is covered with the same material, except at G G, where the fires are first placed.

Lumber made from trees that have been boxed has a beautiful white, rather hot-house plant look, but will not last so well, nor is it so strong as that which has never been boxed. Fire and worms sometimes destroy immense tracts of the pines, and hundreds of thousands of dollars worth of trees have thus been rendered valueless. The traveler along any railroad of the Southern Atlantic coast will be greeted with the sight of the gaunt, ghost-like, leafless monuments of these destroyers.

Spirits or oil of turpentine is used in painting, the manufacture of varnishes, oil cloths, etc., and as a medicine. It has peculiar characteristics in which respect no substitute for it has yet been found. Benzine took its place to some extent during the war, but with the regeneration of Southern industry that has been abandoned. Still, with a less production than before the war, it is sold at about the same price. The discovery of petroleum has lessened its consumption, the spirits having formerly been used with alcohol in the manufacture of burning fluid and camphene. Many were the shifts made to dispense with its use during the war; some varnish manufacturers erected costly apparatus for collecting the spirit thrown off in melting kowrie gum. White paints mixed with benzine rapidly turn yellow and peel off, while with spirits of turpentine they grow whiter, are elastic, and tenacious. These qualities are attributed to its property in absorbing oxygen or transmuting that gas into its allotropic form—ozone. As a medicine it is diuretic, so powerfully so that sailors of vessels loaded with it are sometimes intensely affected by its fumes; rubbed on the joints it has a strange, and if often repeated, an injurious effect. Chemically it is a hydrocarbon, being C_{20} H_{16}. It is a powerful solvent of india-rubber, and if allowed to stand exposed to the air for a length of time is said to obtain the power of bleaching vegetable colors. A substitute was endeavored to be made for it by distillation of the white pine wood in iron retorts, and even yet a species of spirit is made by distillation of that wood, and also of the long leaf pine, but it belongs to the methylic series, and when deodorized is used as a substitute for alcohol in dissolving aniline crystals in dyeing. Pine rosin or resin enters largely into many manufactures. The pale window-glass article has a share in the soap which graces the toilet of the belle, and the dark grades go far to make up the coarser bar. It helps to wash our clothes and to mend the tin caldron in which they are boiled. It furnishes gas light for hundreds of the smaller towns, helps to paste up our thousands of placard advertisements, and assists in sizing the manufacturer's cloth. It is used for making lampblack, and is largely distilled for its oil and residuary pitch. In 1860, $550,000 of capital were invested in this last branch of business alone, and there is equally as much now, while the character of the product has been greatly improved.

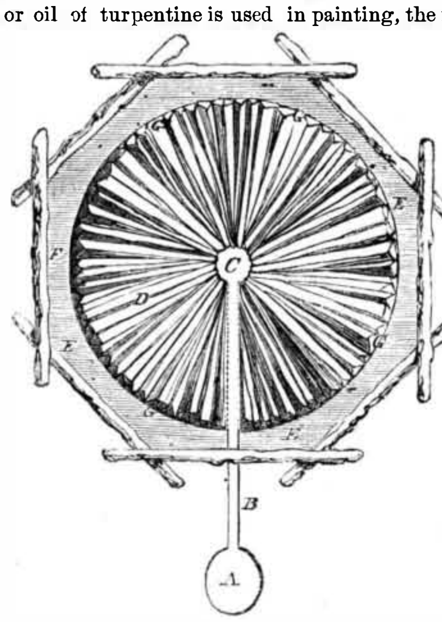


FIG. 7.—DIAGRAM OF A TAR KILN.

