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SEVENTEEN THOUSAND PATENTS SECURED THROUGH OUR AGENCY.

The publishers of this paper have been engaged in procuring patents for the past seventeen years, during which time they have acted as Attorneys for more than SEVENTEEN THOUSAND patentees. Nearly all the patents taken by American citizens in FOREIGN countries are procured through the agency of this office.

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THE CONTROL OF STEAM BOILERS.

The control and management of steam boilers is one of the most important duties devolving upon those who have the supervision of steam machinery. To paraphrase an old proverb, it may not incorrectly be said: "Take care of the boiler and the engine will take care of itself." Although this advice is by no means to be strictly interpreted, it serves to illustrate the force of our argument, which is, that all the attention and care that can be given to the subject in question will be amply repaid. The boilers are the seat of force and develop the power required; into their doors, as into the crucible of the refiner, enter directly the gold and silver of the proprietors. In the proper management of it and in rendering a full equivalent therefor, lies the whole art and secret of successful management. It has been asserted that boilers are in too many cases overtaxed, and our observation and experience convinces us of the truth of this statement. In numberless instances we have seen boilers where the crown sheet was most inadequately stayed to the shell; the crow feet being eighteen inches apart or more, the braces few and insufficient in size, the socket bolts mere pins, and the water spaces altogether too narrow to admit of a thorough circulation of the feed-water. A boiler in the condition thus described carried a nominal pressure, according to safety valve weight, of 75 ℔s.; upon attaching a gage and testing the actual pressure it was found to exceed this figure by nearly 20 ℔s., per square inch, showing of course an error in calculation. Some time afterward we examined this same boiler and found the crown sheet forced down fully an inch from a true plane; it was no more than was to be expected under the circumstances, and we cite the above instance as one fresh in our mind of imperfection, where safety and economy ought to be assured beyond doubt.

Boilers are much neglected; because they have no outwardly visible joints, pins, or other mechanical attachments, they are slighted and left to take care of themselves. But the difference between one well cared for, and one neglected, is just as apparent to the practical eye as it is in the engine. If on opening the furnace doors we find the flues or tubes half full of ashes and cinders; if upon removing the hand hole plates, the water spaces in the legs and front are found obstructed and a heavy deposit of sediment, scale, mud or refuse of any sort choking up the various passages, we have the most incontrovertible testimony that the engineer is unfit for his place, and that he is daily jeopardizing the lives of those in his vicinity and ruining his employers' property. The above combination of details is not by any means unlikely to occur; nearly all practical men will bear us out in this assertion, and will call to mind similar cases that have come under their own observation. When the daily duty of a boiler is once ascertained, it is easy to limit its performance within certain bounds. If a pressure is required of 75 ℔s., carry that amount; not 85 one hour and 65 the next; that would show carelessness in firing. If the construction of the boiler demands that the feed should be kept up to the second or third gage, keep it there, don't let it rise and fall above or below, one or the other; that involves a waste of coal. Pumps in good order force, if the reservoirs be full, an equal quantity at every stroke of the plunger, and we can readily understand how the feed being once regulated will go on in its daily routine with as much certainty as any other well kept apparatus. These matters will doubtless seem trivial and unworthy of notice, but it is through attention to details that great results are achieved. It is no controversion of our argument to say that, because a boiler has not exploded or does not explode while the vices above-mentioned are daily carried on, care and supervision are thrown away. Even if an immediate and terrible disaster does not occur, it is not through any merit of those who expose the boiler to such danger. In any event costly property is greatly deteriorated and money shamefully wasted by carelessness and want of attention to the various minutiæ which make up the grand total of skill in engineering. Every engineer may learn something from unskillful persons; he may see in their want of attention to these grave matters what loss of property to the manufacturer and what ruin of reputation to the engineer is involved through shiftless and wasteful habits.

WHY MONEY IS WORTH ONLY FIVE PER CENT.

