# SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXII.---No. 20. [NEW SERIES.] NEW YORK MAY 14, 1870. $3 per Annum [IN ADVANCE.]


## Improved Portable Engine for Agricultural Use.

The employment of steam power for agricultural purposes is one of the prominent features of this mechanical age. The latest among the important applications of steam, it bids fair to become one of the most important innovations of modern times. No living man can foretell the extent to which it may be carried, or conceive the immense revolution in modern industry it inaugurates.

We believe it, like all other advances in labor-saving appliances, is destined to greatly benefit mankind at large, and to hasten the period when man, emancipated from all heavy and exhausting toil, shall compel the brute forces of nature to perform all work, which is not in itself so pleasant as to be desirable as healthful exercise and recreation.

The inventive skill of the period has been tasked to produce a steam motor which will answer all the requirements of the plantation and the farm; and while many engines have strong claims to public favor few have succeeded in combining all the requirements for an entirely successful agricultural team engine.

It may not be amiss to enumerate such of these requirements as occur to us at the moment, although this subject has already received a large share of attention in these columns.

First, and above all other considerations, an agricultural engine should be sufficiently strong in all its parts, and each part should be simple in construction and easily accessible for adjustment and repair. Certain refinements admissible on marine and stationary engines, designed to be always under the supervision of skillful engineers, are wholly to be avoided on an engine designed to be hauled about from place to place, to be used in field or forest under very different circumstances, for sawing, pumping, plowing, thrashing and cleaning grain, grinding and expressing the juices of fruit and sugar cane, cutting fodder, etc. Nothing can compensate for lack of durability and reliability. The danger of break-downs in the midst of a harvesting campaign must be eliminated as far as is possible for human skill to do it, in conformance with the other conditions of the problem.

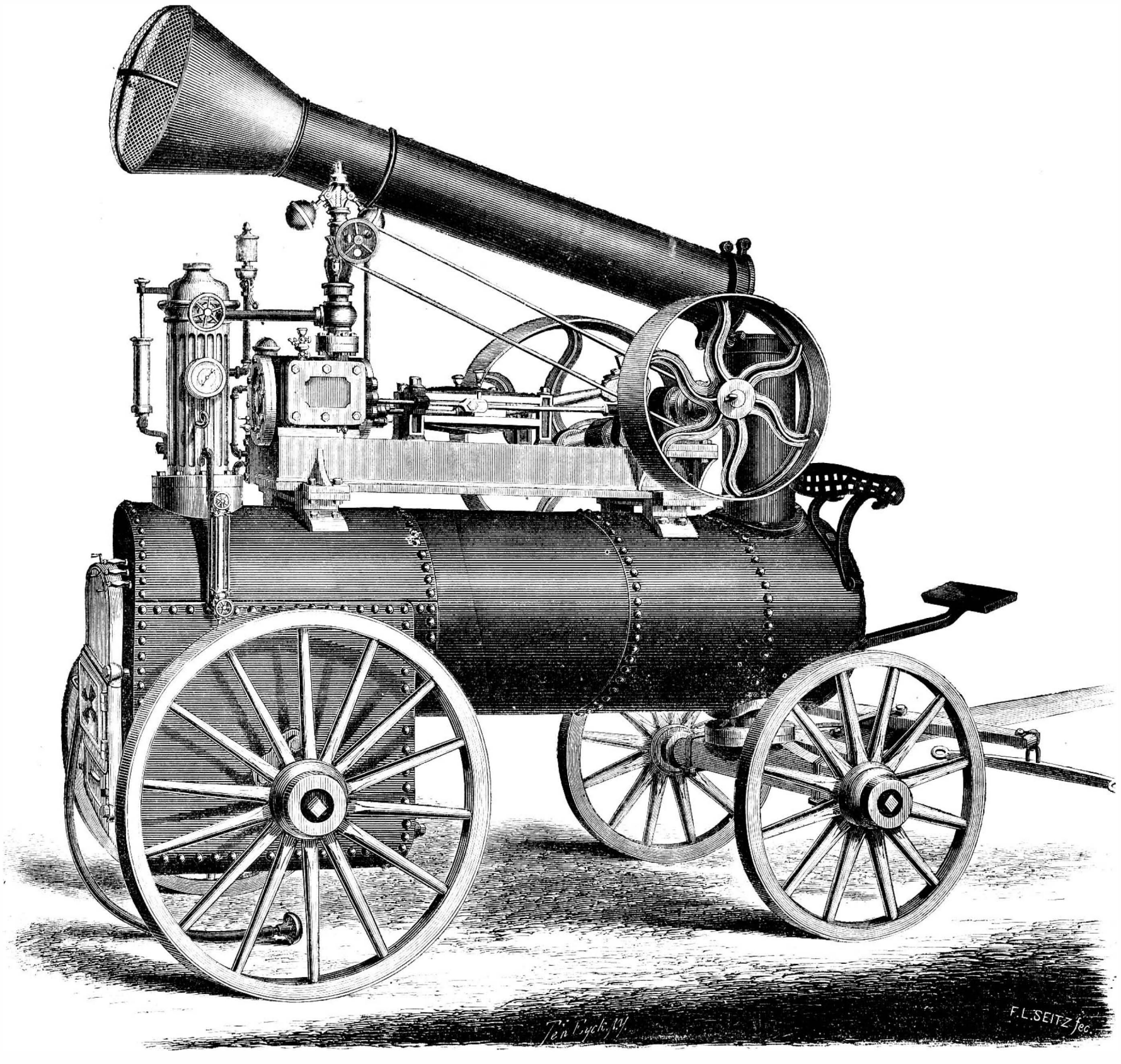
These fundamental requirements being fully secured, the question of economy may next be considered; and such details as are necessary to secure it may be added—always provided they do not too greatly interfere with the attainment of strength and durability.

Then the materials employed in construction must be so formed as to secure minimum weight with maximum strength. Surely here is enough to tax the highest engineering skill of the designer.

We think our readers will agree with us in according to the engine we herewith illustrate, the merit of combining, in a very large degree, all the fundamental requisites we have named, with others that will appear upon careful examination of the engraving.

Every part of the engine is constructed to a standard gage, so that duplicates can at any time be obtained that will fit or replace any part when required, and the work throughout is of the best kind, such as will bear the closest scrutiny from experts.

The boiler is of the locomotive pattern, and is made of such material as to insure safety, durability, and economy of fuel




AMES' PORTABLE ENGINE FOR AGRICULTURAL USE.

It is constructed of the best Pennsylvania iron of the proper thickness; and the furnace is constructed of the best solid fire-box plate, not ordinarily used in portable engines on account of its high price.

The tubes are the best American lap-welded, and the tube sheets are made of the proper strength and thickness. The bracing at the sides, and at the top and bottom of the furnace, is done after the method adopted by the best locomotive builders.

A special merit is, that the form of the furnace—obtained by extending a water space of ample size and semi-circular form, its under side forming an ash pan—allows the water to circulate freely; thus preventing sediment from accumulating and adhering, as it does in the ordinary form of locomotive boilers, in that part of the furnace below the grate.

This latter style of boiler very soon requires new "water legs," as, there being little or no heat below the grates, the water there is in a state of rest, which allows the particles of mineral and earthy matter to adhere to each other and the iron, thereby causing, in a short time, a mass as solid and compact as stone, which soon destroys that part of the boiler.

The circulating water bottom, on the contrary, by the constant movement of the water through it, keeps these particles in a state of suspension, so that they are at once removed from the boiler whenever the blow-off cock is opened. This shaped furnace is much stronger than any other, and obviates the expense and inconvenience of building a separate ash pit.

The smoke-box is a continuation of the shell of the boiler, making it as strong and durable as any other part, which is not the case when it is made of common iron, and merely bolted on to the end of the boiler. The tubes and smoke-box are perfectly accessible for cleaning, through a door, in a in a substantial and ornamental frame which covers this end of the boiler. The furnace front is handsomely designed, and carries the fire and ash-pan doors, and is so made that it can be readily removed, having a large entrance to reach the tubes and furnace for cleaning.

The fire door is made double—its inner part consisting of a heavy iron perforated plate—the outer door being provided with a register to admit air, to ignite smoke, gases, and other products of combustion.

The steam dome is of graceful form, and of ample size to give perfectly dry steam to the engine. The safety valve, as well as its seat, is made of composition well fitted, so that it can neither rust nor stick fast, and is connected to its lever by a device, made on the principle of the link, so that it works with great freedom and uniformity. The steam dome is also provided with a first-class steam gage and whistle.

The bed plate of the engine rests upon carefully and firmly secured saddles attached to the top of the boiler. The engine is of the horizontal style, designed to secure all the requisites of elegance, simplicity, strength, and convenience. All the parts are made in the most approved and workmanlike manner, and the steam is used expansively, according to the most approved modern practice; particular attention being given to adjust the lap of the valve to give the proper cut-off, and to proportion all the passages and ports so that the highest mean effective pressure in the cylinder may result from a given boiler pressure.

The heads of the cylinders are easily accessible, no parts having to be removed in order to reach them; and the cylinders are felted and handsomely lagged to prevent loss of heat by radiation. All the usual and useful appendages found on first class steam engines, such as oil-cups for the cylinders, pet-cocks, water gage, oil cups on slides, etc., are provided.

The governor is well made, and sensitive to any variation of load, and performs its office with ease and certainty.

A water heater is placed inside the bed plate, through which the exhaust steam passes, and is finally discharged into the smoke-pipe powerfully increasing the draft.

The pump is double-acting with composition valves, which can be removed for cleaning by taking out a single set screw. An important feature is connected with these pumps. A stop-cock placed in the suction pipe being always open, the pumps are never allowed to run dry, as is frequently the case in other engines; and by the use of a waste pipe with another stop cock—connecting with the discharge pipe from the pump to the boiler, it is easy to regulate the amount of feed water required for evaporation.

The crank shaft is double, extending a sufficient distance on either side of the engine to allow a band wheel of any size to run without interfering with the boiler. It is forged of the best American iron, and its diameter is considerably greater than is ordinarily seen in portable engines of equal power. It runs in boxes giving ample bearing, to insure steadiness of motion and durability.

The connecting rod is made of hammered iron, supplied with bronze boxes, and is fitted up in the best style, and in a very substantial manner.

In short all the appliances of the best stationary engines, if we except certain refinements above noticed, are to be found on this engine, and so arranged as to avoid undue complication.

The engine and boiler are placed on a very strong truck, as shown; the bolster being under the end remote from the furnace, and the bulk of the weight being placed upon the hind wheels of the truck. The axles of these wheels have been, in other truck engines, bolted to the sides of the boilers; but this plan renders them liable to be broken off or to give great local strain to the part of the boiler to which the axles are bolted. In the engine we are describing a better plan has been adopted, and the difficulty alluded to has been wholly removed.

The axles are made of three-inch square iron, and bent so as to form a complete bearing for the curved under surface of the fire-box. At the angles where they project to receive the wheels, brackets are bolted to the boiler which abut against the shoulders of the axles, bracing them against the effects of sudden twists and shocks. No weight rests upon the brackets, the boiler being sustained entirely by the bent axle. This gives very great strength to them, and removes all strain from the boiler in going over rough ground.

A Salter spring balance is used on the safety valve lever instead of a weight, as in locomotives. The smoke-pipe is hinged and provided with a spark arrester. Each engine is also provided with a flexible suction pipe, with a rose strainer, and has a convenient and comfortable seat for the driver of the team when the engine is being hauled from one position to another. It would seem that nothing has been omitted from consideration, in the construction of this engine, calculated to fit it for every requirement of a first-class agricultural steam motor, and as such it will meet an increasing want in many parts of the country.

These engines, of all sizes, from two to forty-horse power, may be seen at 38 Cortlandt street, New York, at the office of the general agent, Mr. Edward P. Hampson, to whom orders or letters for further information may be addressed.

## METEORS.

[From All the Year Round.]

The Universe, of which our solar system is but an infinitely small fraction, is one in material constitution. The spectral analysis of light has shown that the most distant visible heavenly bodies contain substances exactly the same as those which make up the solid crust of the earth. Thus, Aldebaran (the star marked 8 in the Bull), has soda, magnesia, hydrogen, lime, iron, bismuth, tellurium, antimony, and mercury. Sirius, the Dog Star, likewise confesses to soda, magnesia, hydrogen, and probably iron; and not only the stars but many of the nebulæ have been made to avow their possession of similar, if not exactly identical elements.