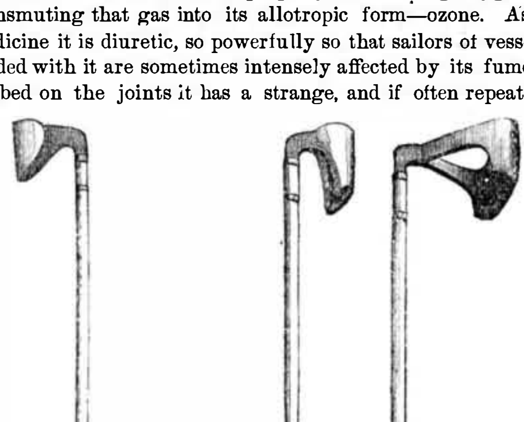


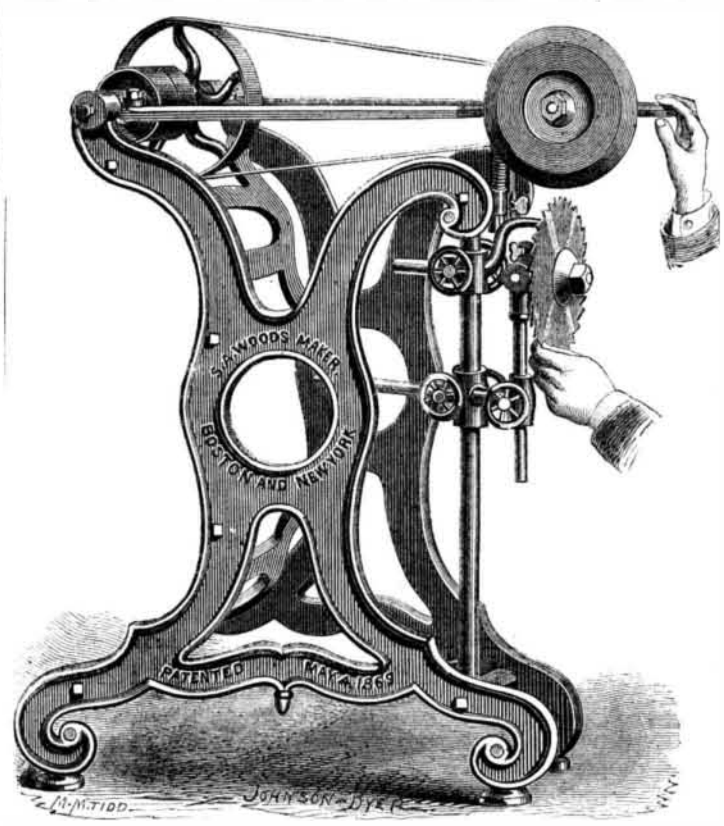
FIG. 8.—HACKER. 9.—ROUND SHAVE. 10.—SCRAPER

MANY cases of poisoning have occurred by contact of guano with wounds. It should be handled with gloves.

WOODS' SAW-GUMMING AND SHARPENING MACHINE.

The desirability of replacing the old and tedious method of filing saws, has led to the invention of various devices designed to perform the work in a more rapid and accurate manner; and the file is fast giving way to the emery wheel.

Our engraving illustrates a machine employing a wheel of this kind, of very simple construction, and apparently well adapted to accomplish the end desired. It is the invention of Mr. S. A. Woods, whose wood-planing machine and wood-molding machine were described on pages 90 and 135, current volume.



The working parts are constructed upon a triangular iron frame, upon the top of which is suspended a swing frame, the back end having a driving shaft (forming the hinge) with tight and loose pulleys; from this, power is transmitted to the arbor upon which is secured a solid emery wheel. The arbor on which the saw is placed is so arranged that universal motion is readily obtained to accommodate any sized saw or shaped tooth desired. The wheel is held away from the saw by means of a coil spring, under the swing frame. The frame is pressed down, bringing the wheel in contact with the saw with one hand, and the saw turned on the arbor with the other; thus the slightest touch can be given to the tooth of the saw without injury. The position of the operator is such that he can look directly across the tooth of the saw, and judge correctly when it has received the finishing touch. A device can also be attached for sharpening straight or mill saws (not shown in the cut). The speed given to the emery wheel is from 1,800 to 2,000 per minute.

