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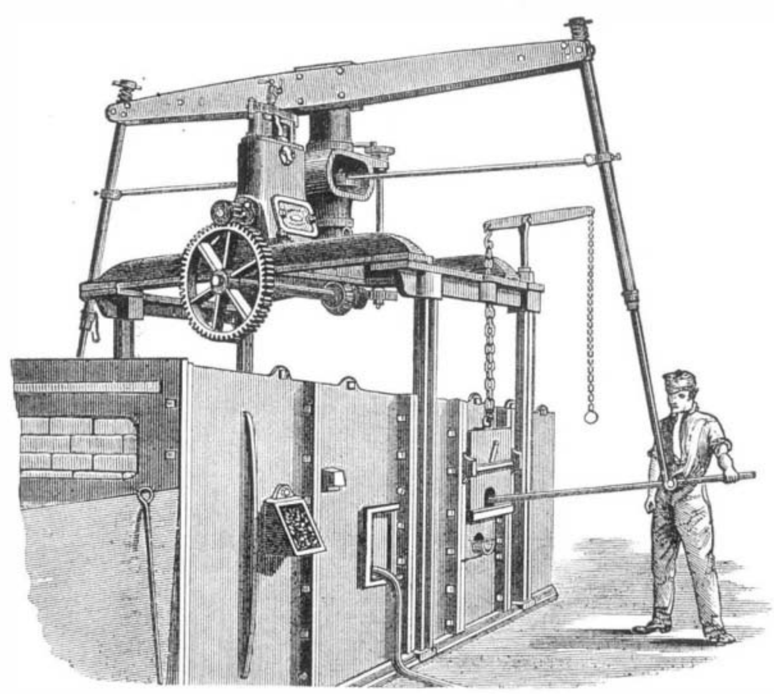
PUDDLING MACHINERY.

We illustrate herewith a rabbling machine for puddling iron, which can be used in conjunction with any of the known furnaces in puddling, and is now almost exclusively used in the Cleveland district, in England, being fixed over the ordinary furnaces. The machine and engine [Clough's patent three-cylinder] are attached to a substantial bedplate, supported on four double-headed rails, or by other means, over the furnace, the latter having a door at each side for charging and withdrawing the bloom when puddled. From each end of a wrought iron beam are suspended two tubes, to which are imparted a vibrating motion from a crank plate working in the column of the machine. These tubes have at the lower end a double hook, on which the rabbles hang, and the latter, in addition to receiving the vibrating motion of the tubes, also have imparted to them a radial motion from the ends of the wrought iron beam. The rabbles thus operate in two directions, and puddle the iron over the whole surface of the furnace bed. The usual charge for a furnace is about 14 cwt., but considerably larger charges have been successfully dealt with.

The consumption of coal is about 14 cwt. to the ton of bars made, and much less fettling is required. The men have easier work and get out a much greater weight in less time than by ordinary hand labor. Considerably over one hundred of these machines have been sold during the past year, and they are acknowledged by those whose opinion should carry weight, to solve in a most satisfactory manner the problem of mechanical puddling. Special care has been taken to have all the working parts as far as practicable protected from dust, as it is well known what grinding effects the dust and ashes from puddling furnaces have upon machinery.



CLOUGH & CO.'S PUDDLING MACHINE.

BRAYTON'S HYDROCARBON MOTOR.

It will be remembered that not long ago we illustrated and described the above-named invention in its then most improved form. Of late, however, the construction of the machine has undergone considerable modifications ; and, as will be seen in the annexed engraving, its construction has been materially simplified. In order to appreciate the nature of this in many respects remarkable motor, which, through its utilization of the gases due to the sudden combustion of oil, may be started or stopped almost immediately, which requires no continuous fire and therefore no furnace, which in brief, costs nothing while not actually in operation, it will be well briefly to review its history as an invention. Thus we shall best exhibit the connection between the present and prior types of machine.