There is no class of questions which excite more universal interest than those which relate to the acquisition, distribution and accumulation of property, and among these questions one of the most important is that of the causes which determine the rate of interest. These are perfectly simple, and are easily understood if we take the trouble first to understand what it is that is borrowed and loaned in the market as capital.

If we step into the office of Robbins, the great note broker in William street, we shall see retired merchants and others coming in from time to time during the day, and looking over the notes and acceptances which have been left with him for sale, and when they find the note of a firm which they think is sure not to fail, some of them will, if the rate is satisfactory, purchase the paper; in which case the clerk reckons the discount, and the buyer gives his check for the balance. Let us trace this operation and see what it is that passes hands.

In the first step it is doubtless money. The maker or owner of the note delivers it to the buyer, who pays for it either in money or in his order to the bank where his money is deposited. In this, as in other operations, a sufficient amount of money is employed to effect the exchange of values. But if we look a step further, we shall discover that the great bulk of capital which has been borrowed and is bearing interest now exists in the form of cloth, beef, machinery and other commodities. The rate of interest, therefore, is determined by the relation between the supply and demand of capital in all its forms—in merchandise generally—the quantity of coin and bank notes in circulation having very little influence upon it.

In 1849 the writer of this heard a lecturer explaining that the gold mines of California where to make money so abundant that the taking of interest would be abolished; but when the same lecturer arrived in San Francisco, he found that the current rate of interest on perfect security was ten per cent a month. Though money was more abundant in proportion to the wealth of the people than it ever was in any other community in the world, the total capital—embracing all its forms—was very scarce, and the demand for it was very great. The country was filled with men who had not succeeded at the East, and who were consequently poor, while the extraordinary resources of the State furnished unusual opportunities for the profitable employment of capital. Capital in any other form as well as that of money commanded a large revenue for its use. A rocker that cost $30 would rent for $1 50 per day, and a lot of ground that was offered for sale at $225, commanded a rent of $40 per month.

We shall find in other places a corresponding relation between the rent of land, buildings, machinery, &c. and the rate of interest on money. Indeed, when a man hires money, what he really wants the use of is some other form of property. If a manufacturer leaves his note at Robbins's for sale, or offers it at a bank for discount, though he obtains money in the first instance, he presently exchanges this money for machinery, or raw material, or some article to use in his operations. These articles perform the office of tools in his hands, enabling him to produce a larger amount of value, and thus to pay for the use of his capital. If a merchant hires money, he uses it for the purchase of merchandise, by which he is enabled to do a larger trade and make larger profits, and thus he can afford to pay for the use of the capital. Neither the manufacturer nor the trader could afford to hire money and keep it in the form of money. In this shape it would not earn its interest.

The great mass of capital which is at interest in the country exists, therefore, in the form of merchandise, and the rate of interest depends upon the relative supply and demand of the aggregate capital.

The supply of capital is furnished by all who live within their incomes, and therefore depends mainly upon the provident dispositions and habits of the community. The demand for capital comes from the enterprising and active men in the community who discover profitable modes of employing it. The rate of interest at any time depends upon the relative power of these two classes; as would be anticipated, this is constantly fluctuating. At the present time in the city of New York it is five per cent.

VISITS TO OUR MACHINE SHOPS—THE ALLAIRE WORKS.

Among the many large shops in this city, for the manufacture of all kinds of machinery, the Allaire Works holds a prominent position. Since 1819, when these Works were first incorporated, they have been steadily occupied in building marine and stationary engines that have created for them the most enviable reputation. Some of the most celebrated ships, in point of speed and economy, have had their engines put in at the Allaire Works. Here was built the famous *Vanderbilt*, the *North Star* and the *Baltic*, or one of her sister ships, comprising the old Collins' line; and others, whose histories are not familiar to the public generally, have had their massive engines constructed at these Works, from the conception of the design to the fastening of the last rivet in the wheel-arms. The proprietors are at present very busy with their various contracts, of which we give a list, adding previously, however, that some 800 men are now employed upon them.