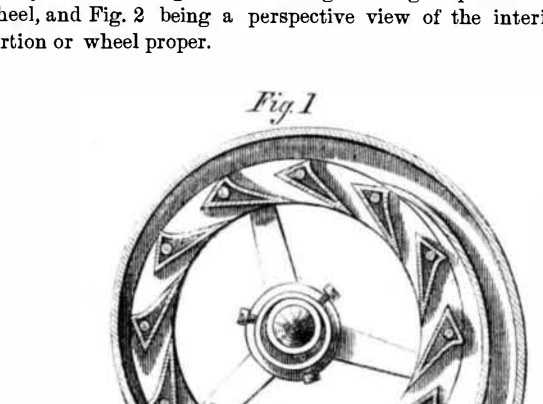
A number of these machines are now in use, and, we are informed, giving excellent satisfaction.

Patented May 4, 1869, by S. A. Woods, 91 Liberty street, New York, and 67 Sudbury street, Boston, Mass., where machines may be obtained, and letters for further information may be addressed.

SNYDER'S IMPROVED TURBINE WHEEL.

This invention consists in a peculiar form and construction of the buckets in turbine wheels, the form adopted being distinctly shown in Figs. 1 and 2—Fig. 1 being a plan of the wheel, and Fig. 2 being a perspective view of the interior portion or wheel proper.

Fig 1



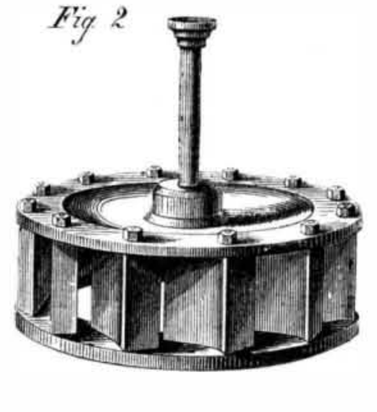
It will be seen that the general form of the buckets is that of a triangular prism, the most acute angle of the triangle being toward the interior of the wheel.

The wheel is of the kind known as center discharge, and the water is carried to the buckets by a scroll, which scroll is divided by a partition, so that one half of the water, as it enters the gate, is carried half way around the wheel before it reaches the buckets and acts there with full force.

The outer edges of the faces of the buckets, which receive the impact of the water, are curved somewhat abruptly inward for a short distance, and then extend in a true plane to the point of discharge. The discharge takes place through the bottom of the wheel, as shown in Figs. 1 and 2. The back faces of the buckets are perfect planes, and the spaces between them are somewhat narrowed toward the point of discharge.

Fig. 3 is a perspective view of the wheel when placed in the scroll, also showing the method of supporting the lower bearing of the upright shaft, and the attachment of the wheel to the shaft.

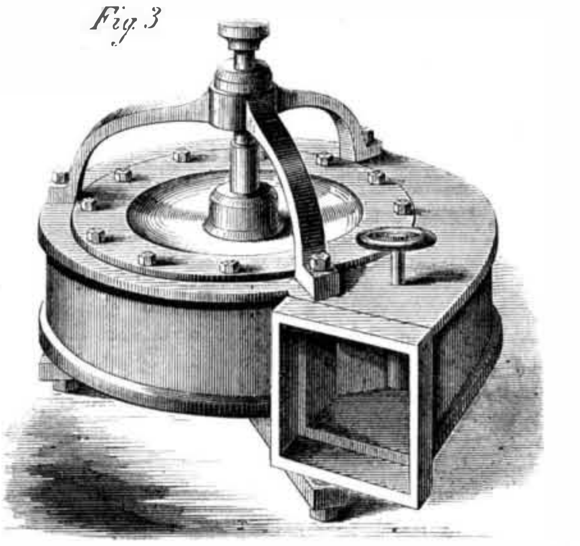
Fig 2



It is claimed that the construction of the buckets described, secures the full force of the water against the extreme leverage of the wheel, and that thereby its power is much increased over that of other forms of turbines.

Patented, through the Scientific American Patent Agency, May 25, 1869. Further information and circulars may be obtained by addressing the patentee, William H. Snyder, Phelps, Ontario Co., N. Y.