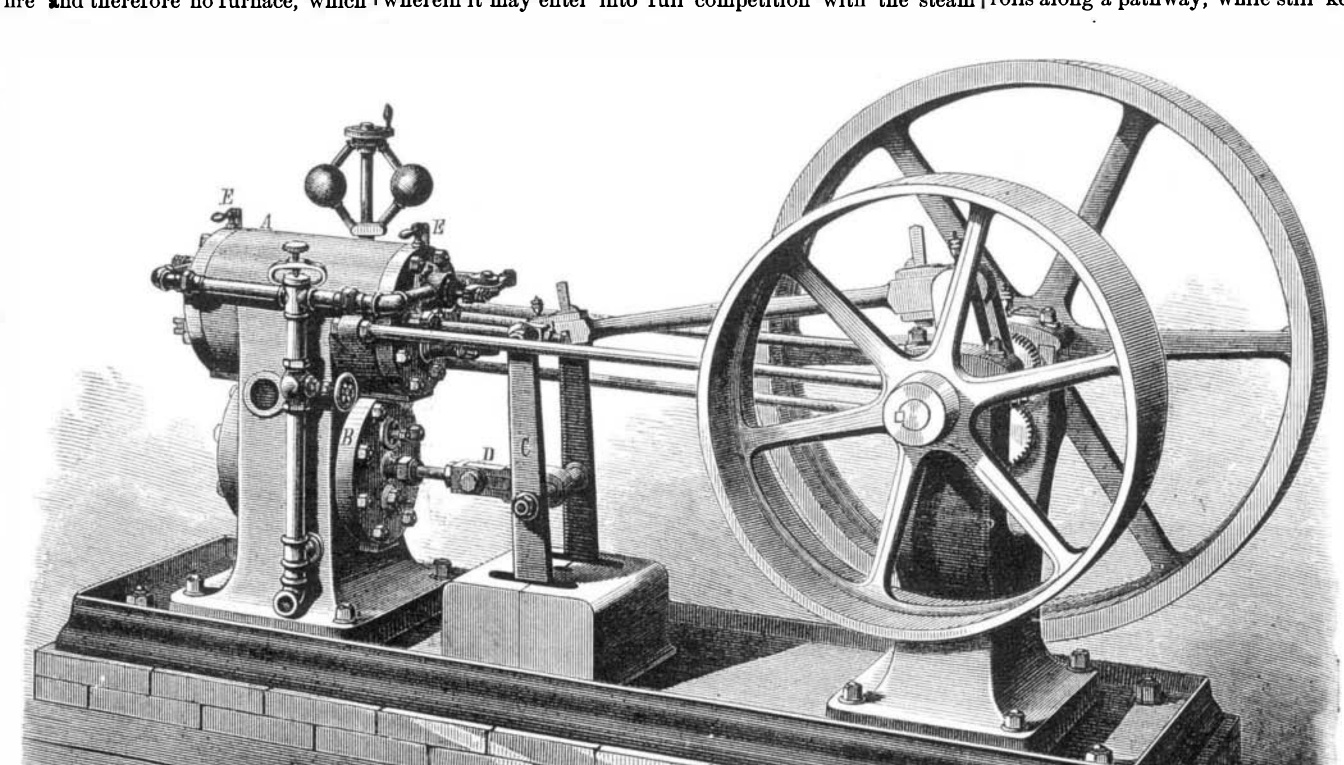
In the first engine made by the inventor, Mr. George B. Brayton, a well known engineer who has devoted a quarter of a century to this especial subject, separate charges of hydrocarbon were exploded, the force acting on a free piston to compress air, which in turn expanded upon the crank piston. Subsequently a rack and reversible catch or pawl held the piston, and the vacuum was used in connection with the air pressure. Five engines were built on this principle, only however, to be abandoned when the idea occurred that an explosive mixture could be burned without explosion by utilizing the principle embodied in the Davy Safety Lamp. On reducing this plan to practice, another difficulty was met in the production of a vapor compound which has a tendency to condense under high pressure ; and the effect of the varying temperatures upon the evaporation was a further trouble. The substitution of coal gas for liquid hydrocarbon obviated the trouble ; and, after nineteen years of labor, the inventor found himself possessed of an efficient gas engine, which he patented in 1872, and which subsequently satisfactorily underwent tests made by eminent engineers in this city.