In the Annuaire of the Bureau des Longitudes, for 1870, M. Delaunay confirms the theory of the unity of the constitution of the universe by a different set of facts and arguments which have all the charm of novelty. For ages, nobody knew what they meant; and we read his lucid explanation with the pleasure enjoyed in guessing a riddle which has long puzzled our brains, if we may compare the solution of a play on words with the satisfaction of obtaining the grandest views of nature. In the present "notice" he treats of what we may learn from the various kinds of meteors—a term which, in its Greek original, means merely something hanging aloft.

Spectral analysis has enabled us to study the material elements of the heavenly bodies; but this is not the only means we possess of discovering directly the secrets of the constitution of the universe. Certain phenomena, now to be examined, put it in our power to make a close inspection of a considerable number of bodies distributed in space. We can even handle some of these bodies, and analyze them by the various processes which our laboratories have at their command. The results have been valuable, from their verifying, directly and undeniably, the notions already derived from other sources respecting the condition and nature of the matter dispersed throughout celestial space.

While gazing at the starry heavens, we often see a bright point dart rapidly across the constellations, and then disappear without leaving any trace. This is what we call a shooting star. Sometimes the brilliant point marks the line of its passage by leaving behind it a luminous train, which lasts a few instants, but vanishes soon afterwards. The path of the shooting star is usually rectilinear or straight, or rather it would coincide with the arc of a great circle traced on the celestial hemisphere. In a few cases, which are very rare, the path presents successive sinuosities, or takes a decided bend, making an angle, sometimes very large, with the direction it followed at the outset. In other words, the shooting star seems to travel in a serpentine course, or rapidly to change its direction, and even, in certain instances, it seems to go back again, returning towards its starting-point. Shooting stars constitute a special class of luminous meteors, which appear at all times and seasons. Not a night passes without several of them being observed. The frequency with which they show themselves, as we shall see by-and-bye, is more or less great, according to circumstances.

From time to time, but much less rarely, there occurs a phenomenon, the same in kind, but much greater in intensity. A luminous body of considerable and appreciable dimensions rapidly traverses the heavens, shedding a bright light in all directions. It resembles a ball of fire, whose apparent magnitude is often comparable to that of the moon. This body generally leaves behind it a very visible luminous train. Often, during, or immediately after its appearance, an explosion takes place, and even occasionally several explosions, which are heard at different and widely distant places on the surface of the earth. Frequently, also, the explosion is accompanied by the bursting of the ball of fire into luminous fragments, which seem projected in different directions. This phenomenon constitutes what is called a meteor proper, or, by French naturalists, a bolide—a word which we might well naturalize, as it is used in that sense by Pliny, and is derived from a Greek verb to throw, to shoot out. The phenomenon occurs by day as well as by night—only in the first case the light it emits is very much diminished by the light of the sun, and, in fact, is only perceptible when developed with considerable intensity.

On the other hand, on the earth's surface we sometimes find solid bodies of a stony or metallic nature, which appear to have nothing in common with the soil on which they live. From time immemorial the vulgar have attributed to these bodies an extra-terrestrial origin. They were believed to be stones fallen from the sky. They have been designated pierres de foudre, pierres de tonnerre, thunderbolts, because they were regarded as matter shot by lightning to the surface of the earth. Many of these pretended thunderbolts have been recognized to derive their origin from the soil itself in which they were found. Such are the ferrugineous pyrites, so commonly occurring in chalky strata. But, for a certain number of them, their extra-terrestrial origin has been indisputably ascertained. The name of aërolites (stones of the air) is given to them as a reminder that they fell to the earth from the depths of the atmosphere which envelops our globe. What relationship can possibly exist between shooting stars, bolides, and aërolites? A variety of opinions has been held on this subject. What strikes us most is the vagueness and indecision with which they have been offered, the slight actual knowledge possessed respecting the phenomena under consideration, and at the same time the incredulity with which philosophers have received the accounts furnished to them by the public.

First, as to their incredulity. In Kepler's Ephemerides, we read, "7—17 November, 1623. A fiery meteor, or globe of fire, was seen throughout almost the whole of Germany, flying rapidly from the west to the east. It is affirmed that in Austria something like a clap of thunder was heard. Nevertheless, I do not believe it; for nothing of the kind is to be found in the accounts that we possess."

In the Memoirs of the Académie des Sciences for 1700, Lémery writes: "We cannot reasonably doubt that the matter of lightning and thunder is sulphur, set on fire and shot out with great velocity. As to the lightning-stones with which the vulgar will have it that the thunder is always accompanied, I take their existence to be very doubtful, and am even inclined to believe that there never have been any real ones. None of these stones are to be found on the spots that have been struck by lightning; and even if we had found one, we should sooner believe that it came from some mineral matter melted and formed by the burning sulphur of the thunder in the earth itself, than that the stone had been formed in the air or in the clouds, and shot out together with the thunder."

Next, as to the vagueness and indecision of their views. Halley several times directed his attention to meteors, and the causes by which they may be explained. In a note, published in 1714, in the Philosophical Transactions, No. 341, he relates the occurrence of two remarkable meteors, one of which was seen in Italy on the 21st of March, 1676, the other in England, in the neighborhood of London, on the 31st of July, 1708. He demonstrates that, from the directions in which the latter meteor was seen at different places, its hight above the earth may be estimated at from forty to fifty miles. Then he adds, "I have deeply reflected on these circumstances, and I consider them the most important facts that have come to my knowledge relating to the phenomenon of meteors I am inclined to think that there must exist a certain quantity of matter in ethereal space formed by the fortuitous concourse of atoms, and that the earth meets it while traveling along her orbit, before it has acquired a great rate of speed in the direction of the sun." Here he "burned," as children say; he was within a step or two of what is now held to be the truth.

Some years afterwards, on the appearance of an extraordinary meteor, seen in England on the 19th of March, 1719 (whose hight above the earth Halley reckoned at seventy-three miles), the great astronomer put forth a different explanation, to the effect that the matter constituting the meteor had emanated from the earth, through the effects of the preceding unusually hot summer. Sulphurous vapors, he thinks, have no need of air to sustain them, but mount by a sort of centrifugal force; they then form a train, like a train of gun powder, and, when inflamed by spontaneous combustion, the fire runs along it from one end to the other. And that was the best explanation Halley could give of meteors and bolides.

Mussenbrock, in his "Course of Experimental and Mathematical Physics" (translated into French, 1769), in like manner attributes a terrestrial origin to the materials of which fire-balls consist. "All bodies," he says, "which form part of the universe, emit different emanations, which rise in the air, mingle with it, and are the matter and cause of meteors." And afterwards, "As these globes of fire spread, wherever they pass, an odor like that of burning sulphur, I can scarcely doubt that they are clouds principally composed of brimstone and other combustibles issuing from volcanoes which have opened fresh mouths among the mountains, and have discharged large quantities of sulphurous vapors before they have caught fire."

The opinion of the learned in the second half of the eighteenth century respecting stones fallen from the sky, may be gathered from a report made to the Académie des Sciences, in 1769, by the celebrated chemist Lavoisier, in the name of a commission appointed to give an account of a phenomenon of the kind which had lately happened in France. First, he expresses his skepticism. "In spite of the notions accredited among the ancients, true philosophers have always regarded as very doubtful the existence of these thunderstorms. And if it was considered suspicious at a time when philosophers had scarcely any idea of the nature of thunder, it must appear still more so at the present day, now that it is known that the effects of lightning are the same as those of electricity."

He then proceeds to relate the facts. On the 13th of September, 1768, at about half-past four in the afternoon, there appeared in the direction of the Château de la Chevallerie, near Luce, a little town in the Maine, a stormy cloud, inside which was heard a short, sharp thunder-clap, very like the firing of a cannon. Then, throughout the space of two

leagues and a half, without any fire being perceptible, there was heard a considerable noise in the air, which sounded so like the lowing of an ox that many people were deceived by it. Finally, several individuals who were doing harvest work in the parish of Périgué, about three leagues from Lucé, hearing the same noise, looked up, and saw an opaque body which described a curve and then fell on a strip of grass on the high road to Mans, near which they were working. They all ran up to it quickly and found a sort of stone, about the half of which was buried in the earth; but it was so burning hot that they could not handle it. Then they all took fright and ran away; but returning some time afterwards, they saw that it had not stirred, and found that it had cooled sufficiently to admit of a close examination. This stone weighed seven pounds and a half. It was triangular in shape; that is, it presented three rounded protuberances, one of which, at the moment of its fall, had entered the sod. All the part of it which was in the ground was gray or ash-colored, while the rest, exposed to the air, was extremely black.

We have here all the circumstances of a meteor, with explosion, and the fall of a solid body to the earth, but without any luminous appearance, in consequence of its happening in broad daylight. Lavoisier, after mentioning the existence on its surface of a very thin coating of black, swollen matter which appeared to have been fused, came to the conclusion that the stone had not been exposed to a considerable degree of heat, nor for any length of time; in fact, it decomposed before it became red-hot; consequently that it did not owe its origin to thunder, had not fallen from the sky, nor had been formed by mineral matters fused by lightning. The commission gave their opinion that the stone, which perhaps had been slightly covered with earth or turf, had been struck with lightning, and so laid bare; the heat had been sufficient to melt the surface of the portion struck, but had not lasted long enough to penetrate the interior, which was the reason why the stone was not decomposed. It is clear they were determined not to believe the evidence of the persons who saw it fall. The uncertainty respecting the nature and the cause of meteors is further shown in a letter addressed, in 1784, by Charles Blagden to Sir Joseph Banks, and published in the "Transactions of the Royal Society of London." His conclusion is that the sole known natural agent, to which the production of these phenomena can be attributed, is electricity.

Such was the state of opinion respecting meteors and stones fallen from the sky, when Chladni published, in German, in 1794, "Reflexions on the Origin of Divers Masses of Native Iron," and notably of that found by Pallas in Siberia. With wonderful acuteness he maintained the thesis that everything seemed to prove that these masses of iron are no other than the substance of bolides or globes of fire; for all that was known of those meteors proved they were formed of heavy and compact materials which could not be projected in the air in a solid shape by a terrestrial force, nor be composed of diverse substances disseminated in the atmosphere. Moreover, the lumps found where these bolides have fallen, bear so striking a resemblance not only among themselves but to those of Siberia and, elsewhere, that it suffices to make us adopt an opinion which is further confirmed by numerous proofs.

His reasoning respecting the origin of bolides reads almost like second sight. It is known, he urges, that our planet is composed of various elements—earthy, metallic, and others—among which iron is one of the most widely distributed. It is also conjectured that the other heavenly bodies are made of analogous materials, or even quite identical, although mingled and probably modified in very various ways. There ought likewise to exist in space much solid matter collected into small masses, without belonging to any of the heavenly bodies properly so called, and which, set in motion by projective or attractive forces, continues to advance until, arriving within the sphere of the earth's (or any other heavenly body's) influence, it falls upon it by the action of gravity. The motion of those masses of matter, extremely rapid in itself, being accelerated by the earth's attraction, causes such friction with the particles of the atmosphere as to heat them to incandescence, and make them throw off vapors and gaseous fluids, ending with the explosion of the mass.

It is a remarkable fact that aerolites are principally composed of iron. But, urges Chladni, if the above theory is correct, we must believe that other substances found in stones fallen from the sky—such as sulphur, silex, magnesia, etc.—are not peculiar to our globe, but are among the elements which enter into the composition of all the heavenly bodies. This opinion coincides, as near as may be, with the discoveries made by the spectral analysis of light. Shooting stars are also referred by Chladni to the same cause as meteoric fireballs or bolides, with which view philosophers of the present day do not exactly agree. What they do hold would occupy too much space to be included in this paper.

A lucky circumstance hastened the adoption of Chladni's ideas. News of the appearance of a magnificent meteor in the neighborhood of L'Aigle (department of the Orme) having reached the Académie des Sciences, and some stones fallen from the sky on that occasion being submitted to it for examination, one of its members, the young Biot, was requested to proceed to the spot and ascertain all particulars respecting the meteor.

