Continued from first page.

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 case may require; this process of adjustment may of course be repeated until the brasses are worn out.

Fig 1.

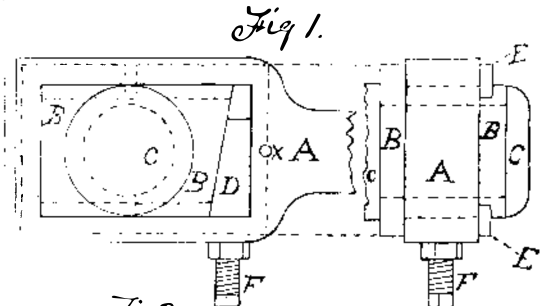


Fig 2.

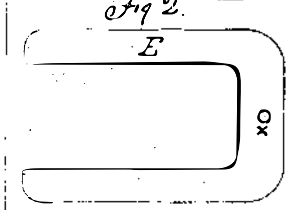


Fig 3.

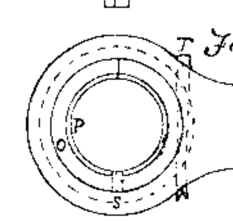


Fig. 3 shows a good substantial form for the ends of parallel rods; the outer ring, O, must be large enough to let the collar of the wrist pass easily through the eye in the rod; the ring, P, is simply a lining of hard composition, to take the wear of the wrist and to be renewed occasionally when worn 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 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;

but in a foot note to the edition of 1814, he says: "This steamboat (the one built by Roosewalt, in connection with Fulton and Livingston), called the New Orleans, was launched in March, 1811, descended the Ohio and Mississippi, and landed at Natchez in December, 1811, where she took in loading and passengers for the first time, and passed on to New Orleans, in which route she has been successfully employed ever since. Her accommodations are good and her passengers numerous—seldom less from Natches than from 10 to 20 at $18 per head; and when she starts from New Orleans, generally from 30 to 50, and sometimes as many as 80 passengers, at $25 each to Natchez."

The writer further states that the New Orleans had up to that time (1814) cleared over $20,000, over and above all expenses, the interest on the investment included ! The cost of building is not stated; but the owners are said to have estimated the value of their "experiment" at $40,000. The writer of the note goes on to say: "The steamboat goes up in from seven to eight days from New Orleans to Natchez, and descends in two or three, stopping several times for freight and passengers. She stays at the extreme of her journey (New Orleans and Natchez), from four to five days, to discharge and take in loading. It is thought, however, by pushing her, she is capable and ought to make the trip every three weeks throughout the year, in which case her gains would be considerable more than stated; 3 weeks to each trip being 17 trips a year, four more than she performed last year."

In those days, Americans were nothing if not patriotic, and consequently we are not surprised at finding our author commenting thus upon the achievement: "When we reflect that England has had the use of steam power for upwards of one hundred years, and that it was left to Americans to apply its force to the propelling of boats against wind, tide, and the most powerful currents of our rivers, we cannot but rejoice and believe that America possesses that happy kind of superior genius, willing to embrace all the better parts of the old, and capacitated to invent new, principles."

There are other extracts that I might make which would astonish and instruct your readers. Captain Eads' plan of jetties is here proposed and urged by our author, years before Eads was born, as the only way to deepen the mouth of the river. In advance of the bulk of geologists, he boldly throws away the antiquated notions of the age of the world, and declares: "When I survey this immense work performed by the hand of Nature, I cannot accord with the views of the philosophers who are pleased to figure out the infantile state of our world. * * * On the contrary, we must grant it an incalculable antiquity !" Pretty well said for 1814 ! F. L. J.

Osceola, Ark.

Aeronautics.