Mr. Brayton now resumed his studies on the oil engine, and after two years he devised a motor wherein a combustible compound is formed by mechanical means, which can (he claims) be used successfully regardless of pressure or temperature. Then followed an improvement in extending the water circulation through the piston, so that the power can be applied to both sides of the same, thus doubling the capacity of the engine. Latterly, the principles have been extended to engines of large dimensions, and thus the oil motor has been developed, so to speak, into a position wherein it may enter into full competition with the steam engine. Although it may never do all that steam has done, it is but just to add that it can do that which never has been accomplished while using steam, namely, that, through the invention, a hundred horse power engine may be almost instantly set in motion by igniting a small burner with a match.

The principles upon which the engine operates are as follows : A small pump feeds the necessary quantity of petroleum into a chamber containing a fibrous substance. An air pump forces through the fibrous compound, which is situated close to the cylinder, the quantity of compressed air necessary to the combustion of the petroleum. The air, in passing through the fiber saturated with petroleum, becomes mixed with the hydrocarbon; and from the combustion of the compound, the expansive force which operates the engine is generated. A small independent pipe keeps a current of air passing through the fiber, and thus continuous combustion is secured. To prevent the combustion of the fiber and the petroleum therein contained, there is, between them and the cylinder bore, a perforated plate which acts upon the principle of the Davy lamp, and thus completely isolates the combustion which takes place in the cylinder. This combustion can only occur as the hydrocarbon and air enter the cylinder; and since this is accomplished gradually, the combustion is gradual, answering exactly to the admission of so much steam. The engine is so constructed as to cut off the supply of hydrocarbon and air at a definite point of the stroke; and the remainder of the stroke is completed from the expanding force of the products of combustion, thus securing the economy due to working expansively. The action of the engine is, therefore, substantially the same as that of an ordinary cut-off steam engine. To keep an equable ratio between the power of the engine and the amount of its load, a pressure diaphragm is provided; while by a very simple arrangement, the supply of oil can be increased or diminished to suit the demands of the duty.

Instead of having guide bars and crosshead guides to guide the piston rods, a novel and simple device is used, as will be seen by referring to our engraving, in which A is the engine cylinder, B is the air pump, and C is a lever connected to the engine and pump pistons. The bottom of this lever is a section of a circle struck off the centre of the piston-rod crosshead journal. As a consequence, the bottom of the lever, C, rolls along a pathway, while still keeping the center of the top crosshead parallel at every point of the stroke, with the pathway, which, being true with the bore of the cylinder, produces a parallel motion without any of the friction due to a sliding motion. The direction in which the fly-wheel revolves is *from* the cylinder (looking at the top of the fly-wheel); and thus the whole tendency due to the angularity of the connecting rod is to keep the lever down upon the pathway on the bed-plate.

The first double-acting petroleum engine made by Mr. Brayton ran in Machinery Hall during the Centennial Exhibition. It was entered as a 10-horse engine, but proved upon a friction brake test to give 12½ actual horse power. The 10-horse engine here illustrated contains many advantages over, and im-



BRAYTON'S HYDROCARBON ENGINE.

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provements upon, the one exhibited. It has been stated that the chemical constitution of petroleum shows it to be, as a fuel, 25 per cent. superior to all other fuels. In the Brayton engine the whole products of combustion are contained in the working cylinder, thus, it is claimed, utilizing to the utmost extent the theoretical value of the fuel. In this connection, however, it may be said that, since petroleum, if consumed to practical completion, leaves a mineral residue, the combustion in this case not carried to its final limit, there remaining in the cylinder a comparatively heavy oil, which prevents the formation of a solid deposit, and which serves at the same time for lubrication. The engine is substantially and well built, and has, as will be seen, but few parts, the working parts being accessible and all under the eye of the engineer.

For further particulars address the Pennsylvania Ready Moter Company, 132 North Third street, Philadelphia, Pa.

Communications.