It appears that on Tuesday, 6 Floreal, year XI. (26th of April, 1803), about one in the afternoon, weather calm, there was seen from Caen, Pont-Audemer, and the environs of Alençon; Falaise, and Verneuil, a very brilliant ball of fire, which darted through the atmosphere with great rapidity. A few instants afterwards they heard in the town of L'Aigle and around it, throughout an area having a radius of more than thirty leagues, a violent explosion, which lasted five or six minutes. At first there were three or four shots like those of a cannon, followed by what resembled a discharge of musketry, after which there was a frightful rolling like that of drums. The air was calm and the sky serene, with the exception of a few clouds.

The noise proceeded from a small cloud, rectangular in shape, which appeared motionless during the whole duration of the phenomenon, except that the vapors composing it bulged out for a moment at different points, through the effects of the successive explosions. Its elevation in the air was very great; for the inhabitants of La Vassolerie and Boislaville, hamlets situated more than a league apart, beheld it simultaneously over their heads. Throughout the whole canton, above which the cloud was hovering, they heard hissing noises, like those of a stone shot out by a sling, and at the same time they beheld the fall of a multitude of solid lumps, exactly similar to the bodies known by the name of meteoric stones.

If the meteor had burst at one single instant, the stones would have been scattered over a nearly circular area; but, in consequence of the successive explosions, they were strewed over a long strip of ground answering to the meteor's course. The largest found weighed eight kilos. five grammes (about seventeen pounds); the smallest, which M. Biot brought away with him, not more than seven or eight grammes. The total number of stones which fell may be estimated at two or three thousand.

After this inquiry, it was no longer possible to entertain the slightest doubt as to the reality of stones falling from the atmosphere subsequent to the explosion of meteors or bolides. M. Delaunay has collected similar instances, wonderfully agreeing in their details, ranging from the year 1819 to 1868, inclusive; from which he deduces the consequence, that the fact of stones falling from the sky cannot be questioned. They are not darted by lightning, as the vulgar long believed, but they proceed from meteors or bolides, which suddenly appear in the atmosphere, and usually fall after the explosion of the bolides. Those meteors, moreover, are occasioned by the rapid passage through our atmosphere of solid bodies existing in space, and which the earth encounters along her orbit.

Aerolites, touched immediately after their fall, are found to be burning hot. But they cool with very great rapidlty; a proof that their high temperature was merely superficial, and had not penetrated their entire mass. As to the form, it is coarsely polyhedral, with irregular sides and edges. The flat portions of their surfaces often present hollows like those produced by pressing a round body, as a marble or an apple, on a layer of paste or dough. They are also covered with a thin, black crust, usually dull, but sometimes shining like a varnish.

The merely superficial heat of aerolites at the moment of their fall, and the thin, black crust which covers them, clearly demonstrate that they have been subjected, for a very short time, to intense heat, which has melted their outer shell without penetrating to any depth within. On breaking an aerolite and exposing one of its fragments to the flame of a blowpipe, you produce on the surface of the fragment a crust exactly similar to that which covered the entire aerolite. Doubt on the subject is no longer possible. Besides which, the black crust is often wrinkled, owing to the rapid passage of the air over the melted surface.

And now, what is the cause of the intense but short-lived incandescence of bolides? Chladni, we have seen, thought it owing to the *friction* of the air; Benzenberg, in 1811, supposed it rather due to the *compression* of the air. M. Regnault, after experiments on gases flowing with great rapidity, made in 1854, came to the same conclusion, namely, that the temperature of bolides is solely owing to the heat disengaged by the compression of air. When a body moves through the atmosphere with a velocity greater than that of sound, the air's elasticity is neutralized, and compression takes place as if it were inclosed in a vessel. The violent heating of the bolide, during the short lapse of time occupied by its passage through the air, is the necessary consequence.

Showers of iron are much rarer, at least at the present epoch, than showers of stones. Meteoric iron presents itself in masses quite free from stony matter, and sometimes sufficiently pure to be forged immediately. It has even been employed in the fabrication of tools and weapons. Meteorites also contain many other materials of great terrestrial importance, such as oxygen, hydrogen, and carbon. They hence lay claim to a community of origin with the planets which revolve round the sun; which is confirmed by the recent discovery of numerous extremely small planets and the probable existence of others smaller still, which remain invisible in consequence of the trifling quantity of sunlight they reflect.

Of late years, great pains have been taken to form collections of stones fallen from the sky. We may specially cite those in the British Museum, in the Mineralogical Museum at Vienna, and in the Museum d'Histoire Naturelle, at Paris. The last contains specimens of two hundred and thirty-five falls, that is of nearly all; since the number of stone showers represented in collections does not exceed two hundred and fifty.

### A Chapter on Chinese Walls.

Bishop Kingsley, in the *Central Advocate*, thus discourses on the city walls of the Chinese:

"All the cities of China are surrounded by high, strong walls, whose massive proportions a stranger has no adequate idea of until he sees them. The walls surrounding the city of Pekin are from twenty-two to twenty-five miles in length, and, on an average, fifty feet high. This wall is sixty-six feet thick, at the bottom, and fifty-four at the top, and once in a few yards there are immense buttresses to give it still greater strength. At every fifth buttress the wall, for the space of one hundred and twenty-six feet in length, is two hundred and fifty-six feet in thickness. In several places the foundation of this wall is of marble, and when the ground is uneven, immense quantities of cement, as durable, nearly, as granite, and about as hard, have been used to level up the ground. The main body of this wall is made of bricks, each twenty inches long, ten inches wide, and five inches thick. These bricks are burned very hard, and have precisely the appearance of stone.

"On the inside of this wall, as well as on others, in other cities, there are esplanades, or stairways, with gates to them for ascending them. And over all the gateways there are immense towers, as large as great churches, and much higher, constructed of these great burnt bricks. On the top of this immense wall there is a railing, both on the outside and inside, coming up to a man's waist, which railing itself is a wall, thus giving a sense of security to a person walking on the top. The outside railing is made into turrets, for the use of cannon, in case of attack. The entire top of the wall is covered with strong burned brick, twenty inches square, resembling the flagging of our sidewalks in large cities,—only, as I have said, these walks are fifty-four feet wide.

There is no way of getting into the city, only to go through this immense wall. And wherever there is a gate for the purpose of getting through, there is another wall built, inclosing a square space, compelling all persons who go into the city to go through two walls, by passages at right angles to each other. The walls are so immensely thick, that these passages through them, arched over with cut stone, remind one exactly of our railroad tunnels in the United States. At each of these great archways there is an enormous gate made of strong timbers, everywhere as much as ten inches thick, and covered on both sides with plates of iron, like the sides of our war ships. These gates are shut early in the evening, generally before sundown, and not allowed to be opened during the night for any purpose. They are fastened on the inside by means of strong beams of timber.

"I have been somewhat particular in describing this wall, because the general construction of all walls in China are similar to this one, although they are not all so high nor so thick. But there are probably a thousand walled cities in China, whose walls will average twenty-five feet high and twenty feet thick, and another thousand whose walls may be somewhat less. Then there is the great Tartar Wall, a little north of Pekin, one thousand five hundred miles long, and older than the Christian era, thicker and higher than any of the rest. There are said to be one thousand five hundred prefectural cities in China. All these are surrounded by walls built by the Government, besides the great number of cities whose walls are made at the expense of the city government alone. And when we have spoken of the walls surrounding the cities, we have by no means done with the subject. For example—in Pekin, inside the inclosing wall, there is another of miles in extent, surrounding what is called the Imperial City. Then, again, inside of this is another immense wall, surrounding what is called the Prohibited City. Within this inner inclosure is the residence of the Emperor, and all the other buildings connected with royalty. And so the Altar and Temple of Heaven are surrounded by two concentric walls, of great extent and magnitude, which must be passed by means of immense gates. Then there is the great wall, covered with dry thorn brush, surrounding what is called the Place of Punishment, where criminals are beheaded, and their heads exposed in cages for a terror to evil doers, and where other criminals are crucified, and yet others starved to death, amid the most piteous moaning and insane ravings for food. Again, the Hall of Literary Examination, where forty thousand men compete for literary degrees, and where the longest purse is more successful than the hardest study, is surrounded by another wall and entered by gates. Then all places of idolatrous worship, and they are legion, in these great cities, are surrounded by high walls. The old city of Nankin, on the south bank of the Yangtze Kiang, is surrounded by a wall eighteen miles long. The city of Tiensing, in the northerly portion of China, has a wall fifteen or sixteen miles in length. The city of Foochow, with one side exposed to the river Min, is surrounded by a high wall. Wherever stone can be had, it is used for these structures. The city of Ranchack, also on the south side of the Yangtze, is surrounded by a wall, running over the top of the mountain a thousand feet high. I also saw, while ascending the Yangtze, a monstrous wall surrounding an area on the top of a mountain, where the Chinese of that region took their wives and children for safety during the terrible rebellion that swept over a great part of China a few years ago.

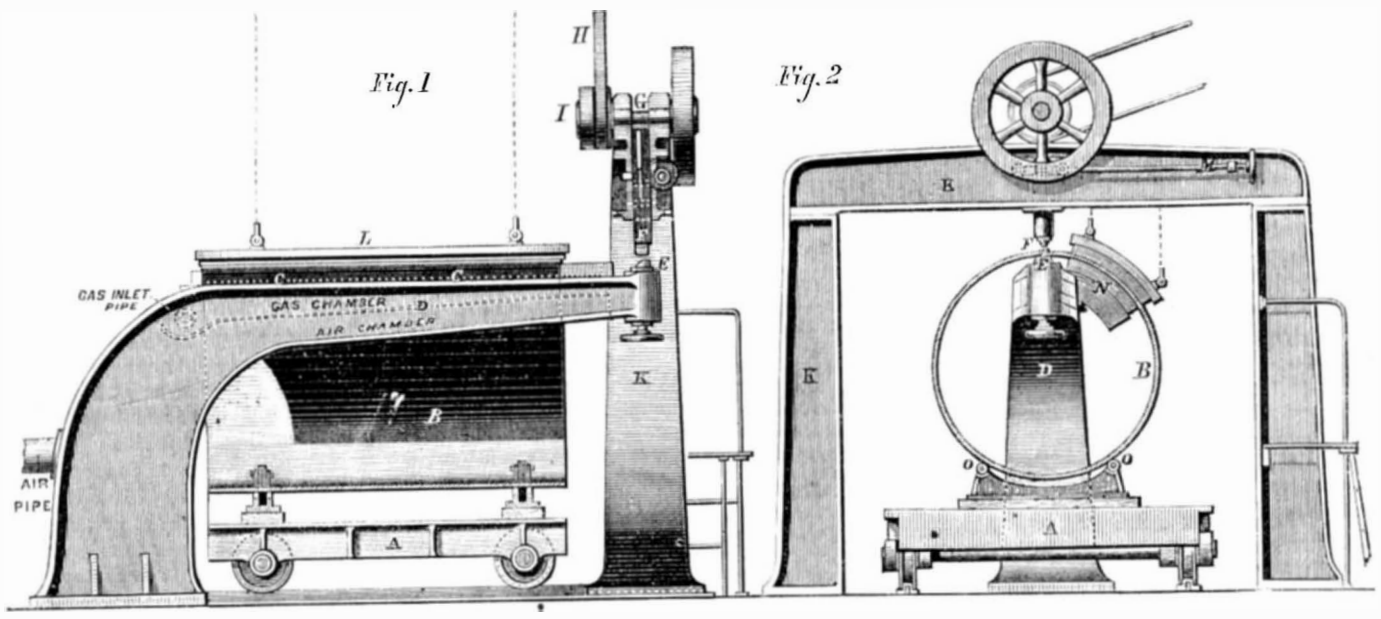
"Then, in thousands and tens of thousands of instances, in China, a high wall is built right before the door of a private dwelling, to ward off spirits of ancestors, who are supposed to to be blind, and obliged to move in straight lines, and who will, consequently, stumble against the wall when they come to it, and give up the pursuit.

