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IMPROVED FEED WATER HEATER AND PURIFIER.

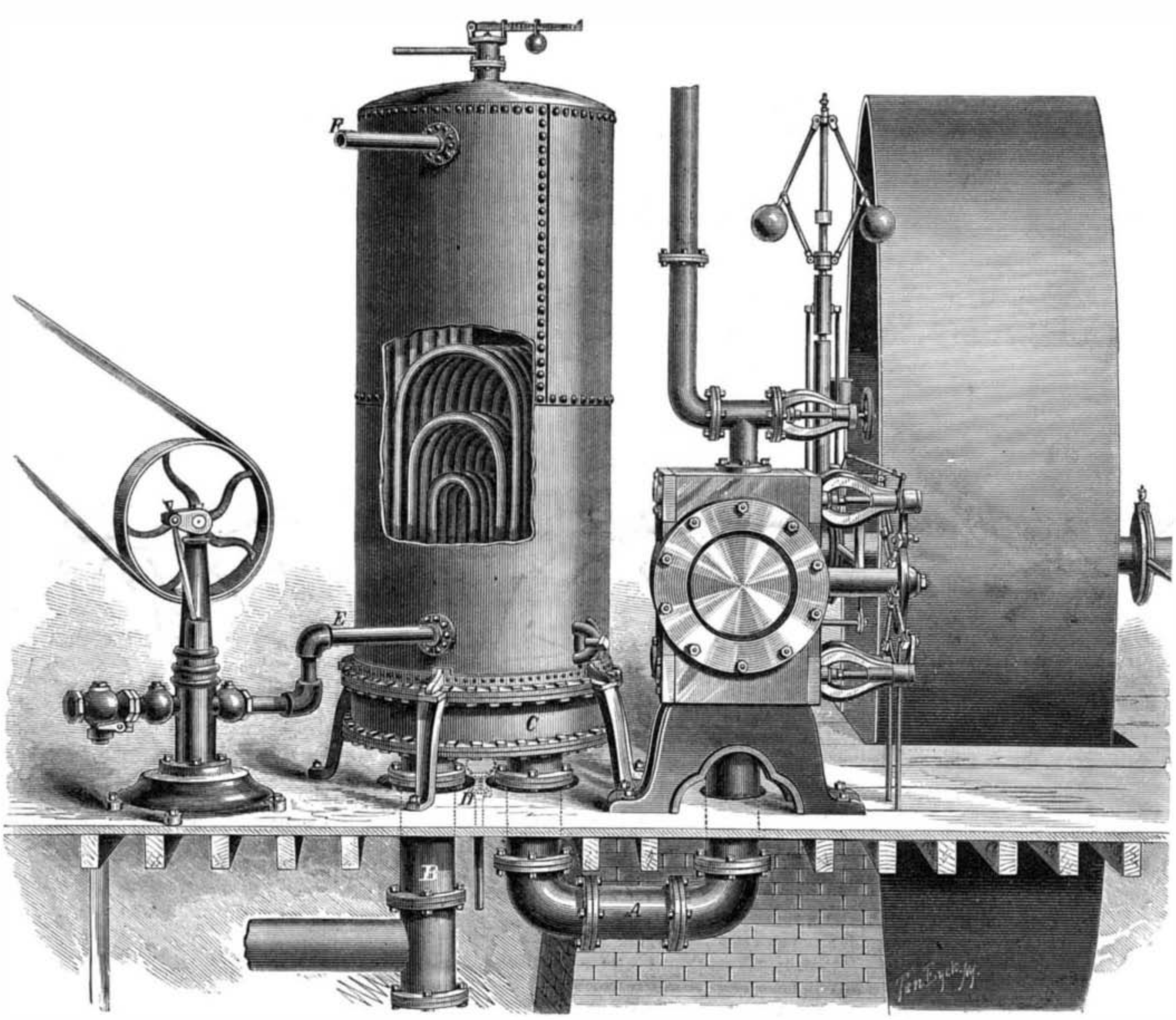
To the use of impure feed water, there is little doubt but that a large proportion of the constantly recurring boiler explosions may be attributed. The history of those catastrophes which have happened on the steamboats plying upon Western rivers shows that the majority have taken place when the streams were high and filled with impurities, which last, often mingled with grease or oil, were allowed to enter the boiler with the feed. It is very questionable whether exhaust steam, charged as it is with lubricating matter from the cylinder, should be permitted to come in contact with the feed water, since the grease, mingling with the impurities held in the water, may easily form an insoluble substance which, settling on the bottom of the boiler, may cause the burning out of the sheets, with the attendant dangers thereupon, or at best, with certain kinds of water, may establish foaming in the generator, likewise perilous.