Binocular Vision.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of November 25, I notice an article giving the history of the stereoscope; and having never seen in print any other theory of binocular vision than that contained in the article, I conclude that scientific men accept these ideas as correct. Until it can be ascertained that a person who never saw with but one eye does not see things in relief, the theory of Sir Charles Wheatstone, that a superposition of one image on another is necessary, cannot be proven. If any one closes one eye, the relief view of objects is not affected. But in this case it may be said that it is caused by the experience of previous observations. In viewing objects at a distance there is a convergence of the vision, which allows only one focussed point to be seen at a time, but each eye sees a different image as the object is viewed from two different points about two and a half inches apart, yet only one object is seen. When I was a boy I often amused myself in observing objects passing by the corn crib. If the slats are two and a half inches wide and nailed vertically, leaving spaces about one and a half inches, an object (such as a man plowing, passing in front at some distance, say a quarter of a mile) will present a very amusing and instructive spectacle to any one placed inside the crib at about eight or ten feet from the slats. The width of the slat prevents him from converging his vision. Sometimes the horses will be a great distance ahead of the plowman; in a moment the man will be at the horses' tails, then the horses will appear to have very long bodies. It is not necessary that the lenses be prismatic.

More than twenty years ago I made two stereoscopes with common lenses of six inches focus, placed two and a half inches apart from center to center, with their axes parallel. The images were pasted on the cards so that any two corresponding points were exactly two and a half inches distant. The effect was equal to, if not better than, that produced by prismatic lenses. I think the parallel vision is nearer the truth, as the rays of vision, from a base line of only two and a half inches (the distance of the eyes apart), are very nearly parallel. It seems that the small difference in the images has much to do with the unity and relief.

As this subject has been handled by men of great acumen, I feel diffidence in approaching it, but never having seen or heard of a steorscope made with ordinary lenses placed with parallel axes, this may be the means of further investigations by persons having more time, and being more competent, than your correspondent. JOHN H. HEYSER.

Hagerstown, Md.

A Cigar Box Telegraph.

To the Editor of the Scientific American:

Having seen a description of Bailey's system of sea telegraphy in your SUPPLEMENT, No. 7, I recalled some experiments in that line made by myself some years ago. The manner of making the signals, though not new perhaps, was entirely original with me, and would probably interest many of your readers. The system was used at night only, and was managed in this way: A small kerosene lamp was inclosed in an ordinary cigar box, which had an opening cut through the top for the lamp chimney, and several small holes through the bottom to admit air. On the side of the box, just at the height of the flame, was cut a round opening, about four inches in diameter, and covered with glass, to keep out the wind. A shutter of suitable size to cover this opening, was then fastened to the box, by a single screw at the bottom, so that the shutter could be vibrated to or from the opening, like an inverted pendulum. A small stop was put on one side to prevent the shutter from passing the opening; while a knob near the screw served as a handle to vibrate the shutter. A light spring kept the shutter closed, so that no light was visible. My brother, who lived just one mile distant, possessed a similar box and lamp, which we used almost every night. The usual Morse code was used, and the dots and dashes were distinguished from each other by the duration of the flash. To open the shutter and close it immediately represented a dot; to open and close slowly, —say to keep it open about half a second—represented a dash.

A little practice soon enabled any one to read or transmit a message almost as rapidly as by the electro-magnetic system. At the distance of a mile the light of the small lamp, seen through the opening of the cigar box, looked like a tiny spark, but was distinct and certain. With an instrument on this principle, having a powerful lamp and reflector, I believe that messages could be easily transmitted a distance of ten miles in clear weather. Any boy can easily make and use a contrivance of this sort to amuse and instruct himself during the long winter evenings. T. C. HARRIS.

Sassafras Fork, N. C.

Solid-Ended Connecting Rods.

To the Editor of the Scientific American:

It would seem that a connecting rod forged in one piece, with simply an opening in its ends for the reception of its brasses, would commend itself both for locomotive and stationary engines wherever it could be applied, as superior to the complex and costly combination of strap, gibs, and keys usually employed.

I am not aware of a single instance in our American practice where such a rod is used for the main connection of a locomotive; but solid-ended rods are used occasionally for parallel rods, and stationary engine builders are beginning to appreciate them. A good sample of such a rod was seen on the Brown engine in the saw mill at the Centennial Fair. This engine, by the way, was one of the finest on exhibition; its design, proportion, fit, and finish being excellent.