"After giving a good deal of attention to the subject, I am satisfied that the whole amount of wall in China, if put together, would build one twenty feet high and ten feet thick, entirely round the globe, and would require five thousand men to work steadily for two thousand years to accomplish the work."

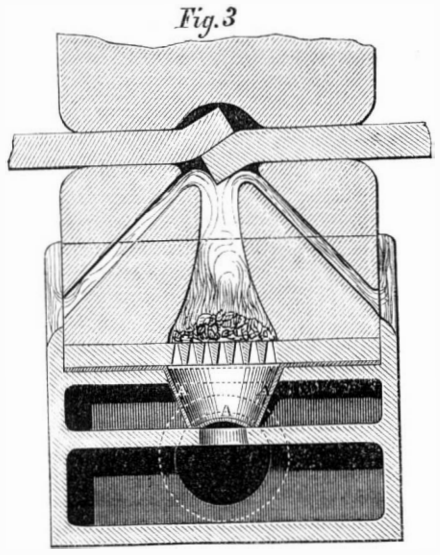
APPARITION RINGS.—A novelty has reached London under the above appellation which is said to be an invention, the cleverness of which is unquestionable. Without any necromantic tricks, an optical delusion, pure and simple, is produced. To all appearance a link is seen to traverse the whole length of a chain, but it does not fall off, and whence it comes or whither it goes are inexplicable mysteries.

### Improvements in Welding Plates.

We illustrate this week from the *Mechanics' Magazine* an invention just patented by Mr. W. S. Sutherland, Liverpool, England. It consists of a means of uniting the ends or edges of plates which are heated in a furnace of peculiar construction, while they are in contact to prevent the formation of scale on the meeting surfaces; also of a furnace for heating such plates, and the arrangements of the apparatus to bring the edges of the plates under the hammer head as speedily as possible while the plates are at a welding heat; the edges being first bent outwards, but in opposite directions, by suitable rolls or other appliance. The invention will be well understood by referring to the annexed engravings, where fig. 1 is an elevation of a furnace so arranged in connection with an overhanging girder as to facilitate a barrel of a boiler or tube to be brought into position for being welded at all the seams by the power hammer instead of being riveted, as clearly seen in the end view, fig. 2. The mechanism consists of a carriage, A, upon wheels for conveying the heated plates of the tube, B, to be welded under the hammer, so that they are united by a succession of rapid blows. The lower portion of the furnace consists of two chambers or passages, one for the fuel and the other for the air or other gas used to support combustion; these materials being led or forced into their respective chambers through the inlet pipe. The fuel and air or other gas pass through a diaphragm of wire gauze or perforated plate, the perforations being proportioned to properly mix the gases for combustion. The mixed fuel and air or other gases then pass through a perforated slab or tile of refractory materials into the combustion chamber and against the parts to be heated, and thence through the escape passages into the open air or into flues placed conveniently to receive them. The fuel is contained in and by the combustion chamber; suitable openings being left for extracting the residue. The air or gas for combustion passes from the chamber through the perforated




IMPROVEMENTS IN WELDING METAL PLATES.




slab or tile of refractory materials amongst the fuel, and the heated products of combustion, after heating the parts to be welded, pass through the escape passages into the open air or into flues placed conveniently to receive them. The carriage, A, carries the tube, B, to be welded, which is adjusted so as to allow the parts to be welded to pass into and opposite to the furnace, C, carried by the arm, D; this arm, D, in some cases also carries the adjustable anvil, E; above this handle is the hammer, F, worked in this arrangement by means of an eccentric on the shaft, G, which eccentric is driven by means of the strap, H, acting upon the fast and loose pulleys, I I; the hammer, F, is carried by the standards and girders, K K. In some cases the furnace is carried by chains, so as to be raised and lowered easily. There is an arrangement for adjusting the hammer to suit various thicknesses of plates. The hammer is in two portions, the lower portion being screwed into the upper portion. This upper portion slides through a worm wheel driven by a worm turned by a hand wheel and spindle. N shows the improved furnace adapted for heating the edges of tubes to be welded together, end to end. The tube resting upon the rollers, o, o, has part of the seam to be welded heated by the improved furnace, and is then easily revolved by hand or otherwise and passed between the hammer and anvil and rapidly welded. Fig. 3 shows an enlarged section of a furnace with two edges of plates in position for being heated. In this form of furnace a fuel-pan, A, is employed which is to be supplied with air to support combustion and also with gases if necessary, the gases being driven into one of the chambers below.

### American Marbles.

The *Architectural Review* in discussing the subject of black marble and its treatment in architecture, says that at the present time the wealth in marble possessed by this country, instead of decreasing with the great demand made upon it for building and ornamental art purposes, is developing still more its intrinsic value in the recent discoveries of colored marbles of a superb quality which prolific Vermont has contributed to our national resources. In the rooms of the Royal Institute of British Architects, London, there are now to be seen specimens of American colored marbles which have called forth the admiration of all observers. Our present object, however, is to call attention not to the white or to the varicolored, but to the black marble which in its own way confers so much benefit on art by the very force of contrast it creates. It is generally of a fine texture (especially that which is very deep black), but it is rare to find it without calcareous spar in veins through it. The best quality occurs in beds of from three to eight inches thick; but some beds are thicker. It is tough, and contains a good deal of carbon, which imparts the color. It is greatly valued for inlaying, and is extensively used for vases, pedestals, chimney pieces, etc.

It is occasionally ornamented by etching and engraving, in which processes the polished surface is removed, and the brown color of the rough marble exposed. Powdered white lead is sometimes rubbed into the etched surface, to increase the effect. The French have a method of ornamenting marble in this way by etching with acids deeply into the marble various designs upon a properly prepared bituminous ground. When the corrosion has gone sufficiently deep, the cavities are filled up with hard colored wax, so prepared as to take a polish equal to that of the marble when cleared off. Drawings thus made on black marble, and filled in with scarlet wax, after the manner of Etruscan, have a fine effect, and are used for tables, paneling, etc. They have a method in Derby, England, where this art is carried on to a considerable extent, of exposing the brown color without destroying the polish, the effect of which is more durable than ordinary etching.

Rosewood marble, so called from its marking, resembling that of rosewood, is extremely hard and of close texture, being next in these respects to the black variety. The beds are of considerable thickness, but the most beautiful part of the marble is only about six inches thick. The *russet* or *bird-eye* marble takes its name from its color and appearance—the shades varying from light gray to brown. It contains numerous minute embedded or encrinital fossils, and is found in layers of from six to eighteen inches in thickness.

As yet, we believe there has been but one quarry of black marble worked in this country, namely, that of the Mosquito Valley, near Williamsport, Pa., which is a very compact, excellent material, but until very lately every effort to polish its surface proved a failure. We, however, have now on our table a highly creditable specimen of polished black marble from the quarry just named, and we entertain a strong hope that black marble in abundance will be found native to our soil, and worthy of a distinguished place in the art-materials of our country.

### Changes in Fishes.

In the *American Naturalist*, Charles C. Abbott, M.D., gives some account of the changes in the fishes of New Jersey within a few years. A slight local disturbance sometimes quite alters the fauna. Thus in 1867 a small, never-failing brook, emptying into the Assumpink, was populated by chubs, dace, and minnows. In July a heavy, sudden fall of rain caused a rise of water, but did not alter the brook enough to attract the attention of those who lived near it. After the subsidence of the water not one of these fish could be found there, while their place was taken by roach, mullets, and red-fins, which are now abundant, while not a chub can be found.

Dr. Abbott mentions several fishes that were not inhabitants of the New Jersey streams twenty-five years ago, which are now quite abundant; and he is greatly at a loss to imagine how they can have reached these streams. He mentions the interesting case of the gizzard shad, which is sometimes carried by freshets into inland streams or ponds. A pond near Trenton was stocked with them in 1857, and is now full of specimens, weighing sometimes five pounds. They have become so different in color from the same fish as found in the Delaware and on the coast that Dr. Abbott at first thought them quite distinct; and he says they have changed considerably, but only in color, during the last ten years.

### McNEIL'S IMPROVED TOBACCO PIPE.

Tobacco has come to be such a staple article of luxury that any improvement connected with its use, and having sufficient merit to bring it into popular favor, is sure of an extensive sale.

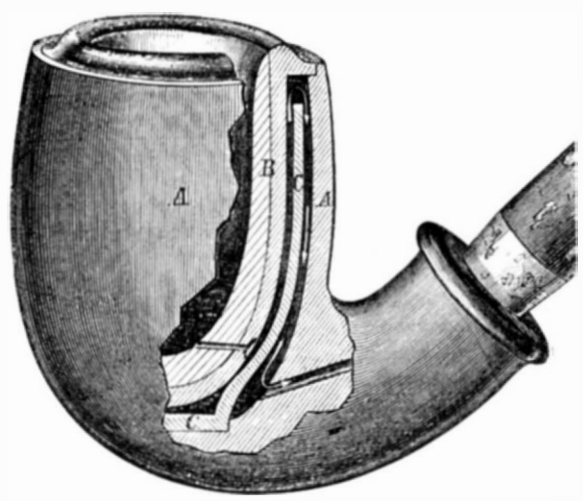
In smoking tobacco in pipes the following things take place. A portion is entirely burned, another portion is destructively distilled, and a portion of the active principle of the plant, nicotine, is distilled over with the water of which all tobacco contains more or less. A part of this moisture with its nicotine condenses in the pipe, and mingles with the tarry matter produced by destructive distillation, and the peculiar excellence of the meerschaum pipe is that it, from its very porous nature, absorbs or soaks up the oily noxious matter, and thus prevents its passage through with the smoke.

But meerschaum pipes are expensive and easily broken, and they have a trick of cracking upon so slight a provocation, that no man who buys a new one to-day can positively rely upon its being a whole one to-morrow.

In the pipe we herewith present to the attention of our readers, a provision has been made for the collection of the foul matters, and for facility in their removal in an ingenious and novel manner. The pipe bowl—in the peculiar construction of which the invention consists—is composed of three parts or shells.

The outer shell, A, is formed after any appropriate design, and a shoulder formed on the inside of the upper edge supports an inner bowl, B, which has a flange or rim upon its upper edge, as shown.

The inner bowl is made of one kind of material, or it may be lined with any suitable material, as shown in the engraving.




It will be seen that when the outer and inner bowls are placed together, they do not touch except at the upper border, leaving an unfilled space in which a third bowl, C, is placed. Suitable openings being made near the bottom of the inner bowl, the smoke passes up and down between the surfaces of the three bowls, as shown by the arrows, depositing its nicotine and moisture within the bowl, C, from whence it is easily removed when necessary, as the parts may be separated and put together again with the utmost facility.

The inventor of this improvement is Wm. S. McNeil, office 104 Wall St., New York, to whom all communications should be addressed.

### The First Japanese Railroad.

Letters from Japan state that the arrangements are completed for a line of railway—the first in the country—to connect Yeddo and Osaka, the new and old capitals of the Empire, a distance of 300 miles. There are also to be branches from Yeddo to Yokohama, and from Osaga to Tsuruga. The work will belong to the Japanese Government, but is to be carried out under the advice of English engineers appointed by Mr. H. N. Lay, who has selected Mr. Edward Morel as principal engineer. Mr. Morel has been summoned from Australia, where he was engaged in works for Mr. Edwin Clarke. An English loan of one million sterling is to be raised to meet the costs, and this will be secured not only by the line itself, but by a mortgage on the Custom duties collected at the ports. From three to five years is to be allowed for completion.

### The Planet Mars.

The planet Mars is enveloped, exactly in the same manner as its next door neighbor, the earth, in a dense screen of mists and cloud; and it is only at the favorable moments when these clouds are rent asunder, that the actual surface of the planet can be seen. When the cloud curtains are most close-drawn the hue of the planet is greenish-white; when the curtains are flung open the planet wears a ruddy light. The planet's body is red, like the red sandstone of the earth. The drapery of clouds is of the same tinge as the clouds of the earth when seen hanging in masses under reflected illumination.