To the Editor of the Scientific American:

Your comprehensive editorial article published under date of December 2, 1876, seems to embody the latest suggestions in regard to the subject of aeronautics. The substitution of a machine sustained by mechanical force, instead of by a buoyant gas, is a mark of progress, since a car sustained by gas is, from its large size, in proportion to its carrying capacity, necessarily unwieldy, and at the mercy of the element it is proposed to navigate. That a heavy body can be sustained by mechanical force is evidenced by the flight of birds. That a heavy body can be sustained by continual circular fan motion is evidenced by the toy tin fan, which, when a certain velocity is given it, overcomes the pressure of its weight, rises, and continues to rise as long as that circular motion is, through its own momentum, kept up; and could the velocity with which it starts be maintained by some power within itself, it would be clearly self-sustaining.

The results of the experiments of the Aeronautical Society of Great Britain, noticed in the above mentioned article, afford a very satisfactory starting point from which to calculate the amount of nominal horse-power required to raise and keep supported a certain number of pounds weight. These experiments show that a plane, whose surface measures one square foot, held at an angle of 15°, against a current of air having a velocity of twenty-five miles per hour, will sustain a weight of $1\frac{1}{2}$ lbs., while the direct pressure, necessary to hold the plate against the current, is $\frac{1}{3}$ of a lb.

Assuming the result to be sufficiently accurate for purposes of experiment, the number of lbs. weight a nominal horse-power will sustain can be readily calculated. A plane at rest, and a wind velocity of twenty-five miles per hour, is equivalent to forcing a plane against still air at a speed of twenty-five miles per hour. The horse-power required to maintain a pressure of $\frac{1}{3}$ lb., at a speed of twenty-five miles per hour, would be equal to that number of lbs. ($\frac{1}{3}$), multiplied by the number of feet a minute which it moves (2,200), and the result divided by 33,000, which will give a result of $\frac{1}{45}$ horse-power as the power required to sustain $1\frac{1}{2}$ lbs., or $\frac{2}{135}$ horse-power to the pound, which is one (1) nominal horse-power to every $67\frac{1}{2}$ lbs., of weight sustained.

Twenty horse-power would sustain theoretically a weight of 1,350 lbs., but, practically, probably only about 1,000 lbs., and would require two fans each $33\frac{1}{3}$ feet in diameter, moving at a speed of 35 revolutions a minute, which, with the faces at an angle 15°, would represent a wind velocity of twenty-five miles per hour. As a proof of the power required to drive two such fans at the speed named, we have only to reverse the process and call them wind wheels and calculate the power to be derived from them, with a wind velocity equal to that produced by their motion, twenty-five miles per hour, the result will be very close to twenty horse-power.

From these figures can be seen the enormous amount of power required to be developed by apparatus which must not weigh complete—with supplies for keeping up the power driver for managing the craft, and passengers or freight—a greater number of lbs. than $67\frac{1}{2}$ lbs., (practically 50 lbs.) to every horse-power such apparatus is capable of developing and maintaining. This proportion of power to weight is largely in excess of that which can be produced by any motor at present manufactured, although the steam fire engine boiler comes nearest, for furnishing the most power with the least weight. Until a motor can be devised which shall cover the required demands aerial navigation will probably remain a practical impossibility, but, given these requirements, there is every reason to believe this seemingly difficult problem can be successfully solved. In the past twenty years manufacturers of steam engines and boilers have been, each year, getting more steaming capacity and power within less space and with less weight. It is not particularly visionary to suggest that it may be in the range of possibility to make such advances in future as have been made in the past and produce a motor which shall fulfil the requirements of aerial travel.

Meriden, Conn. CHARLES E. DAYTON.

A Renewal of the Lactometer War.

As a general rule, when learned doctors disagree, they fight out their differences in ponderous pamphlets and periodicals, and occasionally in the lecture room, among their compeers in learning. The general public rarely pays much attention to such warfare; first, because it believes that truth is mighty and will prevail; and secondly, because the subject matter of the controversy too often soars far above the average intellect. Recently, however, a great battle, wherein the public is materially interested, has been waged in a court room; and for several days two sets of learned chemists, armed with lactometers, retorts, flasks, and libraries of authorities, have each endeavored to impress one weary judge and twelve tired jurymen with the profundity of the ignorance of their respective opponents, and the accuracy of their own views.

