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**WHAT CAN BE DONE FOR INVENTORS---ADVICE
GRATIS AND ADVICE FOR PAY.**

For the information of inventors, we would state that it is the custom, at the office of this paper, to examine models or drawings and descriptions of alleged new inventions, and to give written or verbal advice as to their patentability, without charge. Persons having made what they consider improvements in any branch of machinery, and contemplate securing the same by Letters Patent, are advised to send a sketch or model of it to this office. An examination will be made and an answer returned by early mail. Through our Branch Office, located directly opposite the Patent Office in Washington, we are enabled to make special examinations into the novelty and patentability of inventions. By having the records of the Patent Office to search, and the models and drawings deposited therein to examine, we are enabled to give an inventor most reliable advice as to the probabilities of his obtaining a patent, and also as to the extent of the claim that it is expedient to set up when the papers for an application are prepared. For this special examination at the Patent Office we make a charge of Five Dollars. It is necessary that a model or drawing and a description of the invention should accompany the remittance.

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

Pamphlets of instructions as to the best mode of obtaining patents in this and all foreign countries are furnished free on application.

For further particulars as to what can be done for inventors at this office, see advertisement on another page, or address

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BREECH-LOADERS TO BE ADOPTED.—The Government has appointed a commission of seven military officers, to meet at Springfield Armory on the 4th of January, for the purpose of testing breech-loading carbines and muskets, in order to select the best for army use.

PROFESSOR RANKINE ON EXPANSION.

We have the pleasure of laying before our readers in this number a communication on Expansion, from W. J. Macquorn Rankine, LL.D., of Glasgow University. Among the eminent masters of science, the two who have probably devoted most labor to the study of steam, are Regnault, of France, and Rankine, of Scotland; and there can be no higher authority on all questions relating to this department of physics than Professor Rankine. In this communication, the effects produced on the temperature and tension of steam by its expansion under various conditions are most clearly and distinctly stated.

It will be seen, that Professor Rankine says that steam, in expanding, without doing work, is slightly superheated; thus ratifying our reasoning on this point, and contradicting the conclusions of Mr. Isherwood in regard to condensation from "expansion *per se*."

In going over so much ground in a short newspaper article, of course it was necessary to condense the several statements to the utmost, and while we admire the terseness, we cannot help wishing for a fuller discussion of some of the positions. From some of Mr. Tyndall's remarks we should suppose that he would take the ground that steam in escaping through a safety-valve performs precisely the same amount of work, in disturbing the atmosphere and in other ways, that it does when it pushes a piston before it in a loaded engine. But Professor Rankine says that in the former case it does no work, and is superheated, while in the latter, it performs work, and is partly condensed.

In Mr. Isherwood's experiments, as well as in those of Messrs. Hecker and Waterman, it was found that from 8 to 45 per cent. of the steam was condensed in the cylinder, without doing work. This condensation takes place even when the cylinder is surrounded by a jacket of hot steam, the cooling not being effected by the conduction of heat through the walls of the cylinder, but by the abstraction of heat from the interior surface, in re-evaporation, during the exhaust, the water formed by condensation during the previous stroke. Should the fact of this large condensation be confirmed by other observers, it will be a very important matter to be taken into account in the practical application of Professor Rankine's principles to working engines.

Ought this condensation to be considered, or ought it not, in the third case cited by Professor Rankine, where steam expands and performs work, being maintained exactly at the temperature of saturation? It is said that the circumstances of this case are practically realized in many actual steam engines, as is shown by the agreement of their performance with the results of calculation. Though the performance of the engine agrees with the calculated power of the steam operating in the cylinder, what would be the agreement if the calculation was based on the whole quantity of steam formed in the boiler?

It was from the assumed disturbance of the pressure in the cylinder of a steam engine by this condensation and re-evaporation, that we supposed this instrument fails to furnish data for determining the theory of expansion. Though indicator diagrams give a good approximation to the whole work done, if from 8 to 45 per cent. of the steam is condensed without doing work, the work done is not a very close approximation to that which the whole of the steam would perform if it were all utilized.