In the annexed engraving is represented the Berryman feed water heater and purifier, an invention which has been in successful use for some time both in this country and in Europe. It was patented as long ago as 1872, by Mr. R. Berryman, of Hartford, Conn.; and since that date many changes have been made and improvements added, until the manufacturers think they have about exhausted all means for additional improvement.

The illustration represents the device attached to an engine, showing all the connections. A portion of the shell of the heater is broken away in order to exhibit the shape and position of the tubes These last are made in the form of an inverted U, and their lower ends are set in a tube sheet of cast iron varying from two to three inches in thickness. The shell is composed of boiler plate, strongly put together and capable of sustaining as high a pressure as that to which any steam boiler may be subjected. The tubes are seamless and made of drawn brass or copper. Their shape prevents any alteration by contraction or expansion of the metal, and the mode in which they are set in the sheet renders it impossible for them to work loose.

A is the exhaust pipe of the engine, through which the steam enters the V-shaped tubes in the heater, circulates through them, and finally is conducted off by the pipe, B. The steam can then be utilized for warming a building or shop, or for any other purpose, the same as if it had not been directed out of its course. The area of the tubes is, in every case, at least twenty-five per cent greater than that of the exhaust pipe, so that no back pressure on the engine is produced by them. The chamber, C, is divided by a steamtight partition, and the pipe from the blowcock, D, extends through this partition into the water space around the tubes. The feed water pipe, from the pump, injector, or hydrant, is connected at E near the bottom of the heater, and the eduction pipe, which conducts water to the boiler, is shown at F. A safety valve is added to guard against excessive pressure within the shell.

It is well known that the large majority of substances which form impurities in feed water will separate and deposit themselves when the temperature of the water is raised to 186° Fah. and thence to boiling: provided, however, that sufficient time is allowed for this to take place, that the water is permitted to remain quiet, and that it is kept under pressure. All of these conditions, it is claimed, are carried out in the Berryman heater. The capacity of the chamber is so regulated that it contains sufficient water to keep up a constant supply to the boiler for full thirty minutes. This supply being retained at 210° Fah., and under boiler pressure, allows ample time for the impurities to separate and deposit at the bottom of the heater, whence they are removed by occasionally opening the blow-out cock. There is always about 100° Fah. difference between the temperature of the water at the top and that of the water at the bottom of the heater, so that the sediment, falling into comparatively cool water, is not solidified, and therefore, being kept in solution, is easily blown out



BERRYMAN'S FEED WATER HEATER AND PURIFIER.

The water, being taken in at the bottom and removed at the top of the apparatus, is entirely free from agitation; and as it is pumped through the tubes with simply a check valve between it and the boiler, the same pressure acts upon it as upon the contents of the latter.

We are enabled to glean some idea of the practical working of the invention from a large number of commendatory letters from users of the same, submitted to us by the manufacturer. One writer says: "The feed water, delivered to our boilers in its purity, has not only kept them clean but has entirely removed all of the old scale which incrusted the flues." Another gives a highly favorable report after testing the apparatus very thoroughly on board a Mississippi steamboat. From one letter we learn that the heater maintains the water at a uniform temperature of 206°, and a new boiler connected with it six months ago is yet perfectly free from scale. Still another writer notes a saving of one third of his fuel, another states that hard lime water is rendered as soft as rain water; and thus we might continue giving extracts from dozens of similar testimonials, received from both English and American users, all agreeing in the same excellent results.

The reader interested can, however, obtain full particulars by addressing the manufacturer, Mr. I. B. Davis, Hartford, Conn.

To destroy chinch bugs, put old pieces of rag or carpet in the crotches of the trees attacked. When the worms spin, as they will, in the rags, throw the latter in scalding water. The bugs can thus be killed by wholesale

Wilhelm Bauer.