Under these circumstances, the only way in which anything like an idea can be formed of what the appearance of the planet would be if the drapery of cloud was entirely removed, is to fit together piecemeal the several passing glimpses that are caught of different parts of its surface at favorable times. The best views are so fleeting and capricious that the observer has to watch continually for hours to catch, it may perhaps be, but a momentary glimpse, which then has to be quickly fixed in the mind in order that it may be accurately transferred into the form of an endering record. And this task can only be worked at, it will be remembered, when the planet is in opposition; that is, when it is on the same side of the sun as the earth, and therefore in its nearest approach to the observer—a circumstance which recurs after intervals of 780 days. The observations of Beer and Madler were made with a fine telescope of Fraunhofer's construction, which enlarged the apparent dimensions of the planet from 22 seconds to 110 minutes of arc, and which made its disk seem nearly four times as broad as the moon. Instruments of this class, until very recently, have been very costly affairs. But through the great ingenuity and skill of Mr. With, instruments of a high order of merit and power can be now supplied at something like one fourth the cost of those of an earlier time. Mr. With's telescopes are reflecting instruments in which the mirror is made of silvered glass, glass being much more easily worked into perfect form than the old speculum metal, and silver afforded a far more brilliant surface than the mixture of copper and tin.

Photography is as yet unable to cope with work such as the delineation of the appearances on Mars, because the actinic power of the largely magnified image of the planet is very low, and because the complex movements of the planet and the earth both render prolonged exposures with any exactness of definition impracticable. Mr. Browning has nevertheless shown that there is something which photography can do in regard to this planet, although it cannot make the planet sit for its portrait. It can enable any pair of human eyes to contemplate the picture of the planet exactly as it would be seen if at some favorable instant it could be caught entirely stripped of its veil of cloud. It can bring all the thousand-and-one results of patient and prolonged study and watching together into one glance. Such are, in fact, the stereograms of Mars which Mr. Browning has prepared.

It now only remains to draw attention to the leading features which are developed in these interesting delineations of Mars. Certain spectroscopic observations made by Mr. Huggins leave no reasonable ground to doubt that the red color of Mars is due to the physical character of the actual substance of those portions of the planet's surface. The ruddy hue is at all times less strongly marked towards the border of the visible disk of the planet, where it is more masked in consequence of the reflected light having to pass through deeper tracks of the planet's atmosphere than in more central regions. It is also very much more intense at some returns of the planet into the favorable position of opposition than it is at others. Thus, for instance, the planet was much more distinctly red in the year 1868 than it was in 1864. This seems to indicate that clouds are more prevalent in the platetary atmosphere at some times than at others. The greenish or bluish-gray patches have just such a character of light as would be reflected from large oceans of water. The red and gray patches of Mars are, therefore, now accepted as indicating a very high degree of probability that these are actually continents and seas, which are contemplated, by chance glimpses, upon the planet's surface.

The actual amount of solar light and heat which Mars receives from the great central luminary is less than one-half the amount which is conferred upon the earth; in more exact numbers the proportion is $\frac{43}{100}$.

From some careful investigations made by the philosopher Zollner, it appears that Mars appropriates for his own intrinsic use something more than seven-tenths (or more exactly ·7328 parts) of the solar energy which it receives, and reflects into space nearly three-tenths (or more exactly ·2672 parts).

With lessened solar force less vapor is raised into the atmosphere, and less rain is precipitated upon the land. There are, therefore, less vigorous traces of the changes that are worked by the wearing away of high land under the action of running water. Something also of the difference of sculpturing and contour are most probably due to the fact that a globe, having only one-seventh part the volume of the earth, would pass from the primeval incandescent and plastic condition into the hardened and rigid form much more rapidly, and therefore would not have the wrinklings and foldings of its contracted crust arranged in exactly the same way as the wrinklings and foldings of the crust of the larger earth.—*Prof. Mann.—British Journal of Photography.*

PALE LACKER FOR TIN PLATE.—Best alcohol, 8 oz.; turmeric, 4 drs.; hay saffron, 2 scr.; dragons'-blood, 4 scr.; red sanders, 1 scr.; shellac, 1 oz.; gum sandarach, 2 drs.; gum mastic, 2 drs.; Canada balsam, 2 drs.; when dissolved, add spirits of turpentine, 80 drops.

## OBITUARY--ZERAH COLBURN, ENGINEER, AND LEADING WRITER OF ENGINEERING PAPERS.

We have had specially prepared for this paper a portrait of the late Zerah Colburn, which we publish with the accompanying obituary notice from the pen of his former associate, Mr. A. L. Holley, as published in the New York *Times*, of May 2d.

The name of Zerah Colburn is known to the engineers of all countries where professional literature exists, and his writings are perhaps more various in scope and more vigorous in practical treatment than those of any other member of his profession. In his death engineering sustains an irreparable loss.

Mr. Colburn was born in Saratoga, N. Y., in 1832, and was named after his uncle, the celebrated mathematician. His father died soon after, and his mother, very poor and infirm, removed to New Hampshire, where, during his boyhood, young Colburn earned his living on a farm. His early means and opportunities for acquiring an education were limited to a few months' attendance at a district school, a short clerkship in a factory, and such books as he could find in a remote country village. But his industry and his wonderful memory more than made up to him then, and throughout his life, his want of early advantages. From an odd volume of the old *Penny Magazine* he gained a knowledge of the world and an inspiration to see and figure in it, which all educational appliances fail to give the average boy of the period. At the earliest possible moment, young Colburn left the wilds of New Hampshire and struck out for civilization, and he kept moving till he finally settled down in its midst—in London. His first sight of a city, and, what was a greater thing to him, a locomotive, was at Concord. The strong but hitherto undeveloped mechanical talent in him at that sight asserted its proper place, and the locomotive was ever after his chief study, and the subject of his best conclusions and ablest writings.

He soon after, as he found means for support, removed to Boston. His first literary attempt was in verse for the *Carpet Bag*. His professional career commenced on the Concord Railroad, under the late Charles Minot, then its manager, who was attracted by the brightness and practical ideas of this singular youth. In a few months Colburn had mastered the anatomy and physiology of the locomotive engine, tabulated the dimensions and proportions of those under his observation, and published a small, but excellent and still useful, treatise on the subject. He then got a subordinate position, and soon rose to the superintendence of the locomotive works of Mr. Souther, in Boston. Here he tabulated and committed to memory (an easy task for him) the dimensions of all parts of the then standard locomotive, and the cost of all the materials and labor employed in its construction. With the exception of a few months at the Tredegar Works, at Richmond, where, in connection with Mr. Souther, he started the manufacture of locomotives, Mr. Colburn then made New York his head-quarters until 1858. His more important professional work at this time was his superintendance, for a year or more, of the New Jersey locomotive Works at Paterson, during which engagement he made some improvements, still standard, in the machinery of freight engines.

Although eminently fitted for the management of practical construction, Mr. Colburn early found that the literature of engineering was his true calling. He therefore joined the *Railroad Journal* of this city, in which professional readers, soon recognizing the hand of a master, began to look for a new era in technical journalism. And they were not disappointed. In 1854, Mr. Colburn started, in New York, the *Railroad Advocate*, a weekly, devoted especially to the machinery of railroads, and addressed chiefly to the master mechanics, and the more intelligent operatives. The next year he enlarged the *Advocate*, which soon reached a large circulation and great popularity, not only among railway mechanics, but among the profession at large. It is worthy of mention, as illustrating Mr. Colburn's extraordinary power of memory, that he kept no books for many months, but simply remembered when every subscription and advertisement fell due, and made no mistakes.

In the summer of 1855 Mr. Colburn thought he saw, in his large and favorable acquaintance with railroad men, the way to a fortune in the business of railroad supplies. He therefore sold the *Advocate* to Mr. A. L. Holley, then draftsman of the New York Locomotive Works, bought land warrants with the money, journeyed to Iowa and located his lands, and then returned to New York—but with another scheme. The frontier life had temporarily charmed him, and he got together an engine and machinery to set up a steam saw mill in the far West. But before his plans were completed, literature and civilization had resumed the mastery, and he fell to writing for the *Advocate*, because he could not help writing, and to arranging his supply business. The first thing—and the last—that he undertook in this direction was Ames' tires, and with his knowledge, industry, shrewdness, and his advantages with the professional press, he kept the hammers at Falls Village busy day and night building up an immense business, which, unfortunately, the character of the tires did not maintain.

But Colburn was not made for a merchant. He pined for larger professional observation and knowledge, and for a wider field. As suddenly as he went into trade he left it, and sailed for Europe. During a three months' stay or rather rush among the machine and iron works of England and France, whereof the story is recorded in the *Advocate*, and is of permanent value, he had become again and finally wedded to literature. Returning to New York, he connected himself again with the *Advocate*, which was then enlarged and entitled the *American Engineer*.

In the autumn of 1857, Messrs. Colburn and Holley were commissioned by several leading railroad presidents to visit Europe to report on the railway system and machinery abroad, and in view of the financial troubles of 1857, they were advised to stop, at least temporarily, the publication of their paper.

Permanent-way and coal-burning locomotives were found to be the most important subjects of the period, and in 1858 their report on these subjects, largely illustrated by engravings, was published and generally circulated among American railway managers.

Mr. Colburn's thorough and, to American readers, entirely new and startling analysis of the cost and economy of British railways, was the foundation of many of the reforms that have since, although slowly, become standard here, especially in the matter of improved road-bed and superstructure. The success of this book was such that its authors determined to continue their researches, and in the fall of 1858, Mr. Colburn again visited London. Here he commenced writing for the *Engineer*, then the leading professional journal, and soon became its editor. Under his vigorous management it largely increased in circulation and influence.

Mr. Colburn at this time wrote a supplement on the American Practice for a new edition of Mr. D. K. Clark's work on the "Locomotive Engine." After several years' hard work in London, Mr. Colburn resolved to start another engineering paper in America. He came out in the *Great Eastern*, on her first passage in 1860, and soon selected Philadelphia, the principal seat of mechanical engineering in this country, as the birthplace of his own *Engineer*. It was an excellent paper, and the few numbers published will have permanent value, but the time was not ripe, in America, for a publication of this kind, and Colburn, although he had learned to labor, had never learned to wait. In a moment of despondency he dropped his new enterprise, sailed for England, and again became the editor of the London *Engineer*. At this time he familiarized himself with the French language and professional literature. He also wrote several pamphlets on boiler explosions, heat, etc., the originality of which attracted great attention, and he commenced his great work on the locomotive engine.

In 1866, Mr. Colburn started in London the publication of *Engineering*, which is in all countries accounted the ablest and best serial publication on that subject, and he dissolved his connection with it only a few weeks before his death.

During his residence in London, Mr. Colburn was employed as consulting engineer on many important constructions, and prepared many valuable papers in addition to his editorial labors. The more noted of these were his papers before the Institution of Civil Engineers (of which he was a member) on "Iron Bridges" and on "American Locomotives and Rolling Stock," both of which received medals.

Mr. Colburn wrote vigorously, originally, and with understanding on all the leading subjects embraced under the head of engineering. On the locomotive, the steam engine and boiler at large, steam navigation, bridges, railway works, and mechanical engineering in general, he was a first-rate authority.

The saddest part of Mr. Colburn's story remains to be told. Overwork was at least a powerful agency in his early fall, and this, together with his natural impulsiveness and his habitual irregularity in relaxation, as well as in work, drove him, within a few months, into partial insanity. He came to this country a fortnight since, avoided all his old friends, strayed away to a country town in Massachusetts, and there died by his own hand.

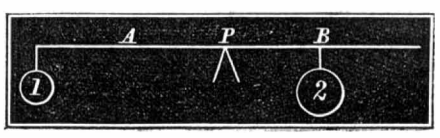
Zerah Colburn was a man whom the profession could ill afford to lose. His thoroughly practical education in the workshop, his extended observation of engineering works, his intimate acquaintance with professional literature, his remarkable quickness of comprehension, his more remarkable memory, and his mechanical talent and inborn engineering ideas, combined to give him a distinction that no engineer in the world will deny him—the best general writer in his profession.

## Correspondence.

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

### A Simple Question.

MESSRS. EDITORS:—It is reasonable, *a priori*, to assume that equal downward forces on the arms, A and B, are required to balance the rod on pivot, P; but the rod is balanced by a force of 1 on arm, A, against a force of 2 on arm, B. The downward pressure of 1 on arm A, is not increased by its




greater distance from the pivot, P, than force, 2, on arm, B, for the joint pressures on the pivot is only 1 + 2 = 3.