The occurrence, however, of this large condensation needs confirmation by other observers before it can be accepted as fully established.

In the mean time, it is exceedingly satisfactory to have the world's present knowledge of steam so briefly and distinctly set forth. Steam in expanding without doing work is superheated, and when Messrs. Joule and Thompson have ascertained the rate of superheating, we shall have a complete theory of expansion, which will supersede the calculations based on the Mariotte law and the hyperbolic curve.

COPPER IN SPAIN.—M. Tribut, a French mining engineer, has lately discovered a very rich vein of cobaltiferous copper, containing nearly 9 per cent. of oxide of Cobalt, near Oviedo, in Spain. He has entered into an agreement with an English house to take nearly the whole produce of his mines,

RETROSPECTIVE.

There is nothing more illustrative of the national energy and genius than the indomitable spirit exhibited under adverse circumstances. If in any other country than our beloved America a faction should arise and threaten the national existence, the plow would stand idle in the furrow, the threads of the loom swing listlessly from the frames, the anvils clink only to the sharpening of swords. The arts have not languished with us though the war still goes on. No very great inventions have been introduced during the past twelve months, but in that time old ones have been well tried and not found wanting.

The turret system for iron-clad vessels of war, against which so much has been written, has proved itself of paramount importance, and signal victories have been gained over our enemies through its adoption.

The utilization of the products of combustion, as applied to air engines, has been perfected in Roper's machine, and a very useful addition made to the list of prime movers.

In the matter of working heavy guns on shipboard we have great superiority over foreign powers. Two men can now handle a 20-ton gun, or heavier, with as much ease as a field piece in battery is maneuvered, and that though the ship be rolling at any angle. When a gunner can stand on his feet, these huge cannon can be worked. The system is the invention of Capt. John Ericsson, and patents were taken out on it through this office.

In the beautiful art of photography some progress has been made during the past year. The distinguishing improvements relate to the printing process. Mr. Swan, of England, has brought to great perfection the plan of carbon printing, by which the salts of silver are wholly discarded. Pictures superior in artistic effect to the silver prints, more permanent, cheaper, and capable of greater variety of tint and tone, are thus produced. Another improvement which has attracted much attention is that of Wothe, of Germany. He prepares the paper for printing by pouring upon its surface a collodion which contains a few grains of the salts of uranium, and also of silver. Very beautiful pictures are made on this paper, and some of the inconveniences of the ordinary method of silver printing are overcome. Both of the above improvements have been fully set forth in our columns.

The extension of the electric telegraph over Russian America, binding it to this country, although not an invention, is one of those great enterprises which will open up new countries to the influence of civilization, and tend to dissipate ignorance, the twin brother of barbarism.

New textile fabrics are being experimented with; new substances for paper making are being tried, but come into use slowly, although manifestly economical and valuable.

In the art of war, very much has been done, and is doing, to render our nation superior to all others. Cannon of large caliber have been introduced, and are making way, in spite of the obstacles thrown in their path by learned and unlearned. Submarine warfare, as relates to the use of torpedoes, has also been experimented with, and the gallant achievement of Lieut. Cushing, with Chief Engineer Wood's apparatus, is an evidence that practical results can be obtained.

The adoption of breech-loading small arms to a considerable extent is also a desirable conclusion arrived at, and the experiments with wrought-iron cannon now in progress will doubtless end in the adoption of them for certain purposes. In hooped ordnance we have the Parrott gun, of which the Chief of Ordnance says that it has proved itself to be a most excellent weapon, superior in general to all others.

The development of petroleum has attracted the greatest attention during the past twelve months, and has become an established industry. The geographical extent of the country in which petroleum is found is known positively to be of immense area. Much value will always attach to it as a staple article.

Of minor inventions the number and character are too great for special mention. The list of patent claims, published weekly in this journal, affords convincing proof that inventors are not idle. There are many things which will never become celebrated in the world that now employ hundreds of tons of iron

and thousands of dollars of capital in their production.

OIL STOCK EXCITEMENT.

