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No. 488,

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STEAM AT A THOUSAND POUNDS PRESSURE.

Jacob Perkins, an American in England, who was the father of the high pressure system of heating by hot water in closed circuits, early gave his attention to the immense power of steam at high pressure for the projection of missiles of war, and so far perfected a steam gun as to exhibit it before the Duke of Wellington in 1824. It was very effective, but the "Iron Duke" considered that a steam boiler that threw away balls as fast as that did would be out of place in an army, and would waste ammunition. From this, steam as a high pressure power has slumbered, with occasional revivals, for more than a half century.

About 1840 a steam rifle made by Perkins was brought to the United States, and exhibited at the southwest corner of Broadway and Chambers Street, New York. It consisted of a steel barrel of medium rifle size, a lever valve, bullet magazine, with a revolving plug arranged for feeding single bullets or a volley. The whole swiveled upon a substantial frame.

The steam generator was of the vertical tubular type, consisting of a strong wrought iron pipe of three inches internal diameter and about eight feet high, with eight internal tubes, each about one-quarter inch in internal diameter. The chamber of the large tube was connected with the valve chamber of the gun by hydraulic pipe with metallic swivel attachment, while the internal tubes were connected with a coil of hydraulic pipe forming the walls of a portable furnace, so that steam used for operating the gun was derived from a secondary generator; the primary circulation being a closed hot water circuit with an air expansion chamber, both divisions having hydraulic or high pressure safety valves.

A small hydraulic pump worked by hand served to feed the generator with the water required for steam; the whole apparatus being very compact, occupying but a few square feet of floor.

A cast iron target a hundred feet away completed the plant.

The closed circulation of hot water from the coil in the furnace through the small tubes in the generator carried the pressure up to a thousand and more pounds to the square inch in a few minutes, and would set the safety valve singing in a tone unknown at ordinary pressures. Under this pressure no water issued from the tiny apertures of the gauge cocks; a blue vapor could be discerned, the tone giving the indication of steam or water.

The safety valve upon the generating or circulating coil was set at three thousand pounds to the square inch, and would sometimes blow off when the gun was not in action, or the water low in the generator.

The heat of the water in the circulating coil was so great as to immediately blue the surface of the pipe when freshly scraped near its entrance to the generator, and would fire pieces of pine instantly.

The heat of the steam in the gun chamber frequently melted the bullets, and rendered volley firing very difficult; for on more than one occasion the whole volley was melted in the chamber by the sticking of the first bullet. The report from the discharge much resembled that of the ordinary rifle, with perhaps less sharpness.

The bullets fell from the iron target in dust, when thrown at the highest pressure; while from lower pressures they were battered into all shapes, from cones to flat, ragged disks.

A peculiar feature of that high pressure steam apparatus with the necessarily high temperature of its active element was the entire absence of any form of packing; every joint was a metallic contact, and the valves of hardened steel with seats of the hardest bronze.

ELASTICITY OF LEATHER BELTS.

One excellent, if not absolutely necessary, quality in a belt is elasticity. Under some circumstances a belt that is non-elastic and only pliable will act, but it is not so useful as a belt that combines elasticity and pliability. A gut string used as a round belt is not elastic—only pliable—and to do effective duty it must be kept very tight, making a strain on the bearings of the spindles it connects. But a belt that is greatly elastic will develop its full driving power, even though it may run quite slack. An amateur foot lathe of considerable capacity can be run by an India rubber thong with so slight a tension as to allow the finger to pass between it and the scored pulley without pain.

Much of the value of leather belts is due to their elasticity; this, as well as their substance, aiding in their adherent contact with the pulley face. By the term elasticity the quality of stretch—permanent stretch—is not intended. An ordinary bullock hide is usually permanently stretched five inches before being cut up, but the elasticity of the belts made from it is not impaired. New belts also have to be "taken up" usually after running a short time. But there is an elastic quality in a well fitted belt that is recuperative; it will return on itself when the temporary strain is removed. It follows, then, that the periodical release of belts from their working strain is a reasonable practice.

A recent experiment appears to prove this. As a test, a mechanic put new leather belts on two iron turning lathes at the same time. The lathes stood side by side, the work on them was similar, and the belts were cut from the same roll. The belt on one lathe was thrown off every night, and that on the other was never released. The latter was shortened four times during its life, while the other was taken up only once, and when the continually strained belt was so nearly worn out as to require repairs, the nightly released belt was in excellent condition.

