines are employed to bend and flange the thickened edge plates. The flanging is effected by laying the plate upon a flat bed, with the portion that is to be flanged over projecting; this part of the plate is then bent down by the descent of a roller. The rolls used for bending these plates have a deep groove formed in them at one end to receive the flange, the width of the groove being adjustable by a large screw and nut. Each ring is formed of two plates, and after these have been welded up, the ring is blocked to the proper diameter and the soundness of the weld tested by means of an ordinary hydraulic wheel-tire block-press.

A series of experiments which have been made upon these welded joints show that their average strength is within one-eighth of that of the solid plates; and in more than half the number of strips of plate which have been cut out across the weld and tested by a tensile strain, the fracture took place in the solid plate, and not in the weld. A number of boilers with welded seams have now been in use on the Midland Railway for some years; they are found to be in good condition, and they have, as yet, shown no sign of furrowing, even at the flanged ends, at the points where the grooving action was most marked in the boilers connected to the smoke-box, tube-plate, and fire-box casing by angle-iron rings. Mr. Kirtley exhibited, on the occasion of the reading of his paper, a number of specimens of corroded plates cut from boilers of the ordinary construction; samples of the thickened-edged plates, flanged and bent, and pieces of welded plate that had been broken in testing the strength of the welded joints, were also shown.—*Engineering.*

WHY A GUN BECOMES HOT ON FIRING.

BY PROFESSOR CHARLES A. SEELY.

When a gun is fired a fierce flame issues from the muzzle, and there is little doubt that this flame was preceded by one still more intense in the confined space of the barrel. As there is manifest here an abundance of heat to warm up a mass of metal like that of the gun, people have readily and unanimously come to the conclusion that the heat of a gun, on being fired, has come directly from the combustion of the powder—the heat is absorbed at the interior surface and from thence is conducted throughout the metal according to the familiar laws. Nevertheless, this popular theory is not altogether sound; I may show that it is quite fallacious.

It is a long time since I have had experience with guns, but I remember quite distinctly that a gun gets warm very quickly. As I have had within a few days no opportunities for experiments, I have consulted many of my military friends on their experience in firing large and small guns, and find that their testimony generally agreed with mine, that a gun becomes perceptibly warm on the outside instantly on firing. Can heat travel through a mass of iron or any other metal instantly? Iron is among metals a very poor, slow conductor; if the conducting power of silver be represented by 100, that of copper will be represented by 74, and of iron by 13. The popular theory fails, because metal cannot conduct heat fast enough to satisfy it.

But before being conducted the heat must first be secured? How difficult this is will be apparent when we realize the small surface exposed to the burning powder compared with the mass of metal, and how very short the exposure is. The contact of the inflamed powder with the metal is only for an instant. There is often no perceptible interval between the explosion of the cap of the powder and the appearance of the flash at the muzzle. Can any great quantity of heat be communicated to a mass of metal in such a little space of time? I have plunged my hand for an instant into molten iron with perfect impunity. A bar of iron may be thrust through a flame many times without becoming perceptibly warm.

I think it quite manifest, from such considerations, that a gun does not receive all its heat from the heat of combustion; the combustion theory does not account for the rapid diffusion of the heat through the metal nor for its great amount.

Another source of heat, of which all know something, and which will relieve us of difficulty, has been overlooked by military men; I allude to the heat of percussion. If a piece of iron be laid on an anvil and struck a few smart blows with a hammer, it becomes hot; the rectilinear motion of the smith's arm is tranferred to the cold iron and in it becomes an undulatory motion of the particles of iron, and the iron is hot. In this case it will be observed that the part under the hammer becomes hot instantly, and is heated almost uniformly throughout. In the case of the gun are there not the same essential conditions—the percussion, the instant heating, and the heat throughout the mass? In short, I am of the opinion that if we could have the expansion of gunpowder, without any heat of combustion, we might still have practically nearly as much heating of guns as now.

The expansive force of fired gunpowder has been estimated all the way from 15,000 (Robins) to 1,500,-000 lbs. (Rumford) to the square inch. Should not this force produce as much heat as the fall of a collossal hammer of a corresponding weight?

The force of the recoil of a gun is never so great as the force which proceeds from the muzzle, and carrying the shot. Is it possible to show that the heat of percussion bears some definite relation to the difference of these? A unit of heat represents 772 foot-pounds.

The friction of the charge, in its passage from the gun, of course, contributes to the heating, but the amount of heat so produced must be quite small compared to the heat of percussion.

[From our own Correspondent].

Foreign Scientific News.

LONDON, Wednesday, June 6, 1866.

Last night a testimonial, in shape of three thousand guineas, was presented to Capt. Maury, late superintendent of the National Observatory at Washington, in recognition of the value of his meteorological researches to all maritime nations. When Capt. Maury left the United States for political reasons, he was warmly invited by the Grand Duke Constantine, of Russia, to take up his abode at St. Petersburg, and Prince Napoleon gave him a similar invitation in the name of France. Of the amount presented to him at the dinner last night, Holland subscribed £1,800, Russia £1,000, and the small remaining balance was made up by England and France.