Nothing in the history of this country, if we except the furor that followed the opening of the gold fields of California, has caused so much excitement in business circles as the rapid development of the petroleum oil interests. There are oil stock exchanges, oil stock journals, and all the other appliances of regular commercial and financial operations. Oil cities even have sprung into existence, and speculation is running up to fever heat; hundreds of Joint Stock Companies have been organized, and a still larger number are now rapidly organizing. Thousands of persons are being allured to invest their money in the stocks of these companies under the stimulus of promises of large dividends.

Now, although there is much substantial merit in the oil well productions of the country, and it is true that there are many really substantial Companies, it behooves those who are infected with the oil fever, to be extremely cautious how they invest their money, or they will surely suffer loss.

Most of the Companies now organized have a nominal capital stock far exceeding the actual investment. Purchasers are attracted towards them by the magnetic newspaper puff, and by rose colored prospectuses they are led to expect results which, in many cases, can never be realized. To illustrate how these Joint Stock Companies are sprung upon the credulous public, we will give an example. A few individuals get control of a patch of land located somewhere in the oil region—land secured under excitement and at speculative prices. The amount promised to be paid for the property we will assume to be \$100,000, a portion of which will be taken by the original owner in stock; with a reserved working capital of \$25,000 additional. Upon this basis a stock scheme of \$500,000 is predicated, and all the enginery well known to the getters up of Stock Companies—for it is a profession now-a-days—is set in full tide of operation. Large commissions are paid to friends to forward the scheme by stirring about among their acquaintances and inducing them to subscribe. These *disinterested* "friends" are "let in," as the phrase is, on "bottom prices;" in other words, they get their shares of stock at cost prices, besides receiving generous commissions for roping in outsiders who pay for their stock two and three times its actual cost in the original investment. Such stocks are known in the market as "watered stocks," and the name is applied to oil stock—more water than oil, which is sometimes a peculiar phenomenon of the oil well—is quite apropos. In reference to the productive value of a particular tract it must be, in many cases, purely hypothetical. Calculations are often based on an assumed fact; sometimes simply on the ground that hard by is a "hundred barrel well" owned and worked by some other company; but cash dividends on the stock will be declared and duly paid—and thus the outsider will be at once assured that he has indeed "struck ile." Matters will proceed in this way for a few months, perhaps, during which time, under this artificial stimulus, the originators of the scheme will find ample opportunity to sell out to eager outsiders. Dividends will then cease, and all these oil stock martyrs will have to show for their investment will be a nicely engraved stock certificate, a few acres of undeveloped land, and a return of perhaps twenty-five per cent, or less, of the original investment in the watered stock. Even these poor profits from the speculation, the certificates excepted, may not be secure in possession; liabilities for the debts of the company may materially lessen them.

According to a carefully prepared table now before us there are more than three hundred and fifty organized companies now in existence, with published capitals, ranging from \$50,000 to \$10,000,000, and one company, proposing to consolidate several others with it, a capital of \$15,000,000.

It is impossible for any sound minded man to ignore the fact that thousands, if not millions of dollars will be abstracted from the people's pockets, and wasted upon a set of men, who, under the guise of respectability, are nothing more nor less than a set of genteel swindlers. As a general rule, we should think it would be safer to look for good

investments in any oil stocks rather than in those brought to our notice in the long winded advertisements which appear in the newspapers. Companies which can be relied upon are not obliged to resort to newspaper puffs for their success; and we advise those of our readers who have an itching for oil stock investments to look sharply into the matter before purchasing largely.

The stock speculative fever is now raging throughout the whole community to an alarming degree—and when the reaction comes on, many an unfortunate dupe will suffer a most prostrating debility.

PROF. DOREMUS'S LECTURES.

DELICATE TEST FOR ARSENIC.