The case was the People against Schrumpf. Schrumpf sold milk which the Board of Health's lactometer said was watered. Scrhumpf was indicted, convicted, fined, and committed to durance vile for ten days. Such, we should explain, was the proceeding which cloaked the real case of Doremus against Lactometer, which was but a repetition of the conflict waged in the courts last spring, wherein the above much abused instrument came off, as it did this time, victorious. President Chandler appeared, as before, as champion of the lactometer, and his opinions were corroborated by many other of our most prominent chemists who have made milk an especial study. Dr. Doremus prosecuted the instrument as of old, and he also had a very respectable support.

We cannot spare space to review the enormous mass of conflicting evidence presented, nor shall we attempt to reconcile the faults or frauds alleged by one side to exist in the instruments of the other. The gist of the whole business is more easily stated. It is a fact, which we have often explained, that the specific gravity of milk may be lowered by adding either water or cream, and its density may be increased by removing the cream. Although cream is lighter than milk, it is heavier than water; and hence the addition of cream has much less effect than that of an equal amount of water ; so that although the lactometer does not detect skimmed milk, it does detect the admixture of any considerable quantity of water. Now, after the most careful experiments, the Board of Health has placed the standard of pure milk at the lowest possible point, namely, specific gravity 1·029; in order that honest dealers may have every protection, and in milk of that specific gravity the lactometer is made to float at the 100° mark. If, therefore, a greater density is shown, then the milk may have been skimmed or slightly watered ; if a less density is exhibited, then either water or cream has been added; and it becomes a question of probability, which no one will think much over before deciding, whether the dealer has added water or cream. The lactometer, therefore, does not and is not claimed to decide the actual value of the milk, but it does serve to indicate any considerable amount of dilution; and this view, in which the best experts agree, is now reinforced by opinions of intelligent parties. The lactometer will therefore continue to be, as it has been all along in this city, a terror to dishonest milkmen and a valuable safeguard for the community.

Enamels for Culinary Vessels.

For enamelling cast and wrought iron vessels, the following is the method and materials most generally employed: 100 lbs. calcined and ground flints, and 50 lbs. borax, calcined and finely ground, are intimately mixed, fused, and gradually cooled. Of this 40 lbs. are mixed with 5 lbs. of potter's clay, and ground in water to a pasty mass. The vessel, first thoroughly cleansed by means of very dilute sulphuric acid and scouring with sand, is lined with a coating of this about $\frac{1}{6}$ of an inch thick, and left for it to harden in a warm room. A new coating is next added, prepared from 125 lbs. of white glass, free from lead; 25 lbs. borax; 20 lbs. soda in crystals, which have been pulverized and fused together; ground, cooled in water, and dried. To 45 lbs. of this, 1 lb. of soda is added, the whole mixed in hot water, dried and finely powdered. A portion of this is sifted over the other coating while it is still moist, and the vessel is then dried in an oven at the temperature of boiling water, (212° Fah.) The vessel is then heated in a stove or muffler till the glaze appears. It is then taken out and more glaze powder is dusted on the glazed surface already in fusion. This enamel resists perfectly the action of dilute mineral and vegetable acids and alkalies, and does not crack or scale off from the metal.

In Germany and France the following process has lately came into use—more especially for enamelling copper culinary vessels: 12 parts (by weight) white flor spar; 12 parts gypsum, and 1 part borax, are finely powdered, ground together and fused perfectly in a crucible; when cold, this mass is again carefully ground to powder, made into a uniform paste with water, laid upon the clean metallic surfaces, dried and fused. This also gives a beautiful alabaster surface for ornamental purposes.

Moses Refuted.