There died the other day an inventor who was not entirely unknown in engineering circles in this country. We speak of Wilhelm Bauer, the German submarine engineer, who expired lately at Munich, at the age of fifty-three. In him the now united Germany, for whose cause he fought in his younger days, has lost one of her most gifted inventors, who will now, when he is dead, receive that recognition which he strove hard during his life to deserve, but which the world was slow to accord. Wilhelm Bauer was the son of a Bavarian sergeant-major, and saw the light on December 23, 1822, at Dillengen, near Augsburg. His education was only of a limited description and he was at an early age apprenticed to a turner. But this occupation did not suit his ardent temperament and desire for distinction, and he entered the Bavarian artillery at the age of sixteen. Here he had the opportunity of acquiring a knowledge of mathematics, which he was ever eager to extend. On the futile war of independence of Schleswig-Holstein against Denmark breaking out in 1849, Bauer was animated by a disinterested enthusiasm for the cause of the duchies, and was one of the first to enter the collecting Schleswig-Holstein army as volunteer. During the short periods of respite in that struggle, he was able to follow his favorite studies. It is said that in his leisure hours he was fond of watching on the coasts of the Baltic the gambols of the seal, how they rose to the surface and as quickly disappeared, and that their play gave rise to the idea of building a ship which, seal-like, would rise and sink, and which could be navigated under the water. After great pains and exertions, Bauer constructed a model realizing his idea, and this soon found such favor that he was able, by means of a subscription raised among the officers and soldiers of the armies of the duchies, to build a small ship according to his plan. Accompanied by two sailors he undertook ten submarine trips with the most favorable results; but as the ship had been constructed on the most economical principles, Bauer's funds being limited, it sprung a leak during the tenth trial trip, and sank to the bottom of the Baltic. This happened on the 1st of February, 1851, at nine o'clock in the morning.

The anxiety of the multitude waiting for the reappearance of the vessel may be imagined, but it is impossible even to picture the terrible position in which Bauer and his companions found themselves. During fully six hours they remained in the almost hermetically sealed compartment of the ship, which was filled with compressed air and into which the water could not enter. Fortunately a happy idea struck Bauer in this emergency. He thought that if he were to suddenly open an exit to the great quantity of compressed air, it would rush out with great force. After the necessary preparations he placed one of the sailors close to the small hatch, closed tightly with glass. At the proper moment Bauer opened the hatch and the three were forced upwards, like, as Bauer expressed it, so many corks of champagne bottles, arriving safely at the surface of the water. This was at half-past three in the afternoon. The ship which he had named Fire Diver (*Brandtaucher*), and which was destined to serve as submarine fire ship, was of course lost; but general attention was drawn to the young inventor, and King Louis of Bavaria, as well as Prince Albert of England, patronized him, so that he was able to build a new model, which was inspected by the Emperor of Austria. It was the intention to utilize the invention practically in the Austrian navy; but the project had to be abandoned for the want of money experienced at that time by Austria. When, during the Crimean war, the English and French fleets invested Cronstadt, Bauer was invited by the Grand Duke Constantine to come at once to Russia and construct a ship which could be employed against besiegers. The ship was finished just when peace was concluded; but Bauer undertook 120 submarine trips with it. A large pecuniary compensation had been accorded to him; but as he did not comply with the demands of Russi an officials, he was exposed to many intrigues, and had almost to fly from Russia under the protection of the Bavarian ambassador. He repeatedly resided in London, and settled finally at Munich, where he continued his studies undisturbed. His name came again prominently before the public when he effected the raising of the Ludwig, sunk in the Lake of Constance. He earned a lasting name and honors by this feat, but at the same time contracted a severe affiction of the gout, which grew worse with time. Paralysed and deprived of speech, he spent his days in a chair, but his mind, notwithstanding bodily infirmities, was as fresh as ever. He subsisted on a pension granted him by King Louis, until death released him from his sufferings.—*Engineering.*

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NEW YORK, SATURDAY, AUGUST 28, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

THE ENGLISH PATENT BILL.

The new Patent Bill, which lately passed the House of Lords, was withdrawn in the House of Commons, and has failed therefore to become a law. A great mass of petitions were presented against it, but none in its favor. The general object of the proposed law was, as we have heretofore intimated, to curtail and ultimately to abolish the granting of patents in England. The intended change appears to have roused the strongest opposition among the scientific and working people of England, but was favored by the aristocracy.

The failure of the new bill leaves the present law in force, with all its excellent provisions for the granting and holding of patents by American citizens and other foreigners. Among the provisions are the following:

Any person may apply for, obtain, and hold an English patent for a period of fourteen years; the patent remains good during this period, if the fees are paid, whether the patentee works the invention or not; he is at liberty to do as he pleases in this respect; no one may use the invention without his consent.

Models are not required; but full drawings and specification must be furnished by the applicant.