The frigate *Lackawanna* is receiving a few finishing touches, being nearly ready for sea; her engines are similar in design to those of the *Adirondack*, which was lately lost off the Florida coast; the cylinders are 42 inches diameter with a mean pitch of 17½ feet. The boilers are Martin's patent, with 8,950 feet fire surface. The usual blowers and engines are also being furnished to her.

For the Norwich freight line a beam engine of 54-inch cylinder by 11 feet stroke, and furnished with Sickles' improved cut-off, is building; the wheels are of wood, 32 feet in diameter by 7½ feet face; it has one boiler of Erastus Smith's patent, a combination of flues and tubes, with a double row of furnaces. Also one engine for Sanford's line, 56-inch cylinder by 11 feet stroke, similar in detail to the above.

Two inclined engines for side wheel gunboats, 58-inch cylinder by 8 feet 9 inches length of stroke, with overhung iron wheels of 26 feet diameter and 9 feet face, with Martin's patent boilers, Sewall's condenser and the blowing engines for the boats, are also in hand.

One beam engine for C. Vanderbilt, Esq., 80-inch cylinder by 12 feet stroke, with iron wheels 33 feet diameter, 8 feet face, and two horizontal tubular boilers with 9,000feet of fire surface, is also being constructed.

These are all the new contracts now building except six gun-carriages for the Ericsson batteries, and the massive machinery for the huge iron-clad ship *Puritan*, now being laid down in Mr. Rowland's shipyard, Greenpoint. These are two cylinders of 100 inches diameter by 4 feet stroke, and are among the largest screw engines in the world, exceeding the *Grand Admiral* and *Great Eastern* by 16 inches in the diameter of the cylinders alone; the latter vessel however, has four instead of two, as is the case with the *Puritan*. One of these cylinders is already bored and the flanges faced; the other had, at the time we saw it, but just been lifted from the pit wherein it was cast; it will soon take the place of the one just finished in the mill, the other parts, slides, valves and rods, are in a forward state and their completion is being hastened as much as possible. Fuller details of the engines will be given soon. Twenty-three tuns of metal were melted for the cylinder casting alone. Some vessels have also just been completed by these Works and repairs are going forward on others. The Haytian man-of-war—*Twenty-second of December*—is receiving a general overhauling.

The engine of the *New World* is being adapted to the steamer *Dictator* now at Mr. Englis's yard, Tenth street (E. R.), and the steamers *Columbia, John Brooks, Vanderbilt* and *North Star* are having general repairs made throughout. Two engines, formerly in service upon the western lakes a short time, are being transferred to some new vessels building for the New York Steam Navigation Company.

At their works at the foot of Eleventh street (E. R.) the company are building the Whitney battery, *Moodna*, which is being pushed forward as rapidly as possible. Through all parts of the establishment the greatest vigor and energy are observable; and the sound of hammers and the laboring of the machines over their ponderous loads create the impression on the mind of the beholder that here at least nothing is neglected that skill and experience can suggest toward building up a navy which shall be at once a source of pride to the country and a terror to its enemies.

THE VELOCITY OF STEAM AND AIR UNDER PRESSURE.