A, Fig. 1, is a side and end view of the crank end of the rod, slightly modified to adapt it to locomotive use, the one on the Brown Engine having semi-circular ends. The opening for the reception of the brasses, B, must, of course be wide enough to let the collar of the wrist, C, through it as shown; the brasses have flanges only on their inner ends, so that the rod, A, may be slipped upon them after they are placed upon the wrist. The wedge, D, may then be put in, and the steel binding plate, E, slid in to place, as shown at E, in the end view. Fig. 2 shows this plate detached from the side view; a small binder is applied at *x*, to keep the plate in its place. The wear of the brasses is followed up by the screw, F, and wedge, D; and when the wedge has reached the extent of its range, it may be returned to the position shown, and a thin steel backer inserted behind one or both brasses as the cese may require; this process of adjustment may of course be repeated until the brasses are worn out.

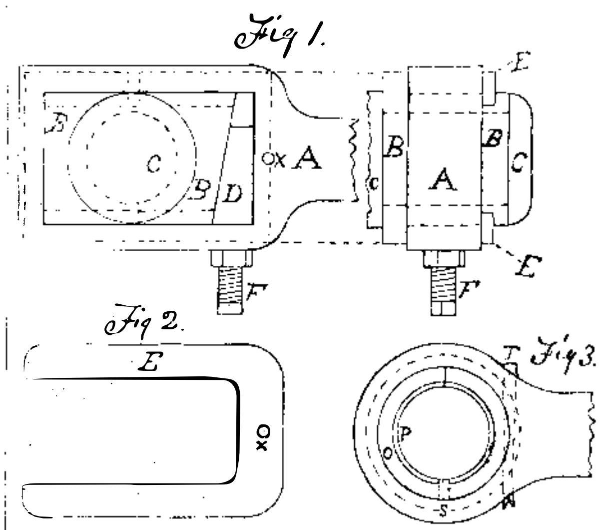

Fig. 3 shows a good substantial form for the ends of parallel rods; the outer ring, O, must be large enough to let the collar of the wrist pass easily through the eye in the rod; the ring, P, is simply a lining of hard composition, to take the wear of the wrist and to be renewed occasionally when worn out; the outer ring being secured by a taper pin, T, split at its lower end as shown. The inner ring is kept from turning by a dowel, S. The rings, being in halves, may be first placed upon the wrist, and then the rod slipped upon them, as explained above. F. G. WOODWARD.

Worcester, Mass.

Boiler Explosions.

To the Editor of the Scientific American:

It is very generally conceded by scientific and practical men that the most common, if not the sole cause of boiler explosions is the allowing the water to become so low that the boiler is overheated, and then while it is in this condition introducing a large amount of water, which, coming in contact with the highly heated iron, is almost instantly transformed into steam, thereby straining the boiler to the bursting point.

Attention should be directed to the other side of the question: the prevention of boiler explosions. Lack of water being the cause of explosions, it is self-evident that a sufficiency of that element would prevent them. The care of keeping up this supply of water rests upon the engineer in charge of the boiler; and engineers are, as a rule, men who have just sufficient education to feed their vanity. They are not educated men, but are a little better informed than their fellows. Their employers, almost invariably, place a large amount of confidence in them. This confidence, taken in connection with their limited education, leads them to feel a superiority to those with whom they come into contact. In many cases it is impossible to tell them anything, for they know all things, as they think, and their evidence is the fact of their employers asking their advice. If an explosion occurs, and you ask the engineer his opinion of the cause, he does not know, he has no theory; but one thing he is positive of: The boiler was full of water a few minutes before the catastrophe occurred; and here he is at variance with all scientific men and the public generally. Such are the men by whom boiler explosions are to be prevented.