The government grants a patent to every applicant, whether the invention be new or old; no official preliminary examination as to novelty is made, but the applicant is expected to make his own examinations, all previous patents being printed and accessible.

If the applicant takes out a patent for an old invention, one that is already publicly known, or has been previously patented in England, such patent will be worthless, as it will not be sustained by the English courts. But if the invention is new in England, the patent will be liberally construed and sustained by the courts.

The British patent covers England, Scotland, Wales, Ireland, and the Channel Islands, or a population of about forty millions of the most intelligent people in the world.

The business connected with the obtaining of English patents is easily transacted, while the postal and commercial facilities now existing between the United States and Great Britain are such that an American patentee experiences little more trouble in introducing and profiting from his English patent than from his home patent.

Nearly all inventions that are worth patenting in this country are equally valuable in England.

Circulars containing further information concerning English patents, their cost, etc., can be had, free of charge, at the office of the SCIENTIFIC AMERICAN.

THE IRRIGATION WORKS OF INDIA.

Among the more remarkable engineering undertakings of the last quarter of a century, remarkable for their bold conception and sometimes for their blundering execution, must be numbered the irrigation works of India. And since the Indian government has announced the intention of devoting to the extension of such works, during the next fifteen years, the enormous sum of a hundred million dollars, it becomes a matter of no slight interest to know both what has been done and what is proposed to be done in this direction.

The conditions, climatic and otherwise, which make necessary the expenditure of millions to correct the unkindnesses of Nature, are happily but little known in this land of abundant and timely rains. It is to be hoped that they never will be experienced; though it must be confessed that, in some of the more fertile parts of the land, the drift of climatic change is as pointedly in that direction as it used to be in other parts of the world, once fertile and densely peopled, now deserted and desolate. Ages ago, when Northern Africa was swarming with thrifty people, when Asia Minor harbored unnumbered paradises, when Persia was the garden of the world, their people would have scorned the idea that their lands could ever become the prey of drought and famine But such has been their fate. So in Northwestern and in North Central India, many seats of ancient power and civilization have become untilled and tenantless through the failure of genial showers; and large areas, as in the lower half of the Punjaub and the adjoining territory of Scinde are scarcely habitable, except along the rivers, where irrigation is possible. To a less but still serious extent, the upper valley of the Ganges, a large portion of Central India, and the east coast of the Madras Presidency are made to suffer from a scanty and somewhat precarious rainfall, and are even liable to witness famine following hard upon drought, except where irrigation has made them partially independent of local rains.

It is about forty years since the British conquerors of India began to take a constructive interest in the reclaiming of the formerly fertile parts of the country by means of irrigation works, first by the restoration of ancient works which had fallen into decay.

From an early period the lowlands along the Indus and its five branches—which give name to the Punjaub—were saved, from the desiccation which befel the plains away from the river, by means of wells and inundation canals leading off from the natural water courses. These works were shallow trenches, unskilfully planned and rudely executed, from five to seventy miles in length, and fed by the surplus water of the rivers when swollen by the melted snow of the Himalayas. At a relatively early period, many of these canals were restored, deepened, and improved under British management, to the great advantage of the surrounding country. For the further alleviation of the same region, a much more ambitious series of irrigation works has been undertaken, of which more will be said further on.

The earliest work of the sort undertaken by the English was planned and executed by Sir Arthur Cotton, of the Madras Engineers. In the southeastern quarter of Madras, the rainfall, though double that of the Punjaub and Scinde, has long been slight and precarious. Various means were adopted by the native rulers to store up water against the time of need, chiefly by means of reservoirs locally known as tanks. Many of these tanks have fallen into ruin, still as many as 43,000 remain, with 30,000 miles of embankment and 300,000 separate masonry works. The same presidency contains also the most ancient specimens of a more ambitious class of irrigation works, consisting of extensive systems of canals, fed from reservoirs formed by the damming of large rivers. The first great work of Sir Arthur Cotton was the restoration of one of these systems, by means of which fertility had once been given to the lower valley of the Cauvery river.

In consequence of the gradual erosion of the bed of one division of the Cauvery, the stream which fed the irrigation canals had been almost deprived of its water, and the total ruin of the country, which depended on the canals, was seriously threatened. By means of an immense dam or annicut, the water was set back into the old channel, the canals were supplied once more, and the irrigation of Tanjore was restored. Thousands of acres of previous waste were brought under tillage, and the productiveness of the whole territory was much increased. The value of the land was doubled, the annual profits of the cultivators were increased by nearly $500,000, and the government land revenue was increased $350,000 a year, all by an improvement which cost only $400,000.