Fig 3

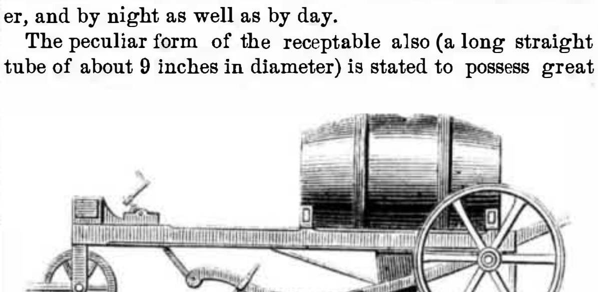


Dyer's House Closet.

The chief novelty about this closet is that, instead of being placed in the ground floor of the house or up a yard at the back, it is carried up to the roof.

The inventor claims several advantages for this position—first, that it is inoffensive, all the noxious fumes escaping through the natural ventilation of the roof; second, that it is desirable that the closet should always be in the house, and therefore accessible without inconvenience in any weather, and by night as well as by day.

The peculiar form of the receptable also (a long straight tube of about 9 inches in diameter) is stated to possess great advantages. First, the surface that can give off noxious fumes is greatly diminished. Second, that surface is always covered by urinary deposit, and the fæces are thereby prevented from disseminating the germs of disease. Third, by means of the orifice at the bottom, the contents of the tube can be removed at any time without offense to the residents. Fourth, the valuable manure which is wasted by the cess-pool system is carried away in an undiluted state, and may be applied to the ground at once by means of subsoil plows which entirely conceal the deposit. Fifth, it is claimed that this is an inexpensive mode of storing human excreta, as the labor of removal is much diminished, being chiefly performed by natural gravitation.



The closet is placed at least 8 feet above the floor of the attic, and the ceiling of the closet is perforated, and communicates with the vacant space in the roof. The tube passes through the back wall of the house, and descends to within 4 feet of the ground. At the bottom of the tube is fitted a perfectly tight draw valve. When the tube is full, or at stated periods, an air-tight tank is brought round to the back of the house, a gutta-percha hose of sufficient length is fitted to the valve, which is then opened. The column of fecal matter, six sevenths of which is fluid, some 30 feet, 20 feet, or 10 feet in hight, then rushes into the tank. The valve is then shut down, the hose removed, and the joints of the valve are washed with diluted carbolic acid. The liquid manure is then conveyed beyond the limits of the city, and is distributed in properly constructed casks which are affixed to Liernur's subsoil plow, of which an illustration is given

These plows, being driven over some of the exhausted soils in the vicinity of the city, will at once restore to them the valuable manures of which they have been despoiled for years past. The offensive manure is then effectually hidden from sight, and from smell, and the "wilderness will be made to blossom as the rose."

We are informed that it is intended to form a company to supply the whole apparatus to houses and to remove the soil at a fixed rate per annum, and also to lease a large area of barren land which is to be reclaimed by the aid of the valuable manure now worse than wasted.

The invention has been patented by Mr. J. Dyer, of Melbourne, Australia.—*Mechanics' Magazine.*

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

A Final Zoic Catastrophe.

MESSRS. EDITORS:—In your issue of Feb. 12 (page 110), is an extract from Prof. H. Wurtz, in which it is stated that through the agency of marine animals, that secrete carbonates from the ocean water, the carbonic acid of the atmosphere is passing "into solid forms, permanent and forever unavailable thereafter," and that soon, geologically speaking, the atmosphere will be exhausted of its carbonic acid, and all organic life come to an end; the burning of the fossil coal by man postponing the catastrophe but temporarily, etc.

Since the publication of Mr. Lyell's "Principles," many theories of igneous and cataclysmic catastrophe, formerly in vogue among geologists, have fallen into disrepute, as being founded on imperfect or fragmentary knowledge of the facts. In the progress of discovery one side of a cycle comes into view, and the "great machine seems to be running down." But further research discloses another side, where forces of equal potency are "re-winding it." Had the Professor looked a little deeper, he might have seen evidence that the crust of the earth, even, has two sides to it.