The subjoined ludicrous production, from the New York *Times*, is one of the best burlesques on the "scientific method" that have come under our notice. The hit at geologists who construct elaborate theories on exceedingly frail suppositions might well be extended to some learned professors in other branches of science, who have reared wonderful but unsubstantial fabrics of apparent fact solely from the "scientific (?) uses of their imaginations."

"A new and violent blow has just been struck at the Mosaic account of creation by the discovery of an extremely important fossil in a coffee sack at Baltimore. In the center of this sack was found the skull of a monkey. There can be no doubt as to the facts. The coffee was of the variety called Rio, and the skull was perfectly preserved. Let us dwell for a little upon the meaning of this discovery as interpreted by the principles of geology. The coffee sack was 12 (say $12\frac{1}{2}$) inches in diameter, and 4 feet in height. The skull, which lay in the middle of it, was therefore 2 feet below the surface. To suppose that it was violently forced into the sack, after the latter was full, would be eminently unscientific. No one imagines that the fossil birds of the Old Red Sandstone dug down into that locality through the superincumbent strata. Nothing is more universally conceded than that fossils are always found where they belong. The animals whose remains we find in the rocks of the paleozoic, the meso-Gothic, and the Syro-Phœnician strata, belong, respectively, to those several systems. The fossil monkey skull was, therefore, deposited in the coffee sack when the latter was half full, and the 2 feet of coffee which rested upon it was a subsequent deposit. Now, it follows from this premise that monkeys existed during the early part of the Rio coffee period. It is the opinion of most geologists that the Rio coffee period succeeded the tertiary period, and immediately preceded the present period. Now, no tertiary monkeys have yet been found; but the Baltimore discovery shows that monkeys existed as early as the middle of the Rio coffee period, a date far earlier than any which has hitherto been assigned to them.

"We are now in a position to inquire what is the least period of time which must have elapsed since the skull of the Baltimore monkey was the property of a live and active simian. The answer to this question must be sought by ascertaining the rate at which coffee is deposited. It is the opinion of Mr. Huxley, based upon a long and careful examination of over three hundred garbage boxes, that coffee is deposited in a ground condition at the rate of an inch in a thousand centuries, but the deposition of unground coffee is almost infinitely slower. He has placed bags, coffee-mills, and other receptacles in secluded places, and left them for months at a time, without finding the slightest traces of coffee in them. Although Huxley does not hazard a guess at the rate of deposition of unground Rio coffee, Professor Tyndall does not hesitate to say that it is at least as slow as the rate of deposition of tomato cans. Let us suppose, as we are abundantly justified in doing, that 30,000,000 of years would be required to bring about the deposition of a stratum of tomato cans one foot thick all over the surface of the globe, an equally long period must certainly have elapsed while a foot of underground coffee was accumulating over the skull of the Baltimore monkey. We thus ascertain that the monkey in question yielded up his particular variety of ghosts and became a fossil fully 30,000,000 of years ago. Probably even this enormous period of time is much less than the actual poriod which has elapsed since that monkey's decease; and we may consider ourselves safe in assigning to his skull the age of 50,000,000 years, besides a few odd months.

"In the light of this amazing revelation, what becomes of Moses and his 6,000 years? It will hardly escape notice that he nowhere mentions Rio coffee. Obviously, this omission is due to the fact that he knew nothing of it. But if he was unacquainted with one of the most recent formations, how can we suppose that he knew anything about the elder rocks—the metamorphic and stereoscopic stratas? And yet it is this man, ignorant of the plainest facts of geology, and of its very simplest strata, who boldly assumes to tell us all about the creation!"

A Sinister Result of the Centennial.