The compounds of hydrogen formed the subject of the third lecture of Prof. Doremus's course on pneumatic chemistry. Among the most interesting experiments exhibited was the decomposition of arseniuretted hydrogen by heat. Some hydrogen was produced in a retort in the usual manner by the decomposition of water, and was passed through a U tube containing lime to free it from any carbonic acid that it might contain, and then through a second U tube filled with bits of chloride of calcium to absorb the vapor of water mingled with it, in order to procure the gas perfectly pure and dry. It then entered a small glass tube, the middle portion of which was curved into a flat coil, which was heated red hot. No stain appeared on the tube. But on pouring a solution of arsenic into the retort so as to produce arseniuretted hydrogen, a metallic deposit immediately made its appearance beyond the coil, showing that the gas was decomposed by the heat, when the hydrogen was set free, and the arsenic was deposited in the metallic form. The lecturer stated that if oxygen gas was blown backwards into the tube the arsenic would be oxydized, and the crystals of white oxide of arsenic would be found in the tube on the opposite side of the coil.

A NEAT MODE OF MAKING ORPIMENT.

Prof. Doremus explained that chlorine has so strong an affinity for hydrogen that it will take that element from many of its compounds. To illustrate this he introduced a little arseniuretted hydrogen gas under the mouth of a tall inverted bell glass filled with water, when the gas, of course, rose to the top, displacing its own volume of the water. Some sulphuretted hydrogen gas was then poured in the same way up the same glass. On adding some chlorine gas to the mixture, the chlorine took the hydrogen from both the arsenic and the sulphur, when those two elements entered into combination as the sesquisulphuret of arsenic, or yellow orpiment. The hydrogen and chlorine combined to form hydrochloric acid gas, which was absorbed by the water.

FREEZING OF MERCURY IN A RED HOT CUP.

The experiments of the fourth and fifth lectures were mostly repetitions of those made by the same lecturer last winter, and fully described at the time in the SCIENTIFIC AMERICAN. One of the most impressive of these was the freezing of a thimble full of mercury in a red hot platinum cup, by means of solidified carbonic acid and ether.

VOICE OF THANKS TO THE LECTURER.

At the close of the last lecture of the course, a vote of thanks was unanimously and most heartily given by the audience to Prof. Doremus, for his exceedingly interesting lectures and brilliant experiments.

TO OUR READERS.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and enclosing \$1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of \$2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

MODELS are required to accompany applications for Patents under the new law the same as formerly, except on design patents, when two good drawings are all that are required to accompany the petition, specification and oath, except the Government fee.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgement of our reception of their funds.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.



ISSUED FROM THE UNITED STATES PATENT-OFFICE FOR THE WEEK ENDING DECEMBER 20, 1864.

Reported Officially for the Scientific American.

Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying size of model required and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

45,465.—Machine for Making Match-splints.—Emory Andrews & William Tucker, Springfield, Mass.:

We claim, first, The combination of the series of hoppers, the sectional knife cylinder, E, and the guides, f, on the table, B, arranged, constructed, and operating substantially as described. Second, The rack, G, to which an intermittent rectilinear motion is imparted by suitable mechanism in combination with the guides, f, knives, e, feed-plate, D, and hoppers, C, constructed and operating substantially as and for the purpose set forth. Third, The combination of the elastic bands with the stationary lower slat and the upper movable slat in the vertically moving rack by which the match sticks are received and held, at the intervals between the sections or tiers, as they pass from the table under the pressure of the succeeding set.

Fourth, The arrangement substantially as described, consisting of the stationary and movable combs and their operating mechanism by which the alternate match splints within the embrace of the clamp, g, are slipped out so as to detach their points for dipping. Fifth, We claim arranging the match-splints in the clamps in the manner described, as effected by the combs, r', so that they may project alternately at each side of the clamp for dipping and so that the tiers of matches being removed from the frame, may be laid upon each other checker-board fashion, with the blank ends separating the charged ends, preventing the friction of the composition on adjoining matches.

45,466.—Magazine or Self-loading Fire-arm.—John F. Appleby, Mazomanie, Wis.:

I claim the combination of the cartridge ratchet-rod, G, with the breech-piece, C, substantially in the manner and for the purpose herein shown and described.