There is a law in nature, whereby the greater motion of a small force is made equal to the less motion of a greater force. But here there is no motion. How, then, does ar A, with half the force, equal arm, B?

Until a better explanation is given, we may suppose the greater force on arm, B, does, or rather would preponderate if the inseparable and simultaneous creation of motion infinitely small, did not arrest it, as with the parallel case of action and reaction.

T. W. B.

Pittsburgh, Pa.

### Scraping Slide Valves.

MESSRS. EDITORS:—I notice in a recent number an article on "Scraped Surfaces." From thirteen years' experience, I find that for all kinds of slide valves and such like, a really good scraped-up face is a most decided benefit. But it is a lamentable fact that few workmen know how to scrape properly. I have always found that the scraper works best after

a smooth file; everything should be finished with the smooth file previous to the scraper being used. I have seen many workmen leave too much to be done by the scraper. Now that is a gross mistake; every article ought to be fitted as well as possible before being touched by a scraper; otherwise a bad job is almost certain to be the result. The scraper should always be used obliquely to the file marks, never across at any rate. Nothing makes a better scraper for wrought and cast iron than a taper saw file, and for brass a flat scraper must be used if good work is wanted; say about 1 in. broad and $\frac{3}{32}$ in. thick. A saw file scraper is too keen for brass. In all railway shops in Scotland, scraping is much used and with the best results. We always scraped slide valves, motion bars and blocks, and axle boxes. It is certainly a very unworkmanlike way of turning out a slide valve, and leaving it to work itself tight. It is tantamount to saying it can't be made tight. Most of the first class marine engine builders in Great Britain scrape valves, etc. I know Penn, of Greenwich, tried last year to do away with the scraper on a pair of large valves; on the trial trip the valves got cut up awfully; so scraping is there considered a necessity.

Brooklyn, N. Y. WM. P. COWAN.

### Steam on Common Roads.

MESSRS. EDITORS:—Quite a number of years ago I first saw a steam carriage in Brattleborough, Vt.; it was about the size and build of a common 1-horse wagon; its two cylinders were placed horizontally beneath the seat, and were connected by the usual pistons, cross-heads, and connecting rods, to a crank shaft, with a crank upon each end, and at right angles with each other; power being communicated from this shaft to the driving axle by a "chain belt."

The boiler consisted of a series of tubes bent U form, the lower branches of them serving for the grate and the upper branches for the crown of the fireplace, their ends terminating in two parallel horizontal cylinders, the fuel door being between them, the uppermost of the two cylinders being surmounted by a third of larger size for steam room; the tubes and their two connected cylinders being filled with water and cased with sheet iron.

This carriage worked quite lively on level ground and around a circle of from ten feet to twenty feet radius; but I noticed that the fire and the condition of the water in the boilers were matters of considerable care and solicitude with the operator, the fuel being wood, and the boiler containing but little water, the pressure varied greatly and constantly; now flowing freely from the safety valve and the carriage running vigorously, and then barely steam enough to move. There were both power and speed enough while steam was up. I was deeply interested in the novel exhibition, and expected to see, long ere this, steam vehicles in as common use as any other; and I have often wondered that the people should be so tardy in their appreciation of this mode of locomotion.

To be sure the association of boiler bursting has a terror for the inexperienced, but this will always vanish in proportion to the increase of intelligence upon the subject.

During leisure intervals in mechanical operations—especially while engaged in putting up railway engines—I have often busied myself in considering the best methods of applying the power of steam to common road use, both for heavy and light work.

The steam carriage enterprise was prosecuted quite vigorously in England some years ago, and the minutes of evidence taken in the investigation of the subject in the House of Lords are extremely interesting. It is well known that the result of this investigation amounted to almost a prohibition of the working of steam carriages on any of the populous and paying routes; the tolls imposed being so heavy that the proprietors of steam carriages are forced to abandon the enterprise to the "slow coach," podanger policy. Improvement must necessarily be slow while the paths of progress are thus beset with such adverse legislation.

F. G. WOODWARD.

### Collisions on Railways.

MESSRS. EDITORS:—Within the last few months I have noticed that, on railroads, where each train is designated by a number, and all trains are moved by telegraph, that several wild trains, standing on side tracks, have been mistaken for regular trains, and, as a natural consequence, in each case a collision, more or less serious, has been the consequence.

Could that not be remedied by superintendents of roads having the number of each train painted on a movable board attached to either side of the cape of the engines drawing the train. For engines regular trains a revolving tablet could be used, on which could be painted the numbers of both the trains (North and South or East and West) sufficiently large and prominent to be read by the engineer of any train passing another while it was standing on a side track?

For night trains, lamps, with numbers on them, could be substituted for placards.

On all wild or construction trains, the word "Wild," or "Construction," or "Irregular" could be used.

R. E. PLEASANTS.

Louisiana, Mo.

### Buzzing Up.

MESSRS. EDITORS:—I am glad to see the "buzzing up" process brought to notice in the SCIENTIFIC AMERICAN, *vide* page 252 "Explanation Wanted," C. H. Ladomus. Sure enough it is wanted. Fifty years ago the operation was to me a pastime, perfectly bewitching, and unaccountable as now. It is not (?) animal magnetism; I know as much about that as anybody—which is very little. What is it? C. H. L. is, I think, needlessly particular. A lies on his back, on the floor, ground, or an open lounge. B and C (two are as good as four) place their forefingers under the shoulders and hips of A. They breathe in concert by finger signal from A. At the exhalation B and C lift, but they don't lift; the least effort or grunt breaks the spell, and you must begin anew. Thus A is breathed up, the breath lasting, if you are adroit, till you raise him as high as you can reach, when you must catch him to prevent a fall. The head should be the highest and then he will come down on his feet. He will feel that the gravitation is out of him; B and C lift only the clothing. He feels—have you ever dreamed of flying? That is it exactly.

No need of a close or still room, Mr. L. It can be done out of doors, in a gale as well as in a closet. When you get the knack of it—and it has once cost me three hours to teach a class—any two boys of 12 or 15 years can toss up a Daniel Lambert like a feather. I do not know that any science can come out of it, but as an amusement, it is the richest thing I ever knew. Thousands of your readers understand it, but they have need to be touched up a little in order to enjoy it.

Princeton, Wis. W. M. R.

### About Making Tea.

[From Good Health, for May.]

Potatoes, no doubt, are an important addition to roast beef, and the man who first planted them ought to have a statue raised to him. Some people may look with awe upon the rock near Salcombe, in Devonshire, where Sir Walter Raleigh smoked his first pipe in England. Indispensable as the potato, sweetly soothing as the tobacco plant, more thirst-quenching than *lachrymæ Christi*, or Bordeaux, invigorating as, but less soporific than beer, tea "cheers, but not inebriates," and seems to unite in itself the virtues of other modern luxuries, without sharing in their demerits. Tea in China, however, is not the same as tea in America. The Chinaman would as soon think of putting milk or sugar into his tea as we should think of flavoring champagne with salt. He is also far more particular about his cups and saucers than we are. He would laugh at many of our thick clumsy cups, called "china" by courtesy. His cup must be of a certain shape, ornamented with colors, which are always beautiful, and harmoniously arranged. He delights, most of all, in the delicate and transparent paper-china, that feels as light as a wafer, and is instantly heated through. The invariably stout and sedentary person, with useless feet, who sits all day, and sometimes all night, making tea for him, puts a few dry leaves into his cup, then pours the boiling water over them, claps a thin little saucer-lid upon the cup, to keep the steam in and draw the tea; and presently the tea is poured into that same little saucer-lid, and drank by John Chinaman, much in the style of our washerwomen. In Russia they make tea in tumblers, and flavor it with lemon and sugar. Some people add rum and drink it cold. In France if you call for tea, you will get a thin boiling fluid, which flows almost colorless from the tea-pot, and tastes something like warm water flavored with dandelions. Of course we mean to imply that our method of making tea is the only sound and proper one. We are not sure that we might not borrow the saucer-lid from the Celestials, but we must insist upon plenty of milk and sugar. At all events, in a free country we may fairly claim the liberty of the subject in this direction; but, alas! how few people know how to make tea! only middle-aged bachelors ever attain supreme excellence in this art, and perhaps a few gifted ladies who have been carefully instructed by them. How many of those unconscious damsels, who carelessly shovel in an indefinite number of spoonfuls, and drench the same with an indefinite quantity of half boiling water, realize the difficulties of the task they have so lightly undertaken! They confidently put their tea-pot on the stove, as they say "to draw," as if, forsooth, tepid water would ever draw the hidden treasure out of leaves that have, perhaps, been placed in a tea-pot only half warmed. Others pour you out three thimblefuls as strong as brandy, and then fill up your cup with pure water, and hand you this flavorless mixture, with the request that you will add milk and sugar according to your taste, as if any possible additions could make the wretched stuff drinkable. Some pour your tea into a cold cup, and deluge it with milk. Others merely tinge the fluid, already pale with weakness, thinking that the tea will look darker without much milk. Some give you a good first cup, and let the drained tea-pot stand till you call for a second; then they have the effrontery to fill it up under your very nose, and offer to pour you out any quantity of hot water, which they expect you to drink gravely, with milk and sugar, and call it tea. Others put in soda, and stir the tea-leaves with a spoon—some boil your tea! in fact, there is no end to the dreadful delusions practiced by women on themselves and their victims under the name of tea-making. Doubtless, there are certain rules which may be laid down, such as—see that the water boils; warm your tea-pot and cups well through; fill the tea-pot at least half or three-quarters full, or your tea will be cold, the water will not be hot enough to draw, or it will draw a little strong essence, which you will presently have to drown, and consequently spoil, with boiling water. Keep the tea as much as possible of an even quality. Let the second and third cups be at least as strong as the first. Dr. Johnson was a great connoisseur in tea, and used not unfrequently to take twelve cups. But such were Mrs. Thrale's experience and skill, that we do not hear of his ever being disappointed. But no rules will insure good tea-making. *Poeta nascitur non fit*, and it may be said similarly, you are born a tea-maker, but you cannot become one.

However, to be a good tea-maker is one thing, and to avoid being a very bad one is another; and we are certain, if ladies could be made to realize the importance of this delightful art, and if they only knew what excellent judges most men are of tea, we should soon have what is sadly wanted through out the country—a great reform in tea-making.

### The First Artificial Fire.

Dr. Collas, in *Cosmos*, expresses doubt that the primitive races made fire by simply rubbing together two pieces of wood against each other. He claims that "the friction of two pieces of wood against each other is not sufficient to excite fire, and after what I have seen, I doubt very much if the strength of man is equal to such a task, even if it were possible. It is then not impossible, when we seek from the habits of men still in the uncivilized state, to learn the habits of pre-historic man, assisted by the utensils or relics which time has spared, to arrive at very definite conclusions concerning them.

"The savage, in making his fire is, according to the Sanscrit etymology, a veritable *Prometheus*, for he *hollows by rubbing* in order to *steal away* the fire. Without the groove which he wears he could not make fire. His method is to take two dry pieces of wood unequal in size and hardness. In the larger and softer he plows the groove. The other he bluntly points like a pencil. The larger being firmly supported against a tree or a large rock, the smaller is pushed backward and forward at an angle, in such a way that a groove is formed, making at the same time a mass of fine shavings, or rather a sort of powder which he gathers up at the extremity of the groove opposite to him. The powder soon blackens and smokes, then takes fire, but the *powder only*, and not the piece of wood. Sometimes sailors have attempted the same thing, and have succeeded in blackening the powder and causing it to smoke, but I have never known one to inflame it. Our attempts have been successful in increasing the depth of the groove, but so far as heat was concerned, beyond blackening the powder, we have produced only that which induces prespiration.

"If now we take into consideration the rôle of the powder, the amount of unskilled labor which I have seen lost in *rubbing* pieces of wood with which, without great effort the young Kanack could procure fire, we are led to think that it would be difficult to make a fire with a piece of wood revolving like a drill. With equally good reason we shall conclude that the rocks (*pierres*) found near pre-historic dwellings served another purpose than that of making a fire, and that the piece of granite from Lake Fimon was a household utensil probably analogous to those which the inhabitants of India now possess, and which they use for bruising many substances used as food, whether by pounding them, or by crushing them under a stone roller."