While it is much more agreeable to believe that our Centennial Exposition has been attended with none but beneficial results, the fact cannot be ignored that one unfortunate consequence is just now strongly obtruding itself. To the unsettled state of politics is undoubtedly owing the check which all have remarked in the rapid recovery of business from the stagnation of the past three years; but to that cause alone cannot be laid the unusual financial stringency which prevails at the present time, most especially in agricultural districts. Reports from many sections of the country state that failures to meet obligations, among the farmers, were never so frequent; while business with that usually thrifty class of the population has rarely been more dull. It looks very much as if the people, possibly relying on the favorable indications (which appeared during the summer) of a brisk fall and winter trade, had invested their savings in Centennial excursions, and now find themselves compelled to retrench, or, in many cases, driven to the worse result of failing in their payments. There is one consolation in the fact that the money has not gone out of the country; and although the movement may remain sluggish till the new Administration is settled upon, a general revival of business will undoubtedly come in the spring.

Stearin from Fats.

Much attention has been attracted by our recent articles on the manufacture of artificial butter, and many of our correspondents have experimented on the separation of the constituents of fatty matters. The entire separation of the stearin from the fats is, however, a difficulty with some of them, and for their benefit, and that of others, we will give descriptions of the several methods in use.

The first is the saponification of the neutral fat with lime-water and steam, or with aluminate of soda, sold under the name of *natrona* or refined saponifier. Another method is by treatment with dilute and strong sulphuric acid and steam, at a high temperature. The third method is by chloride of zinc, and by dry decomposition and distillation with superheated steam alone. Perhaps the process most commonly employed on a small scale is that of the saponification with lime or aluminate of soda. Heat (in a large, lead-lined wooden vat or tub) the fat and water in the proportion of about 10 lbs. fat to 2 gallons water, by means of steam circulating through a coil of leaden pipes in the bottom of the vat. When all the tallow is melted, add 1¼ gallons lime water containing 1¼ lbs. of lime (about 14 per cent. of the weight of tallow). Heat constantly nearly to the boiling point, with constant stirring, for from 6 to 8 hours. Run off the yellow glycerin solution, add 1⅞ gallons dilute sulphuric acid at 12° Baumé (=1.086 specific gravity, containing 30 per cent. of sulphuric acid, H_2SO_4) to the lime soap; stir, and heat as before until the reaction is complete, shut off steam, let the whole stand to settle, draw off the fatty acids from the top into similar smaller vats, add diluted sulphuric acid and heat, draw off the fatty acids, and wash repeatedly with hot water. The quantity of fatty acids obtainable from 100 lbs. good tallow are about 94.8 lbs. The average of solid fatty acids is about 45.9 per cent.

Let the washed acids stand for some time in a fused state to eliminate all mechanically adhering water, then allow to solidify by cooling. Press out the liquid oleic acid in an hydraulic press; then put the cake in a more powerful press, and subject to pressure again; after this, it is pressed again, as before, but between warm plates. It is then fused, cast in large porcelain-lined iron moulds, of about 5 lbs. capacity each, and set by to crystallize. This is accomplished in 12 hours in winter; but in summer it requires twice the time. The crystallized cakes are placed in bags of horsehair, between plates of iron or zinc, in a hydraulic press capable of exerting immense pressure. The cakes are once more subjected to pressure in a press placed horizontally, the plates inclosing the cake being heated in this case by steam; this removes the last trace of oleic acid. The stearic acid is then melted together with dilute oil of vitriol (3° Baumé, 1.02 specific gravity), washed with water containing oxalic acid, and cast into slabs for the candle maker.