I also claim the combination of the spring cartridge lifter, I, with the breech-piece, C, and ratchet-rod, G, substantially in the manner and for the purpose herein shown and described.

[This invention pertains to that variety of breech-loading fire-arms known as "magazine guns," in which a considerable number of cartridges are carried in the stock, and are so connected with and operated upon by the mechanism of the arm that the cartridges are successively seized and deposited within the barrel, ready for firing. An engraving and description of it appeared on page 49, Vol. XI., SCIENTIFIC AMERICAN.]

45,467.—Pump.—John Bean, Hudson, Mich.:

I claim the combination of the plungers, M and L, with the center valve, g, and the two valves, n, the whole constructed and operated substantially as and for the purpose herein described.

45,468.—Ore Amalgamator.—John M. Beath, San Francisco, Cal.:

I claim, first, A cylinder so constructed as to take the pulp in at its ends, and discharge it through openings in its periphery, using for that purpose the cylinder above described, or any other that is substantially the same and will have the intended effect.

Second, I claim the described method of arranging the dies on the periphery of the cylinder so as to produce a free circulation of pulp in the tank around the dies and cylinder.

Third, I claim the described method of hanging the dies so that the wear and pressure increases from the front to the back part, the whole being for the purposes set forth.

45,469.—Cartridge Box.—Erastus Blakeslee, Plymouth, Conn.:

I claim the combination of one or more movable metal tubes, each containing two or more cartridges with a spring top cartridge box and side pouch, as herein described and for the purposes set forth.

45,470.—Evaporating Apparatus.—Stephed Bowerman, Battle Creek, Mich.:

I claim, first, The arrangement of the evaporating pans, E, and central zig-zag flue, C, within a closed furnace, A, in such manner that the top and bottom surfaces of said pans will be subjected to the heat radiated from said flue, substantially as described.

Second, A flue, C, which is conducted in its upward course through the furnace in such manner as to form an upper and a lower heating surface for each one of a series of removable pans, arranged substantially as described.

Third, Supporting the flue, C, and also the pans, E, when they are arranged substantially as described upon the frames, F, and rods, a, substantially as set forth.

Fourth, The application of over-flow pipes, g, to removable or stationary evaporating pans, which are arranged one above the other within a closed furnace, substantially as described.

45,471.—Grain Dryer.—Jonathan S. Buell & Samuel A. W. Marsh, Buffalo, N. Y.:

We claim, first, The combination with a grain-dryer and with a furnace for steam boilers or other fireplace of a reheating furnace and a fan-blower, when the latter is so arranged in a pipe or pipes leading from the primary fireplace into the grain-dryer, substantially as and for the purpose set forth.

Second, The combination and arrangement of the damper, J, and the pipes, D and L, with the furnace, A, and the rotary fan, R, substantially as and for the purpose set forth.

Third, The combination of the pipe, Q, or its equivalent, with graduated openings with the rotary fan, R, for blowing either a hot or cold blast, substantially as and for the purpose set forth.

Fourth, The combination of the damper, V, with the pipe, C, for the purpose of regulating the draft of the boiler furnace, substantially as and for the purpose set forth.

45,472.—Horse Hay Fork.—Jason R. Cadwell, Dexter, Mich.:

I claim, first, The combination of the hinged toothed handle, C, locking-plate, B, and forked head, A, in such manner that the fork can be used either for elevating hay or as a common dung fork, at pleasure, substantially as described.

Second, Pivoting the handle of a hay-fork to a catch-plate, B, which is affixed to the fork-head, and applying a catch to said handle for fixing it at any desired angle to the tines of the fork, substantially as described.

45,473.—Stern-bearing for Propeller Shafts.—R. E. Campbell, New York City:

I claim the combination of the box, C, wedge, D, and one or more keys, E, F, arranged and operating as described.

[This invention consists in the application of a wedge acted upon by a key in combination with the lower box of a stern-bearing, in such a manner that by the action of the key and wedge said box can be readily adjusted as it wears, and when it has completely worn out it can be easily removed and replaced by a new one, without disturbing the bracket.]