### English Steam Plows in Louisiana.

A writer in the *New Orleans Times* gives an account of a visit to a plantation known as the Magnolia Sugar Estate one of the largest in the country. Among other interesting things he witnessed the operation of some English steam plows. We cull a few paragraphs from his description:

"This new implement of agriculture consists of two ten-ton portable engines, resembling the old locomotive that many of our readers probably have noticed at the lake end of the Pontchartrain dept. Beneath each locomotive is a revolving steam drum, on which passes the steel corrugated wire rope that draws to and fro the cultivator, to which are attached some ten steel tipped plow blades. The cultivator is an iron frame, with a seat at each end, and mounted on two iron wheels. On top of the cultivator sits a colored boy, who by means of a simple tiller directs the progress of the plow. The locomotive engines are situated directly opposite to each other, about two acres in distance. By means of the steam drum and the rope the cultivator traverses the field back and forward much faster than a man can walk, and turning up the soil to a depth of eighteen to twenty-two inches in a more effectual manner than could be done by the old system; a harrow some eight feet in length is used over the same field, and is propelled with great ease by the same motive power.

"Mr. Lawrence, the proprietor of the estate, has four of these plows in operation, which easily turn over twenty-four acres a day, at a cost, including fuel and labor, of some three dollars per acre, which is quite a saving over the method heretofore pursued. There is no apparent intricate machinery about the work; the whole seems to work as smoothly as an ordinary standing grist-mill; the locomotive trails over the road quite easily, propelled by steam. Mr. Lawrence, last fall, took off a crop of over six hundred hogsheads of sugar, the entire plowing having been performed by the steam apparatus. The plow, locomotive, etc., were constructed by a firm in Leeds, England, and cost, exclusive of freight, etc., some £1600. The first one imported to this country is now in New Jersey; one subsequently was sent to Illinois, which has lately been sent to this State, and is now in operation at the Concession Plantation, in the parish of Plaquemine, where it is said to give great satisfaction."

### Preservation of Stones.

Dr. Robert, in the Paris *Les Mondes*, maintains that the use of the black oxide of copper, and its salts, will effectually prevent change in stone. He shows that the decay of granite, marble, limestones, sandstones, and all natural building stones, is the combined effect of various causes, and that among these is a very minute lichen, the *Lepra antiquitatis*, which is one of the worst enemies of stone, and its action is to such an extent that, for instance, the beautiful marble sculptures of the well-known *Parc de Versailles* will, unless proper measures be taken for staying the process of decay, be unsightly and ugly masses of dirt, and quite irretrievably lost, as works of art, within the next fifty years. The author, taking as instances such buildings at Paris as the Bourbon Palace, the *Palais du Corps Legislatif*, the Mazarin Palace

(*l' Institut*), the Mint, and others, points out that dust, spider's webs, and the action of rain, combined with the minute lichen above alluded to, hasten the decay of stone, especially of those parts where any sculpture or ornamental carving promotes the deposition of dirt and dust. Various places and instances are cited, of the application of oxide of copper and its salts, which places are open to inspection, and the length of time which has elapsed since such application, seems to warrant the conclusion that these compounds act as preservatives of stone. In reference to granite, the author states that this stone is also, according to the experience of Egyptian engineers, far more readily affected by a moist climate than one would be led to believe. The obelisk of Luxor, brought from Upper Egypt to Paris, has become blanched and full of small cracks, during the forty years it has stood on the Place de la Concorde; although forty centuries had not perceptibly affected it, as long as it was in Egypt. Granite, in a moist climate, becomes the seat of a minute cryptogamic plant, which greatly aids its destruction, and it is, moreover, a well-known fact, that the disintegration of this stone, which is composed of three separate minerals (quartz, mica, and feldspar), depends very greatly upon the thorough and intimate mixture, as well as the chemical composition of these three ingredients, each of which, in a separate state, more easily withstands the influence of the weather.

### Thames Mud Butter.

A paragraph was recently published in the London journals about the adulteration of butter, in that city, from a product of the Thames mud. At the time of that publication, there was some doubt in our minds as to whether the report had foundation in reality, or whether it was one of those sensational newspaper reports which our British Cousins seem to relish, as well as their Yankee relations. Morgan's *Trade Journal* now reasserts the statement, and gives the following particulars:

"An analytical chemist has extracted from a portion of Thames mud, taken from the river at Battersea, a pure white fat. At this stage it lacks both taste and smell, but properly manipulated, it makes a very popular article of food—whether traceable to the refuse of manufactories and of ships or other sources it is impossible to say. That there is, however, no doubt about the fact is proved by the circumstance that about a week ago a small proprietor on the bank of our noble stream, thunderstruck by the apparent extravagance of an offer for his wharf, learned that it was a very favorable situation for a butter factory. Now, the faster this secret oozes out of its discoverer's brain into the receptive organs of other impostors, the faster, of course, will the mud which it utilizes be made to ooze out of its native bed into pats of London butter, which, if the truth as to its origin were fully told, would be stamped with a likeness, not merely of a cow, but of Father Thames. Unfortunately, knowledge of adulteration is not a step toward its suppression. We must grin and bear it, although we are quite awake to the fact, that our milk is sluiced with water, our stout colored "a fine brown" with liquorice, and our butter likely enough to be enriched with the fertilizing properties of mud. What are we to do, when one proverb warns us that every one eats a peck of dirt before he dies, and another, never to quarrel with our bread and butter, not even when the latter is mud pie with a vengeance—of the earth, earthly indeed?"

### The Oxygen Light.

According to the *Opinion Nationale*, Paris, the new *Prefet de la Seine* has definitively authorized the Tessie du Motay Company to lay their underground communications in the city of Paris for illuminating with oxygen gas.

A system of pipes will connect the oxygen works of Pantin with the boulevards, and in a few months all the inhabitants residing between the "new Opera" and the Passage Jouffroy, will thus be enabled to benefit from the immense advantages offered by this new light over the old gas.

Already oxyhidric lanterns have been placed at the entrance of the bazar European, near the Passage Jouffroy, and project a light of the purest white and the most dazzling brilliancy, near which the old gas pales and appears to shine with the most singular yellow color.

The journal referred to congratulates M. le Prefet de la Seine for having ratified a measure in accordance with the general wishes and interests of the people, and which appears to it to be the indispensable corollary of the great improvements undertaken within a few years in Paris.

### Medical Properties of Eggs.

The white of an egg has proved of late the most efficacious remedy for burns. Seven or eight successive applications of this substance soothes pain, and effectually excludes the burn from the air. This simple remedy seems preferable to collodion, or even cotton. Extraordinary stories are told of the healing properties of a new oil which is easily made from the yolk of hens' eggs. The eggs are first boiled hard, and the yolks are then removed, crushed, and placed over a fire, where they are carefully stirred until the whole substance is just on the point of catching fire, when the oil separates and may be poured off. One yolk will yield nearly two teaspoonfuls of oil. It is in general use among the colonists of South Russia a means of curing cuts, bruises, and scratches.

TO CLEAN MARBLE.—Take two parts of common soda, one part of pumice-stone, and one part of finely powdered chalk; sift it through a fine sieve, and mix it with water; then rub it well all over the marble, and the stains will be removed; then wash the marble over with soap and water, and it will be as clean as it was at first.

### The Osmogene Process.

The inventor of the Osmogene process, for purifying molasses, M. Dubrunfaut, has lately reviewed in the columns of the *Journal des Fabricants*, the progress which his invention has made, and the extent to which it is adopted in the French sugar manufacture. We are not aware that the process has been introduced into this country in a single instance, indeed, it is chiefly valuable for operating on beet-sugar molasses, on account of the soluble salts, which are the chief impurities of this sirup, and which the Osmogene process is so efficient in removing.

M. Dubrunfaut first made public his adaptation of the principle of dialysis in a work presented to the Academy of Sciences, in November, 1855, in which he announced that he had succeeded in applying the power of Osmose to the separation of certain mixtures.

Dutrochet appears to have been the first to study the peculiar behavior (called Osmose) of saline solutions when separated from water, etc., by a diaphragm of a membraneous nature. He was followed with greater accuracy of results by Vierordt, Professor Jolly, and by the closer researches of Graham. The term Osmose, derived from a Greek word signifying impulsion, comprises the two terms endosmose (diffusion through inwards) and exosmose (diffusion through outwards). The first experiment in connection with it was performed by suspending a closed bladder holding a saline solution in a vessel nearly full of water. The salts passed through the bladder into the water at a certain speed, and the water entered into the bladder at a certain speed, but the velocity of diffusion was not alike in each. The more rapid flow from the thinner to the thicker fluid was called endosmose, and the opposite slower current exosmose. It is this principle of dialysis, or diffusion, which M. Dubrunfaut successfully adapted to the purification of beet molasses and the extraction of sugar contained therein. These molasses are a mixture of sugar and different salts, chiefly nitrate of potash and chloride of potassium, which retard and in certain cases prevent the crystallization of the sugars which are present with them. If, then, the proportion of salts in the molasses can be diminished by whatever cause, the molasses will furnish a further quantity of crystallizable sugar.

This result M. Dubrunfaut obtained by placing in the endosmometer of Dutrochet molasses of the usual density in the presence of water, and then causing two currents to flow; a strong one forces the water against the molasses, the other, more feeble, forces the molasses against the water, a diaphragm separating the two. The effect is such that the molasses parts with the greater part of its salts to the water, but with little or none of its sugar, so that the molasses remaining contains much less salts and nearly the same proportion of saccharine, which, by the usual operations of the refinery, may be separated in the form of crystallizable sugar.

Such is the principle of this mode of treatment of molasses and other saccharine liquids, and to the apparatus for carrying it out M. Dubrunfaut has given the name of an "Osmogene."

In an osmogene there are two distinct reservoirs separated by a permeable partition. One of these receptacles contains the molasses or sirup, the other is filled with water; the medium separating the two liquids is of parchment paper.

Each receptacle consists of a casing, the top, bottom, and ends of which are of rather thick wood, while the sides are furnished with parchment paper; each casing is about 3 feet in length, 2 feet in breadth, and ¾ of an inch in thickness. Four bars of wood divide the interior of the casing lengthwise into five compartments, which communicate with each other by an opening in each bar. On each side of the casing is fixed a leaf of parchment paper, kept in place by slender strings. Thus, when the molasses is allowed to enter at the lower part of the casing, it rises in a serpentine manner through the five compartments to the top of the casing whence it may flow out.

A second casing, exactly similar for the water, is joined to the first in such manner that one leaf of parchment paper serves to separate the two cases. This pair constitutes what may be called a set or couple of osmogenes, but as one couple would allow of the treatment of only a small quantity of molasses, a number of these double casings are united, say 25 for water and 25 for molasses, which work simultaneously. The result is, of course, according to the number of cases employed, and it is the union of these cases which is called an osmogene. It is only requisite for success that all the cases of molasses and all the cases of water should fill and empty themselves simultaneously, as if only a single couple were being operated with; to effect this, the molasses enters at the bottom of one end of the series of cases, and a tube communicates with each, the water entering by the top filling simultaneously every water casing and flowing out at the bottom.

There is thus maintained a constant efflux of molasses and water in the osmogene, the two liquids being all the time kept separate during their course by the membrane of parchment paper.