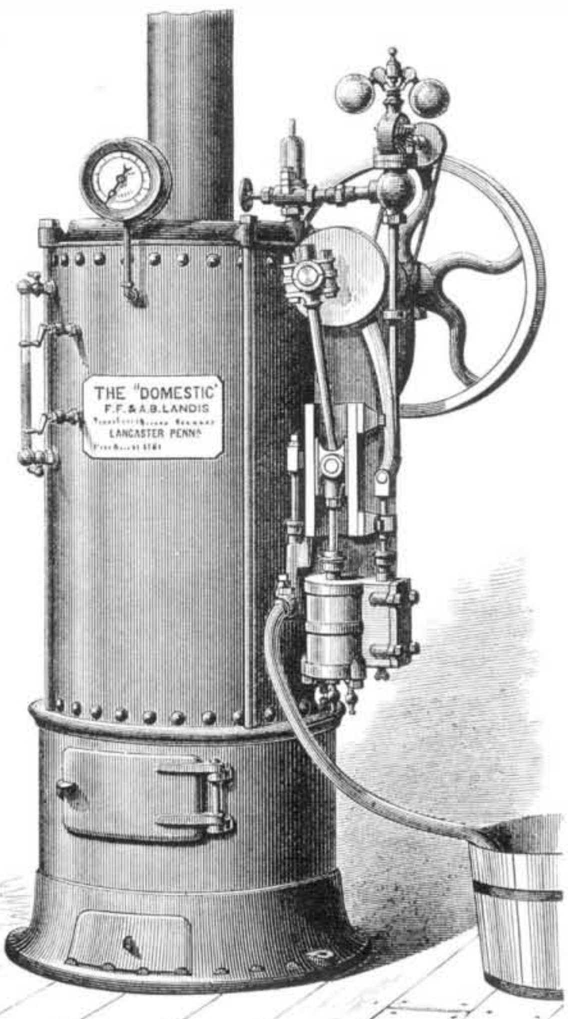
THE TANITE COMPANY'S NEW PLANER KNIFE AND STOVE PLATE GRINDERS.

The Tanite Company's "Automatic Planer Knife Grinder," illustrated in Fig. 1, is made in three sizes: No. 1 for 24 inch, No. 2 for 36 inch, and No. 3 for 48 inch knives. This company claims to be the first to conceive and bring into use the cup wheel, by which the unequal concave grinding, caused by the wear of wheel when used on its face or edge, is avoided. In this machine, the knife is ground with a straight bevel with no change until the wheel is worn out. This apparatus stands about 2 feet 11 inches high to top of wheel, and is 3 feet wide, No. 1 being 3 feet 3 inches, and No. 3, 5 feet 8 inches, long. It has a 1¼ inches steel arbor fitted with self-oiling boxes, with 3½ inches bearings; and it runs, we are informed, perfectly steadily when the wheel is making 1,500 revolutions per minute. It grinds smoothly, leaving no chatter marks upon the knife. Owing to their peculiar process of manufacture, the Tanite Company are enabled to furnish wheels that cut rapidly and with a very small degree of heat. The stove plate machine, which is represented in Fig. 2 is designed to meet the needs of stove manufacturers. It weighs about 720 lbs. The top of table, when horizontal, is 2 feet 9 inches from floor, and in area measures 24½ by 41½ inches; the front end of table can be elevated by means of a hand wheel and screw, so as to obtain, in combination with a cone wheel, any desired angle. The arbor is made of 1¾ inches steel, and has two bearings, one 6 inches, the other 8½ inches, long; and by means of the rack, pinion, and lever, it can be raised 6 inches if desired. The overhead work is very complete, the hangers having adjustable self-oiling boxes.

Both of these machines are of excellent workmanship, and of strong and durable material. For further particulars address the Tanite Company, Stroudsburg, Pa.

THE DOMESTIC STEAM ENGINE.

A new domestic steam engine of 3 horse-power, which is furnished at a very low price, is illustrated in the engraving