So successful and beneficial was this work that Colonel Cotton was enabled to undertake a similar but more extensive operation for the improvement of the lower valley of the Godavery. This was the construction of a dam across the river, two and a half miles long, one hundred and thirty feet broad at the base, and twelve feet high. The dam was faced with heavy masonry, filled in with earth, and protected by an apron of massy stones extending seventy or eighty feet down the stream. A vast system of canals, adapted both to irrigation and commerce, is fed from above the dam. Altogether there are between 800 and 900 miles of artificial channel from which water is supplied to ground otherwise barren, and 50,000 boats and rafts are employed in conveying the produce to market. When the works are finished, 1,000,000 acres will have been brought under cultivation. So far the works have cost somewhat more than $3,000,000; but this sum has been repaid more than twice over by the increased public revenue. Similar though not so remunerative works have been executed for the irrigation of the delta of the Kistna.

While these works were in progress, the engineers of Bengal were employed in reopening and extending the Western Jumna Canal, giving life and verdure to 350,000 acres. In 1848 was begun the Ganges Canal, with a main channel 348 miles long, primary branches of 306 miles, and minor distributaries aggregating more than 3,000 miles. The area over which it diffuses irrigation is 320 miles long by about 50 miles wide. Its cost was $7,000,000.

In the naturally rich and formerly populous region of the Punjaub, as already noted, a renewal of life and fertility is being effected by the Baree Doab. This canal leaves the Ravee—one of the five rivers—where it issues from the Himalayas, and, passing the famous city of Umritser, strikes across the desert, and will eventually rejoin the Ravee after a course of 140 miles. On its way, it throws off branches right and left, the length of which gives the whole work (exclusive of minor distributaries) a length of 357 miles. The area expected to be irrigated is 650,000 acres.

In the adjoining province of Scinde are also large tracts of once productive and well peopled country, now a desert, whose productiveness might be restored by the improvement of the old and the construction of new irrigation canals. It is therefore proposed to re-water the country—the valley of the Lower Indus—by means of four systems of canals: an ambitious scheme, which will probably be carried out sooner or later, converting hundreds of miles of waste land into fertile fields.

Many other irrigation schemes are in various stages of development in India, some of great magnitude. Among these may be mentioned the operations recently begun for turning eastward a portion of the waters of the Sutlej, to restore to its ancient condition an immense area, once richly productive, but on which the desert has lately been fast encroaching. Still more important are the works which have been going on for several years in Orissa, to compel the rivers Brahminuy and Mahanuddy to fertilize the deltas which their inundations have heretofore periodically devastated—works on which $6,000,000 have already been expended

Though not always wisely planned or economically executed, the irrigation works of India have been, even in a commercial sense, paying investments. Some of them have been extremely remunerative, yielding to the government exchequer, in water rates, increased rent of land, and other revenues, a liberal percentage on the capital invested in them. For example, the Cauvery canals are reputed to pay 23½ per cent on their cost, the Godavery works 45 per cent, the Kistna 16 per cent, the Western Jumna 30 per cent. In ordinary years the Ganges Canal, which was unnecessarily costly, pays barely 3 per cent; but in the rainless autumn of 1860, it was the means of saving grain crops enough to keep alive more than a million people, who must otherwise, if left to themselves, have perished from hunger; thus saving to the State not only that number of lives, but the necessity of a proportionate remission of rents and a vast expenditure for the relief of insolvent tenants. The Baree Doab, in the construction of which some stupendous blunders were made, pays 5 per cent. The unfinished Orissa works have not yet begun to be remunerative. Still, as a possible preventive of the horrors of a famine such as scourged the district in 1866, the vast sum thus far expended cannot be said to be an unprofitable investment.

IS EDUCATION FOR CULTURE OR FOR USE?

The interests of education and of educational institutions will occupy a large share of attention during these summer months. And while the universal commendation, by friends and interested parties, of good, bad, and indifferent alike, which conveys the false impression that there is not an inefficient school or instructor in the land, is a topic worthy of serious consideration, we pass it to notice the question as to the real object of education.

Many of our best educators sneer at the idea of making education commercial—at looking to the practical in its pursuit; and in our highest educational circles, these things are considered beneath the dignity of a real student. This idea has been so eloquently and beautifully expressed by President Capen, of Tufts College, in his recent inaugural address, hat we quote it as a sort of text for the remarks we wish