In some localities, carbonic acid derived from the atmosphere, is, by the agency of marine life, being deposited and locked up in the layers that are forming on the *outside* of the earth's shell. But similar beds of calcic and magnesic carbonates, which were deposited in past ages, are in other localities being acted upon by the heat from *within* the shell, and converted into igneous silicates; the carbonic acid being liberated and poured into the atmosphere through the fissures, vents, and craters of several hundred volcanoes.

This flow of carbonic acid, which is a constant accompaniment of volcanic agency, often takes place at great distances from the actual crater, and continues for ages after volcanoes have become extinct. In Auvergne the springs are charged with it. In California, I have seen the granites, and other igneous rocks, as soft as putty from the percolation of acidulated water through them. M. Fournet reports encountering emanations, while opening the mines of Pontgiband, that often burst into the galleries with explosive force, roaring like the steam from a boiler, filling the lower parts of the mines and pouring into the valley in sufficient quantity to suffocate horses, geese, etc.

From the Grotto del Cane, or from similar excavations, this gas has been flowing since the days of Pliny. "But the quantity evolved there is trifling," says Prof. Silliman, "compared to that which escapes constantly from Lake Solfatara, near Tivoli, whose surface is violently agitated with the gases boiling through it."

In the Island of Java there are some fifty volcanoes. Accordingly the flow of carbonic acid is so great, that in the celebrated "valley of poison," the ground is said to be covered with skeletons and carcasses of tigers, goats, birds, and even of human beings, that have ventured into the valley and been suffocated by the gas.

Very likely, at great depths, in these volcanic regions, stratified rocks are now being transformed to granite. It is believed that the granitic rocks of all the loftiest mountain chains, such as the Andes, Alps, Himalayas, etc., were once ocean mud, containing the usual proportion of carbonic acid; and that the carbonates have been changed to silicates, and the included carbonic acid returned to the atmosphere, since England was inhabited by pachyderms, bats, opossums, and monkeys. (Lyell's Manual, p. 231—Appleton & Co., 1864). In the central Alps nummulitic and even newer tertiary strata are found transformed to gneiss, a sort of half granite.

Thus the carbonates secreted from the Eocene sea by the little nummulites, have "rendered up again the treasure of carbonic acid in their marble grasp," by the action of just such a "fervent heat" as that which is now transforming the rocks, and slowly elevating the land in volcanic regions. (Dana's Manual, p. 721-725).

Belts of submarine volcanoes seem to be performing a similar operation upon marine deposits which contain the corals, crusts, and shells of existing species. Such beds are being buried deeper and deeper. Vast accumulations of "ashes," pumice, and cinders, are thrown up from below by eruptions, and then reduced to mud and spread out by the waves; alternating with floods of lava. Thus calcareous deposits are buried, and tend to become the inferior and underlying strata, where they will in time be transformed and decarbonized by the heat.

But this continual volcanic exhaust and depletion of the earth's liquid interior produces collapse; and, consequently, a lateral tension in the crust, which slowly bulges upward in a long wrinkle. This involves exposure to the denuding forces. First, by the dash of waves; afterwards by the action of rains, torrents, glaciers, etc.; the surface rock is scraped off again, and the gneiss, granite, etc., exposed.

In various places all these different operations are being slowly performed. Mountain chains are in the bed beneath the waves of the sea. Those who suppose that the earth is dead, and getting cold, are mistaken. So late as the middle of the Eocene tertiary period, nummulites and other marine animals luxuriated in the sea, on the very spots now occupied by the Alps and Himalayas. There was no more promise *then* that they would rise to their present altitude, than there is *now* that similar mountain chains will come up from the depths of the sea during the coming ages. "The Zoic Catastrophe," therefore, cannot be deduced from the facts of Science. J. W. PIKE.

Windham, Ohio.