herewith given. In construction, this machine embodies many advantageous features. The bed, cylinder, steam-chest, both crank shaft bearings, and the guide lug are all cast in a single piece. The bed is oval in form and hollow, and the portion on which the cylinder is made serves as a feed water heater, wherein the exhaust steam is utilized. In order to protect the crank bearings from heating, due to their proximity to the boiler, they are made of the best Babbitt metal; and a chamber is provided beneath them into which the cold feed water is forced prior to its entering the heater. The chamber also tends to keep the other parts of the engine (except the cylinder, steam chest and heater, which should of course be as hot as possible) in a cool state. The crosshead, connecting rod, eccentric strap, and rod are constructed of cast steel. The crank shaft is of cold rolled iron; the pump barrel, stuffing box, valves, and chambers are of brass, and are disposed so that easy access to the packing may be had. The valves may be reached for repacking and adjustment by slacking one set screw without removing any of the pipes. The tops of the stuffing boxes are cupped so as to prevent water and oil running down over the engine. The piston is a solid casting; and in two grooves in its face are sprung metal rings, turned eccentrically, and larger than the cylinder. This is claimed to form an excellent self-adjusting packing. Lastly, the necessary drain cocks and an efficient governor are provided.

The cylinder diameter is 3 inches; stroke, 4 inches; diameter of fly wheel, 18 inches; and weight, 65 to 70 lbs. At 260 revolutions per minute, and under a pressure of about 100 lbs. of steam, the engine develops (per dynamometer) a little over 3 horse power. It is sold as of 1½ to 2 horse power, with a working speed of 300 revolutions. It may be attached to the boiler by bolts, or to a separate post.

The boiler has a cast iron base, forming fire box and ash pit. There is a fire brick lining which, it is claimed, on becoming heated tends to consume the gas generated. Holes through the smoke bonnet above the tubes are provided, so that the latter can be cleaned without removing the bonnet. Above the bonnet is a circular plate with corresponding apertures, which are, all but one, smaller than those through the smoke bonnet. By turning the plate so that the one large hole is successively brought over the tubes, the latter may be cleaned one at a time. The small holes serve as a damper, admitting cold air into the stack, and so checking the draft, and thus avoiding the necessity of opening the fire door. The boiler has all necessary attachments, and all parts of the engine are duplicated, so that they may be easily replaced.

For further information address the manufacturers, Messrs. F. F. & A. B. Landis, Lancaster, Pa.

Distance Indicator.

This improvement is by Captain Henry Watkin, R. A., being a hydro-clinometer designed for use in coast batteries, having a height of 90 feet and upwards above the sea level. It consists of a piece of wood about 2 feet 6 inches long, 3 inches deep and 1 inch thick. Imbedded in one side is a tube containing colored spirit, there being above the tube a scale graduated for yards. A small telescope is fixed at the top of the instrument at one end, the telescope having cross hairs similar to those in a theodolite. In using the instrument, the end furthest from the observer rests on the top of the box in which it is carried, the end next the observer, and which carries the telescope, being elevated by means of an adjustable brass arm or support. In taking a range all that is necessary is to sight the object and bring the cross hairs to cut the water line. The exact range is then ascertained by reading the figures on the scale at the level of the spirit, which gives it without any calculation whatever. The time required for the operation is about eight seconds, after which the object, if moving, can be continuously followed. After full trial, both at home and abroad, this instrument has been sealed for adoption in the British service.

Fig 1.