The Government has made several attempts to suppress these calamities. On the rivers, it is necessary for all boats to carry a low-water alarm connected with each boiler; and this precaution has reduced the number of explosions to a considerable extent. On land, there has been established in several places a system of inspection. Scientific practical men, who thoroughly understand this business, are employed to examine all boilers, and, in case they prove good, to give certificates to that effect; if otherwise, to have them repaired. This system of inspection has been of great advantage, especially as a means of arriving at the true cause of explosions. It has proved that the bursting of a defective boiler will produce little or no damage; that it is the exploding, the tearing asunder of a sound, well-made boiler, that sends forth the terror and destruction. It has also proved that the inspection of a boiler will not prevent it from exploding, and that such a process will not prevent the engineer from allowing the water to become dangerously low in the boiler. Some other course will therefore have to be taken, and I suggest the use of automatic water regulators and low-water alarms. I will venture to say, that there are over fifteen thousand boilers in Pennsylvania alone, yet, without a doubt, not the one-tenth part of them are using either of these safety arrangements. This is not caused by the expense, for very few owners of boilers would complain against the expense of any thing to secure safety. A very significant fact is that the greater part of the safety arrangements in use in this State are in the oil regions, and this is because there, very frequently, the owners themselves have charge of the boilers. The difficulty is that you go to the proprietor to get permission to attach an alarm to his boiler, he will very likely, in fact almost always, direct you to the engineer, or he will consult that dignitary of himself in regard to it. Of course the engineer gives a decided refusal to have anything to do with it. He knows what the machine is for, and condemns it without an examination. He would not be carrying out human nature, if he did otherwise. You insult him; you wound his vanity, by proposing such a thing as putting up an apparatus to perform the work better than he has been doing it; a machine to give out an alarm and inform against him, when not tending to his duties. You imply a probability of the boiler exploding, which, he thinks, so long as he has charge of it, there is not the least possible danger of. He gives his opinion to the proprietor, and it is taken as correct. The engineer's excuse for disliking these appliances, is that they get out of order. If any one will examine them, and their principle, he will find that they are exceedingly simple, and there is no likelihood of their getting out of order.

Are we to be subjected to the dangers of these explosions and the terrible risk of life incurred on account of the ignorance and vanity of the men who have charge of the boilers? Is is not criminal to neglect any means for the prevention of such disasters? This is a question of public interest, and should be decided by the people, or their representatives. I should like to see something done in this direction, and I am certain that there are hundreds of others who would like to see the same. E. G. A.

Monticello, Pa.

The First Steamboat on the Mississippi.

To the Editor of the Scientific American:

Happening to stop at a bookstall in New York city some years ago, I picked up a tattered duodecimo volume entitled "The Navigator," printed for Cramer, Spear and Eichbaum, by Robert Ferguson & Co., of Pittsburgh, Pa., *anno* 1814. It purported to be "an accurate guide, containing directions for navigating the Monongahela, Alleghaney, Ohio, and Mississippi rivers, with an ample account of these much admired waters, from the head of the former to the mouth of the latter; and a concise description of their towns, villages, harbors, settlements, etc., with maps of the Ohio and Mississippi." The quaintness of the title, and a desire to see what was known at that day of the great Father of Waters, upon whose banks I was preparing to fix my home, induced me to invest a half dollar in the book.

"There is," says the author, or editor (whom I take to be Mr. Zadoc Cramer, as his name appears as the "proprietor of the enterprise,") "now on foot a new mode of navigating our western waters, particularly the Ohio and Mississippi rivers. This is with boats propelled by the power of steam. The plan has been carried into successful operation on the Hudson river, at New York, and on the Deleware, between Newcastle and Burlington. It has been stated that the boat on the Hudson goes at the rate of four miles an hour against wind and tide, on her route between New York and Albany, and frequently with 500 passengers on board. From these successful experiments, there can be but little doubt of the plan succeeding on our Western waters, and proving of immense advantage to the commerse of our country. A Mr. Roosewalt, a gentleman of enterprise, who is acting, it is said, in conjunction with Messrs. Fulton and Livingston of New York, has a boat of this kind now (1810) on the stocks at Pittsburgh, of 138 feet keel, calculated for 300 or 400 tons burthen. And there is one building at Frankfort, Kentucky, by citizens who will no doubt push the enterprise. It will be indeed a novel sight, and as pleasing as novel, to see a huge boat working her way up the windings of the Ohio without the appearance of sail, oar, pole, or any manual labor about her—moving within the secrets of her own wonderful mechanism, and propelled by power undiscoverable."

Whether the citizens of Frankfort, Ky., ever "pushed their enterprise" to a successful completion, and sent their boat out to astonish the natives, is not related by our author;