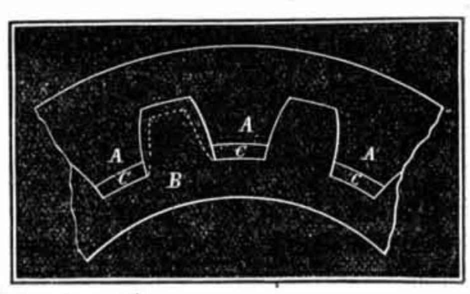
Chilling Cast Iron.

MESSRS. EDITORS:—It is well known that the surface of iron castings is extremely hard, and that this hardness sometimes extends nearly, or quite through, when the casting is very thin, or when a certain quality of iron is used, termed "charcoal iron," such as is used for malleable articles.

On thick castings, made of good machine iron in a common sand mold, this crust is quite thin, hence when a thick, hard surface is needed on any portion of such castings, it is necessary to use a metallic mold at that point. These partial metallic molds, termed "chills," are fitted up with much care, and are so placed in the sand mold as not to mar the true symmetry of the casting.

In the casting of car wheels a "chill" constitutes the whole outer rim of the mold; it is simply a massive iron ring, the inner face of which is, of course, the exact mold or counterpart of the tread and flange of the wheel. If a little charcoal iron is mixed with the common iron, the surface will harden deeper in proportion to the amount used. This susceptibility of cast iron to harden when brought in contact, in a melted state, with cold iron, is a characteristic of great utility.

Some care is necessary in using "chills" on certain castings. In chilling the cogs of wheels, for instance, the cogs of the chill, A, should not extend quite to the base of the



cogs of the wheel, B, but the space, C, should be molded with sand, then the chilled surface will take somewhat the form indicated by the dotted lines; in this way the full value of the chill is obtained without impairing the strength of the rim of the wheel. Another advantage of chilled cogs is that they may be made nearly as perfect as cut ones, because the cogs of the chill may be formed in a gear engine as perfectly, of course, as the teeth of any gear wheel, and the chill is free from other imperfections of a sand mold.

F. G. WOODWARD.

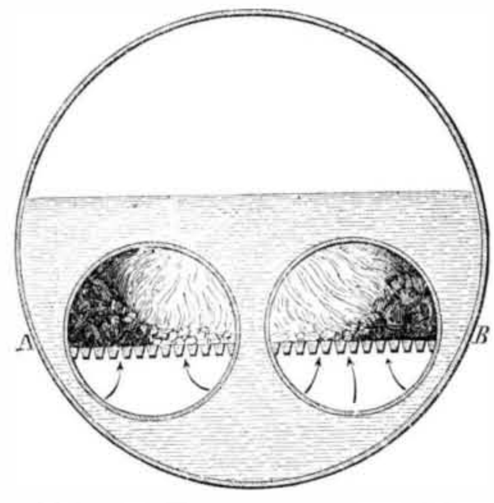
Firing under Steam Boilers.

MESSRS. EDITORS:—Seeing an article in your journal, headed as above, I beg leave to offer you my experience both in this county and in Europe, on the above subject, and if engineers and firemen will give it a fair trial, I think they will find, as I have done, a saving of from 10 to 25 per cent in *fuel*, besides much less labor for the fireman and less danger to the boiler from expansion and contraction while under working pressure.

THE FURNACE.

After seeing that all fittings of the boiler are in the best possible order, turn your attention to the furnace. There is more required here than the simple process of feeding the fire with fuel. In the first place the nature of the coal should be ascertained, and if it be of a coking kind the grate bars will require it to be more open than for coal of a light and gaseous nature. Adjust the grate surface to the heating or absorbing surface of the boiler; this will greatly depend upon the quantity of the fuel and the draft, and the quantity of steam required. If the draft be good, work a thick fire, but do not break the coal excepting it cannot be got in at the furnace door, taking care to feed the furnace on one side, not covering more than one-half of the grate at a time. When that is sufficiently coked feed the other side, putting plenty on at a time, leaving the fuel at the middle of the furnace much lighter and thinner than at the sides, and keeping the grate bars well open. The placing of the coal on one side at a time will prevent the formation of a great portion of the smoke which would otherwise result, and produce a more steady heat. The coal so placed will partially damp the side of the furnace on which it is placed; therefore the necessity of stoking the furnace when the steam is up. By this method of firing, the gas generated will be given out slowly. The greatest quantity of air will pass through that portion of the grate where the fuel is most consumed and where the coal has not been made small by breaking, leaving the interstices wide; and as the oxygen of the air will be in sufficient quantity if this mode of firing is adopted to unite with the gas as it is extracted from the coal, a continuous flame of gas will be kept up and smoke prevented.