Having had frequent inquiries lately respecting the velocity with which steam and air flow into a vacuum, and into the atmosphere under pressure, we will present the laws relating thereto, and other information on the subject. Gases, air and steam, being expansive fluids, come under the same consideration. The method of estimating their velocity under pressure, is founded on the laws of falling bodies, and is a simple application of the laws of gravitation. Thus if a ball of metal is dropped from an elevation, it falls 16 feet in one second of time, and at the end of that second, it has acquired a velocity of 32 feet. The next second it falls 48 feet, so at the end of two seconds it has fallen 64 feet. If the times are represented thus for five seconds 1″, 2″, 3″, 4″, 5″, the spaces fallen in each second will be as 1, 3, 5, 7, 9, and the spaces fallen through in the whole time as 1, 4, 9, 16, 25—the squares of the time. This proportion holds good for any time or space through which a body falls in vacuo. The velocities are as the times of descent, and the spaces fallen through are as the squares of the times, consequently the velocities are as the square root of the hights, or spaces through which a heavy body, like the ball of metal, falls. As gravitation therefore produces a velocity of 2 in descending through the space 1, the hight in feet through which a body falls being multiplied by 64, will give the square of its velocity in feet per second. The velocities being as the square root of the hights, if the hight fallen be 1 foot, its velocity is 8—the square root of 64. This is the constant which is employed in calculating the velocity of falling bodies from known hights, and it is sometimes called "the action of gravity upon a body falling one foot." In applying such data to ascertain the velocity of flowing water, let us suppose the head to be 100 feet, then its velocity per second is 80 feet because $\sqrt{100}\times 8=80$. This is the rule to ascertain the velocity of flowing water under any known head, only instead of 8 being used as the constant, the coefficient 5·1 is used in practice because the flow is not perfectly free through a slit—the water is retarded at the rate of about three-eighths of its theoretical speed. We will now show how this law is applicable to the calculations of the velocities of the flow of steam, air or gases. In this connection another law comes into the calculations, namely, the densities of elastic fluids. Thus the heaviest gas is the most sluggish in its flow, and *vice versa*. Taking air as a standard with a density of 1, the density of oxygen is 1·10563, while that of hydrogen is only 0·06926, and being the lightest of all gases, it flows into a vacuum with a greater velocity than any other, under the same pressure. The velocity of gases in such cases correspond very closely with the square root of their densities. Thus the square root of the density of oxygen being 1·0515 and air being 1, the time of passage of a constant volume of oxygen was observed to be 1 0519, 1·0519, and 1·0506 in different experiments, air being 1, according to Professor Graham on the "Effusion of Gases." Now by knowing the velocity of falling water, under a pressure due to its hight, and knowing the weight of water, all that requires to be done to ascertain the velocity of flowing gases, is to take their relative densities compared with water, and their pressures for the relative hights of a column of water. Thus for example a column of water 34 feet in hight exerts a pressure of 15 lbs. on each square inch at the foot of the column. As a cubic foot of water weighs 62·5 lbs. while a cubic foot of steam of 15 lbs. pressure on the inch weighs ·0373 lb. therefore if we divide the pressure 15 lbs. by ·0373—the weight of a cubic foot of steam—and multiply the quotient by 144, we shall obtain the hight of a column of steam. By extracting the square root of this hight and by multiplying it by the constant 8—as in the case of falling water—we will ascertain the velocity of the flow of steam under 15 lbs. pressure into vacuo. Thus, given the total pressure of the steam, divide this pressure per inch by the weight of a cubic foot of steam, the quotient is the hight of a column of steam one foot square. This quotient is then multiplied by 144—the number of square inches in the base of the cubic foot, and the product obtained is the hight of a one-inch square column of steam equal in weight to the given pressure on the square inch. The arithmetical process for finding the hight is represented thus:—

$$\frac{p}{w}\times 144=h.$$

and the velocity of the flow into vacuo in terms of this hight is

$$v=8\sqrt{h}.$$

Substituting in this expression the value of h previously found, we have

$$v=8\sqrt{\frac{p\times 144}{w}},$$

or by a more simple mode

$$v=96\sqrt{\frac{p}{w}}$$

This rule is obtained by multiplying the square root of 144 by 8—the constant for the action of gravity per foot. To find the velocity of steam of 15 lbs. pressure flowing into a vacuum by the above rule, a cubic foot of this steam weighs ·0373 lbs. and 15÷0373=401 7. Then $\sqrt{401.7}\times 96=1924$ feet per second, is the velocity with which it flows into a vacuum. To work out the velocity of different pressures, a table containing the density of steam per cubic foot under different pressures, is required, as the density increases with the pressure.