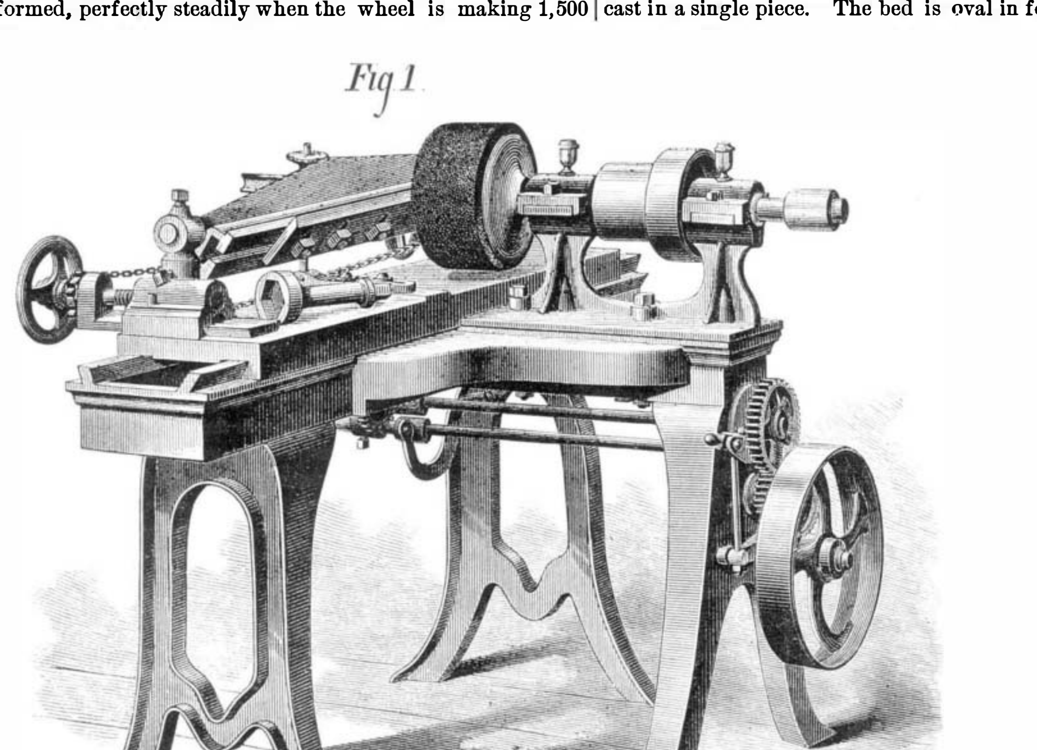
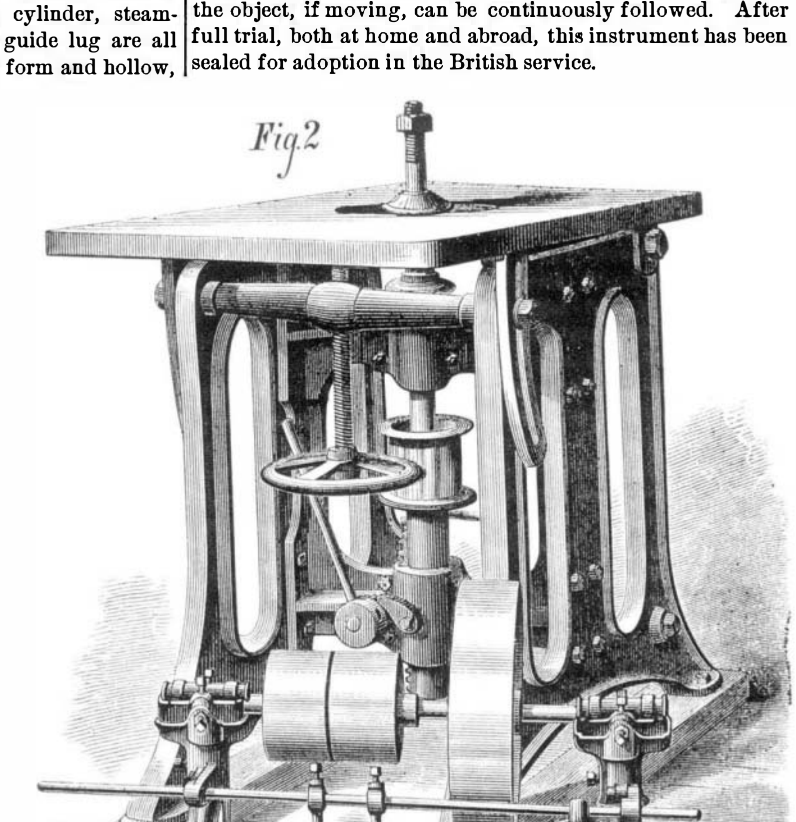


Fig 2.



THE TANITE COMPANY'S PLANER KNIFE AND STOVE PLATE GRINDERS