When one side of the furnace so fired is sufficiently coked raise the burning fuel gently with the poker but do not break it into pieces; at the next firing, place the coal on the other side of the furnace, and similar results will follow. Replenish first one side and then the other, and continue to do so in the working of the furnace, keeping out the cold air as much as possible. Keep the furnace door open no longer than is absolutely necessary, and place your coal before firing near to the furnace, that there may be no loss of time in charging the fire; all cold air coming in contact with the boiler lets down the temperature and does harm. With a double fire-box boiler, fire each furnace alternately in the manner above described, and as illustrated by the engraving, where A and B



represent the sides of the fires last stoked, and the gas given out from the new fuel mixing with the air which passes in the greatest quantity through the thin portion of the fire, as indicated by the arrows. Being thus mixed with air at a high temperature, the gases ignite, and comparatively thorough combustion is secured, preventing smoke and saving fuel. This mode of firing is applicable to most furnaces, whether single or double fire-box, or wholly beneath the boiler.

By all means avoid having a dirty ash pit. A pit nearly full of ashes is a sure sign of bad management, it is necessary to keep the ash pit of a furnace clean and cool and the air as dense as possible, as it is to feed the fire with fuel. If the ash pit be hot the heat will expand the air and the furnace will require greater quantities to pass for the required amount of oxygen which would be supplied by less quantities of cold air. When convenient, use water for the bottom of the ash pit, allowing it to remain to quench the ashes as they fall from the furnace; the evaporation will tend to keep the grate cool.

A great body of fire will evaporate more water with less proportion of fuel than a small and thin fire. The greater the intensity of the fire the more steam will be generated with the same amount of fuel. Where there are a number of boilers it is important that the duty of stoking should be properly attended to; and as smoke is a great nuisance easily prevented, its prevention is a duty which each engineer ought to fulfill. MAJOR CLEGG.

La Crosse, Wis.

Liquid Fuel for Steam Engines.

MESSRS. EDITORS:—I have read in the SCIENTIFIC AMERICAN many valuable articles on combustion, in which it has repeatedly been asserted that chemists prove by experiment that only 10 or 12 per cent of the total heat produced by the combustion of coal is utilized in the steam engine under ordinary circumstances. In connection with this subject, I would state that we have here in Washington, a couple of inventors that claim to do better in the production of heat than has yet been accomplished, as they have had published in every paper here that by their petroleum apparatus they can run a sixty-horse steam engine at the rate of 17 cents per hour; the combustion is so perfect they say that the flame extends the whole length of the boiler, say about 25 or 30 feet, and several feet into the smoke stack, and no smoke can be seen coming from the stack.

These are wonderful statements to any one who has been led to believe that, in all experiments in burning petroleum, the conclusions have always proved that petroleum is about eight times dearer than coal. As for the statement that no smoke can be seen escaping from the smoke stack, as a large black cloud of smoke extending far away in the distance can be seen, whenever the apparatus is at work, arising from said stack, it is rather ominous.

This apparatus consists in a tubular boiler, in which steam is passed through the tubes, and by its heat vaporizes the petroleum which is contained in the space between the tubes. The vapors are passed through a spongy mass and a metallic sieve, and are held in a receiver forming the outer jacket of the boiler. The gases or vapors are burnt at any convenient point, being conveyed through steam pipes. Another claim is that the steam is passed through the fire-place, and there decomposed and fed into the pipes jointly with the vaporized petroleum. This is in substance the whole apparatus, and