Many persons suppose that according to the increased pressure of steam, a proportional velocity of flow is secured, such as twice the velocity for thirty pounds over fifteen pounds pressure and so on. This is not so, for steam of 100 lbs. pressure has only a velocity of 2,081 feet per second, which is but a trifle greater than steam of fifteen pounds pressure. Steam from one pound pressure and upward means above atmospheric pressure. When flowing into the atmospheric instead of into a vacuum, the outer pressure must be reckoned. As the flow of steam is in proportion to its density, as well as pressure, the benefit of using "dry steam" will be apparent. The moisture carried over with the steam from the boiler to the cylinder of an engine is just so much of a drag upon its velocity, involving a proportional loss of useful effect.

The weight of steam is inversely as the relative volume. Thus as the weight of a cubic foot of water is 62·5 lbs. and as the relative volume of common steam is about 1,700 we have 62 5÷1700=·0367 lbs. as the weight of a cubic foot of steam. From this data we can also ascertain the weight of a cubic foot of air. Thus air is 815 times lighter than water, therefore 62·5÷815= 0766 lbs. To ascertain the velocity of air flowing into a vacuum under 15 lbs. pressure, 15÷·0766=195. Then $\sqrt{195}\times 96=1{,}340$ feet per second as the velocity of air flowing into vacuo. As heated air is not increased in density, if the temperature is elevated to 491° Fah. its pressure is 15 lbs. on the square inch because it doubles its volume with this quantity of heat, and it will flow into the atmosphere with the same velocity as compressed air of 15 lbs. pressure will flow into a vacuum. From such scientific data, the advantages which could be secured from using dry superheated steam, and air of a high temperature in engines become evident. But owing to the impossibility of obtaining lubricating agents to withstand high degrees of heat, and owing to the deteriorating effects of elevated temperatures upon the common metals, the full theoretical benefits of high superheated steam, and of hot air cannot be secured in practice, as applied to motive engines.

PROSPERITY OF THE COTTON MANUFACTURE.

Of all the surprising effects of the present war there was certainly no one less anticipated than an unusual prosperity of the cotton manufacture, and yet there never was a time when this great interest seemed to be more flourishing than at present. The shares of all the joint stock companies are very high. Those of the substantial old Merrimac at Lowell, the par of which is $1,000, are now selling at $1,200. Those of the Laconia Company, which have been at about $600 for several years, are now, just after an extra dividend, selling at $1,205. Large additions are being made to the works in all portions of the manufacturing districts. The Manchang mill in Northbridge, Mass., has just received an addition of between 5,000 and 6,000 spindles, and so great is the general demand for machinery that the owners had an offer of 50 cents per spindle advance if they would leave the frames at the shop where they were built. The Hamlet Company at Woonsocket, R. I., is building a large addition to their mill; the Whitings at Northbridge have just completed a new dam, and J. W. Slater & Co. are enlarging their trench at Slatersville in order to supply water for their increased machinery. In short, all the manufacturing villages of New England are busy in enlarging or repairing their works, and making ready for spinning and weaving cotton on a larger scale than ever before.

It is true that many of these enlargements are made for the sake of giving employment to the workman; the manufacturers feeling that they must support their hands in any event, and that it is as well to keep them employed and get returns of some value for their support. Still, there is unquestionably a general feeling of confidence in the permanent prosperity of the business, and even at the present time, with cotton at 60 cents per pound, some styles of goods can be made at a profit.

The large mill at Quinebaug, Conn., is working Surat cotton, and it is found to make very good cloth. Business in Cohoes, N. Y., has never been more active than at present. All the cotton mills are running full time, and the hosiery establishment finds it difficult to keep pace with its orders.

PREPARING WINTER PICKLES.—Take them from the brine, place them over the fire, and cover with fresh water; when they are scalded take them from the fire, and after throwing a little salt into the water, set them (in the kettle) to cool. The next day pour off the water, cover them again with fresh water, scald up and set away to cool, throwing in a little salt as before. Repeat this process for nine days; then scald the vinegar, dissolving in it a bit of alum the size of a nutmeg for a moderate-sized jar of pickles; while hot, pour the vinegar over the cucumbers; after a few days, if necessary, heat the vinegar a second time and pour it over them. Pickles thus prepared have no white scum rising on the surface.