Sir John Pakington, M. P., presided on the occasion, and among the guests present were the Mexican and Danish Ministers; Earls Nelson, Hardwicke, Grosvenor, and Powis; Admirals Sir John Hay, Young, Sir G. Back, Halsted, and Anson; Generals Beauregard and Walker; also Prof. Tyndall, Prof. Wheatstone, Commodore Jansen, Capt. Cowper Coles, and about a hundred others.

At the annual meeting of the Royal Geographical Society, last week, Sir Roderick Murchison, President, awarded the "Founder's" gold medal of the Society to Dr. Thomas Thomson, for his explorations in north-western India, among the mountains whence the Indus takes its rise, and for his researches in Thibet, and other parts of Central Asia. Dr. Thomson was the first to dispel the prevalent idea, entertained even by Humboldt, that Thibet was an elevated plain or plateau, and to trace the water systems, climate, and productions of that hitherto unknown region. For those researches Dr. Thomson, up to last week, never received any reward, and, in fact, in publishing his discoveries, was subjected to heavy pecuniary loss. The "Victoria" gold medal of the Society was then presented to Mr. William Chandless, for tracing, by his own unaided exertions, the river Purus, one of the largest tributaries of the Amazon, from its mouth to its sources. M. Du Chaillu next received 100 guineas from the Society, in recognition of the value of his recent researches in equatorial Africa. M. Du Chaillu, since his last visit to Africa, no longer describes the gorilla as a beast terrible to meet, as an animal that rushes roaring through the woods, gnashing its teeth, and beating its breast with its fists to produce a noise like the roll of a drum. On the contrary he now states that a whole drove of gorillas ran away when they saw him. The strictures of the English press on his first book of adventures have induced more moderate statements, yet it is but fair to M. Du Chaillu to state, that many of his disputed assertions about Central Africa, have been since substantiated as facts.

The *Great Eastern,* with the Atlantic cable on board, will leave Shearness on the last day of this month, and commence the laying operations about the 10th of July. She will be accompanied by the *William Cory,* steamship, 1,500 tuns, the screw steamer, *Medway* of 1,900 tuns, the *Albany* screw steamer 1,500 tuns, and the *Terrible,* man-of-war. The English Government will lend only one ship this time. In the attempt to raise the old cable, it is intended that three ships will grapple it at once, and the westernmost of them put on the greatest lifting strain, so that should it break the cable the other two ships will have a comparatively easy task to raise it, the strain being tak off one end of the loop.

As for the last expedition, Dr. Russell's book about it is of the most unsatisfactory description, and has been severely handled in this country. It has oozed out that in the picking up operations, last year, the incoming line of cable was subjected to sharp jerks, one every three or four minutes. The drum of the machine being a cylindrical form, the cable had to be what sailors call "surged" every few minutes, to prevent it from coiling itself off the edge of the drum. These facts have been suppressed in the book. The contractor's electrician, also, who had charge of the operations, has been, for some reason unknown, replaced this time by one of his juniors. As the Atlantic Telegraph Company had an electrician on board to report what he saw, the shareholders at one of their meetings demanded the production of his account of the engineering operations, and the directors refused the request. As it is customary in England for telegraph companies to print their engineers' reports, and post them to the shareholders, the secresy thrown by the directors over what might be a national undertaking, has brought down a great deal of unpopularity upon a noble enterprise, and it will be hard work this year to get up any enthusiasm in England, about the Atlantic cable.

An Extraordinary Railroad Disaster.

The great Northern Railway, of England, was the scene of an extraordinary casualty on June 14th, which is entirely unprecedented. It seems that a freight train broke down in a tunnel, and the precaution of flagging approaching trains having been neglected, one came along soon after and piled itself on the top of the freight train. Even this experience did not suffice, and a few minutes later still another train came in from the other end and dashed on top of the rest. This jammed the tunnel full to the very crown, and one of the engines having turned over, the coals fell out and set fire to the combustibles. For two days this fire burned unhindered, for the simple reason that it was impossible to check it. The noise of the fire, caused by the heated air rushing out of the confined place, is said to have been fearful. The immense traffic of the road was entirely stopped for the period mentioned. All this was caused by the simple neglect, in the first instance, of not flagging the coming trains. Only two lives were lost

Ryerson's Churn.

In the matter which accompanied the engraving of this churn, published on page 406 of the last volume of the SCIENTIFIC AMERICAN, the address of the inventor was incorrectly given as at *Princeton,* Ind. The real name of the town is Pierceton, Kosciusko Co., Ind.—the similarity of the two names causing the mistake. This churn will be found to expedite the laborious process of churning very much.