This treatment of belts is not always possible; the prime movers and secondary belts can hardly be released every night, unless in such cases as where a long belt is run with an idler pulley or tightener; but the small ultimate belts that drive lathe cones, drills, milling machines, planers, and many other tools and machines could be so treated without trouble and with a resultant economy.

NAILS.

A large dealer in builders' hardware said recently that the demand for clinch or clout nails and for chisel pointed wire nails had largely increased within a year, as compared with that for the ordinary cut nails, and that flooring nails with the wedged-shaped heads were also used in place of the nails with the flat upset heads. His reasons were that better work resulted from the better nails, and there was far less waste. For the coarsest purposes the less first cost of the ordinary cut nails with the flat head induced builders to continue their use; but he believed the improved form and better material of the tough wire and clinch nails would, in time, drive out the inferior material and defective form. The principal advantage of the wedge shaped head, as in floor nails, is that the head never breaks off in driving, as it is only a gradual enlargement of the body of the nail, instead of an upset across the nail. But the chisel point of the wire nail is its especial merit, as it cuts a clean passage through the fibers of the wood for the following of the body of the nail, instead of "stunting" and mutilating the fibers, as the blunt pointed nails do.

The common cut nails will not usually clinch, even when the clinch is turned in the direction of the grain of the wood; but they may be considerably toughened by heating to a red, and gradual cooling. A hardware establishment was burned a few years ago, and among the stores were nearly a hundred kegs of cut nails of various sizes. The remains from the fire were sold to another dealer, and as soon as the value of the burned nails became known he could sell no others until they were gone.

Money in Sunflowers.

Much has been written during the past few years about the value of sunflower seed for feeding to fowls and sheep. The value of the leaves of the plant for feeding to horses has also been favorably noticed. A correspondent of the Toronto *Globe* calls attention to the value of the seed for making oil. In his communication he writes:

Care should be exercised in selecting sunflower seeds, as there is a very great difference in the number of flowers, and consequently in the number of seeds produced, at least so I have proved in my own garden, some varieties ranging from one to three flowers, while others will produce as many as fifty, sixty, and seventy flowers on one stalk. When the object is to provide feed for cattle and fowl, the last variety mentioned will doubtless be found the best paying; when the purpose is to secure oil, only the best oil seed variety should be selected; and, as I have not experimented in this line for oil, I am at a loss which variety to recommend. Experienced farmers and gardeners already know that the plant will readily grow in almost every soil, but prefers light, calcareous land, unshaded in every respect. The quantity of seed required for an acre is from four to six pounds. In some cases the seed is drilled into lines eighteen inches apart, and the plants are subsequently thinned out to thirty inches apart in rows, thus giving about eleven thousand plants to an acre, and each plant produces about one thousand seeds—the better sorts would probably produce many more. In England it is recommended that the sunflower be earthed up when about one foot high, but it will require no further attention. It is said the yield is much increased by the use of a fertilizer, and old mortar is regarded as one of the best. The sunflower has long been grown for its oil seeds in India and Russia, and more recently its cultivation has been taken up in Italy and Germany. In China and Tartary it is produced in immense quantities, and why not equal quantities, as cheap feed for cattle and in benneries, if for nothing else. In Russia, where the production of seed is very large, the oil is expressed on the spot, and is largely employed for adulterating oil, while the purified oil is considered equal to olive and almond oil for table use. In India one acre of land is stated to yield 11½ hundredweight of seed, which in the press gives out forty-five gallons of oil, and is there compared with ground nut and applied to the same uses. I think Canada, including the Northwest, can produce oil in this way quite as well as India or Russia. I also find that experimental culture in France gave 1,778 pounds of seed, yielding 15 per cent of oil (275 pounds) and 80 per cent of cake; but the product (according to the French report) varies considerably according to soil, climate, and cultivation, and that the average may be roundly stated at fifty bushels of seed from an acre, and one gallon of oil from one bushel of seed; also, that the percentage of oil to seed ranges from 16 to 28, and that of husk to kernel from 41 to 60; but this may be in some measure attributable to the varieties used, though none of the reports speak of the varieties grown.

ELECTRIC lights have been introduced into a gunpowder manufactory in England. The buildings are scattered over three miles of territory, and the wires are carried above ground from a dynamo near the center of the inclosure.