### Dr. Charles A. Lee on Water as an Element of Organic Life.

Water is another factor of organic life. Without water no chemical or vital change can take place in the living body. Water enters into the composition of all organic beings. A large number of animals have their existence determined by water. A man weighing 150 lbs. contains 111 lbs. of water in his tissues. The oxygen that vitalizes his tissues is conveyed by water. The starch, the fat, the albumen, so necessary to the existence of animals, are all digested, absorbed, and conveyed to the tissues by water. These substances through whose chemical change life is possible, are decomposed in the presence of water, and the products of this decomposition are carried off by the agency of water. All the higher animals drink water for this very purpose; and the adult human being, on an average, in one form or another, takes from 70 to 80 ounces of water daily. Water is the most potent of chemical agents; its solvent power is equal to that of the mineral acids, and it associates itself in nature with a vast variety of compounds with which it comes in contact in the external world. It dissolves both organic and inorganic matters, hence it may become so contaminated as to be unfitted for the purposes of life. From the inorganic world, it may take up the salts of lime, iron, lead, copper, arsenic, and other compounds in such quantities that, when taken into the human body, it is not only unfit for healthy life, but it may become the source of immediate disease or death. Like the air, it may become the medium of introducing those definite organic poisons, which, kindling similar poisons in the living system, are at once the source of disease to others, and the death of the individual suffering from their action. Hence, among hygenic inquiries, none, perhaps, are more interesting and important than those relating to the quality of the water we drink; and not only this, but as connected with washing, cooking, and manufacturing purposes.

### Modifications in the Construction of the Nest of the Swallow.

In the tenth number of the *Comptes Rendus* for the present year, is a paper by M. Pouchet, on the modifications of the nests constructed by the common swallow, in which he remarks that it is evident the mode of life of certain animals, far from being persistent and invariable, undergoes modifications under different terrestrial conditions, and that, in many instances, their habits are different from what they were in former ages. Spallanzani indeed remarks in one of his remarkable memoirs on the swallow, that the shape and structure of the nests of birds are interesting features in their history, and that each species constructs its habitation on a plan peculiar to itself, which never changes, and is continued from one generation to another. And this opinion is shared by many naturalists; observations, however, when sufficiently close and attentively made, show that it is erroneous. We do not indeed see any modifications of those of their habits which are associated with their biology, so that the arboreal species seek to form for themselves a subterranean nest, or rear their young ones in dwellings adherent to the coigns of our houses, but it nevertheless is ascertained that in a succession of years, each learns to improve the construction of his residence. Certain birds work up only the products of our own handiwork, and would necessarily employ natural substances if these were deficient. Thus, as may be seen in the museum of Rouen, the Loriot of Europe sometimes forms its nest with thread ends under the branches of trees, which cannot possibly be the natural method. For several centuries the common swallow has disported itself in our crowded cities, and with its friendly masonry attached itself to our houses. The chimney swallow, still more familiar and audacious, often builds in the smoky shafts of our domiciles, or even in the noisiest factories, undisturbed by the din or the fires or the movement around them. Such habits must form a strong contrast with those of their predecessors in times long gone by. When we ourselves wandered untutored savages in the prehistoric times, or when still later we constructed lacustrine towns, or megalithic monuments, the habits of the birds can scarcely have been identical with those of today, for such human edifices afforded little security or shade. They must then have built amongst rocks. Nearly the same remarks apply to the storks, which have not remained stationary, but have preferred to their less commodious dwellings those offered to them by man. These changes in the industry or the manners of birds are perhaps even more rapid than we might at first sight suppose; and M. Pouchet's observations have demonstrated to him that notable improvements have been adopted by swallows in their modification during the first half of the present century. Having directed a number to be collected for the purpose of having drawings made from them, M. Pouchet was astonished to find that they did not resemble those he had collected some forty years ago, and which were still preserved in the museum of Rouen. The present generation of swallows have notably improved on the architecture of their forefathers, amongst those still building in the arches and against the pillars of the churches. Some, however, still adhere to the old methods, or such nests may possibly have been old ones which have undergone reconstruction. In the streets, on the other hand, all the nests appeared to be constructed on the new method. And now for the differences observed. The old nests show, and all ancient writers as Vieillot, Montbrillard, Rennie, Deglaun, etc., describe the nest of the house-swallow as globular, or as forming a segment of spheroid with a very small rounded opening, scarcely permitting the ingress and egress of the couple that inhabit it. The new nests, on the contrary, have the form of the quarter of a hollow semi-oval with very elongated poles, and the three sectional surfaces of which adhere to the walls of edifices throughout their whole extent, with the exception of the upper one, where the orifice of the nest is situated; and this is no longer a round hole, but a very long transverse fissure formed below by an excavation of the border of the section, and above by the wall of the building to which the nest is attached. This opening has a length of nine or ten centimeters and a hight of two centims. M. Pouchet considers this new form affords more room for the inmates and especially for the young which are not so crowded, whilst they can put out their heads for a mouthful of fresh air, and their presence does not interfere with the entrance and exit of the parents. Lastly, the new form protects the inhabitants of the nest better than the old one, from rain, cold, and foreign enemies.

### Improved Cherry Stoner.

On page 289, Vol. XVIII., of the SCIENTIFIC AMERICAN, we published an engraving of a neat and ingenious device for removing the pits from cherries, plums, and the like, and also the seeds from raisins, cranberries, etc. Since that time the machine has been greatly improved, and a very different form given to it, although the principle of removing the pits by punching, is retained.

The improved form of the machine, which we illustrate in connection with the present article, was patented by George Geer, of Galesburg, Ill., the inventor of the former machine.

It is screwed to the table by a hand screw, A. An upright, B, supports the body of the machine. The fruit is held in the left hand as shown in the engraving, and rolls down along a gutter, C, and enters the small cups in the periphery of the annular wheel, D.

E is a double crank from which a link, F, imparts vertical, reciprocating motion to the cross bar, G, and also to the recurved punching bar, H. Each time the cross bar, G, rises, a stud, I, engages with one of the cups on the annular wheel, D, turning it along one-eighth of a revolution, and bringing another cup directly under the point of the punching bar, H, carrying with it the fruit which has fallen into it from the gutter, C. Each of the cups has a hole through the bottom large enough to permit the passage of the pit; and when the punching bar descends by the rotation of the crank, it pierces the fruit and forces the pit through the bottom of the cup, into the chute, J, whence it falls into a dish placed to receive it.

The point of the punching bar is branched into four short sharp prongs, so that it cannot slip to one side of the pit; and a plate, K, prevents the fruit from rising with the punching bar.

Thus the pits may be removed almost as fast as a child can turn the crank, and the operation is so rapid that the juice does not escape, and the fruit retains its natural shape and appearance.

This ingenious and useful invention is manufactured by Geer, Stewart & Brother, Galesburg, Ill., to whom all communications should be addressed.


GEER'S IMPROVED CHERRY STONER.

### Improved Screw-Driver.

In an article published on page 393, Vol. XVIII., of the SCIENTIFIC AMERICAN, discussing the reason why a long screw-driver will put in a screw easier than a short one, we showed that the fact was attributable solely to increased leverage. The device which forms the subject of the present article, and of which an engraving is given, secures increased leverage at the will of the workman without increased length, and will for many kinds of light work also take the place of the bit-stock or brace for drilling, boring, etc.

In the engraving, A represents a wood handle, having a recess to receive and retain, when not in use, a second and smaller point, B. This recess is indicated by the dotted line. This supplementary point has a sleeve, indicated by a dotted line, which slips over the point of the larger screw-driver.

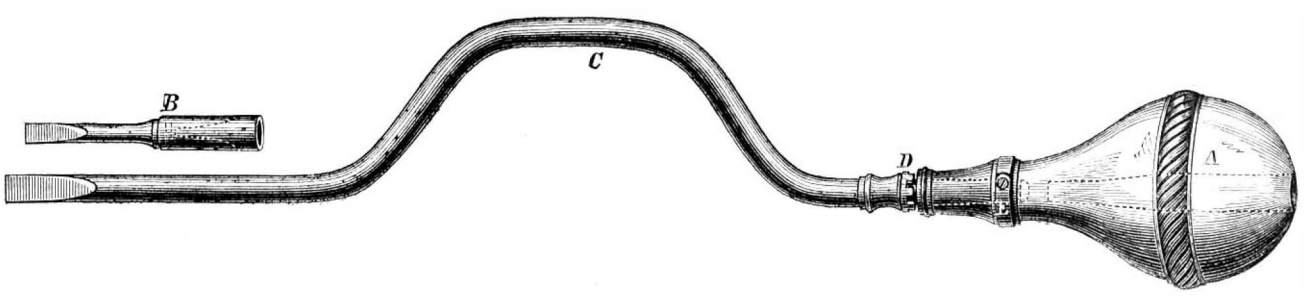
The shank, C, of the larger screw-driver is bent in the form shown. At D is a clutch, one portion of which is formed on the shank, and its counterpart on the handle, and underneath the ferrule.

The extremity of the shank, C, in the interior of the handle, has a turned groove, into which the point of the screw, E, enters, and holding the handle so that the two portions of the clutch cannot engage with each other, permits the shank, C, to be revolved like an ordinary bit-stock.

When it is desired to use the tool with one hand, the screw, E, may be turned out a little distance, when its point no longer enters the groove, and the counterparts of the clutch at D, engage with each other. The shank will then turn with the handle, and may be used precisely like the ordinary screw-driver, except that when it is necessary to use the power of both hands in driving home a large screw, an increased leverage is gained by the curvature of the shank.

It will also be obvious that bits properly formed may be placed on the end of the large screw-driver in the same manner as the supplementary point, B, above described, when the instrument will take the place of the ordinary bit-stock.

Various styles of handles may be employed which will suggest themselves to manufacturers. It can be made of wood or metal, and constructed to carry a "kit" of small bits if desired. The inventor would like to communicate with manufacturers in regard to the making or introduction of the device. Address David Drummond, patentee, McGregor, Iowa.




DRUMMOND'S IMPROVED SCREW-DRIVER.

### Who Named the Pacific Ocean?

It was Ferdinand de Magelhaens, or "Magellan," as he is usually called, who named the Pacific ocean. Balboa discovered it, from the Isthmus of Darien, several years before, but did not give it the name. Magellan was a native of Portugal, but had been several years in the service of Spain, when he formed the design of going westward from Spain to the East Indies. He started with five ships, in 1519; reached South America in safety, but had to quell a mutiny among his rascally crew before proceeding further. Then, continuing his voyage, he passed through the remarkable strait which bears his name, thus saving hundreds of miles of navigation around Cape Horn, where it is said, "Forever and ever the wildest winds of heaven seem let loose to vex the ocean into madness." Then finding the waters so much more placid than the Atlantic, he named the ocean Pacific. He reached the Ladrone islands, and thence the Philippine islands, where he was killed in a quarrel among the natives. His ship was conducted by Cano, one of his officers, onward to Spain, being the first that had circumnavigated the globe. The voyage occupied three years and one month.

### Cellars.

There ought to be no cellars under any dwelling, because they are always more or less damp and musty; and are the receptacle of every variety of substances subject to decay, decomposition, and the promotion of unhealthful gases and odors; not one cellar in a thousand, either in town or country, is clean or dry; and as any housekeeper may verify in ten miuutes. Cellars are usually cluttered up with old barrels, boxes, casks, bottles, cast-off boots, shoes, hats; with bones, ashes, and various remnants of wilted and rotting potatoes, turnips, apples, and other varieties of fruits and vegetables; it is the gases, the emanations, arising from these things, which cause the worst forms of typhoid and other malignant fevers. It is a benevolent arrangement of the wise and good Ruler of us all that pestiferous gases are lighter than the common air, and rise with great rapidity in warm weather to the regions of the clouds, where they can injure no one, and are either purified or resolved into their elementary conditions. Thus the disease-engendering atmosphere of the cellar, rises upwards, penetrates the crevices of the flooring, and would escape from the building, but is confined to the parlors and chambers, especially on the highest floors. This is particularly the case in New York City where the only entrance to the cellar is within the building; hence, every time the cellar door is opened, a crowd of foul emanations rush upward to impregnate the air of every apartment in the house. Very many of the ceilings of cellars are not even plastered; when really they ought not only to be plastered, but the eight or ten inches between the floors and the plastering, should be filled with charcoal or ashes. We have seen water closets under the stores in Broadway, which, for conditions of filthiness, are an utter disgrace to civilization. From considerations above named, the cellar should be the cleanest apartment in every dwelling; and in this moving time of the beautiful May, when perhaps half the dwellings change occupants, it is peculiarly convenient, when a cellar has been emptied by the movers out, for those moving in, to have the cellar most completely emptied of every thing not fast attached to the building; let every avenue of grating, door, and window be left open day and night for at least a week; the floor, walls, and ceilings or joists should be swept several times; the walls and ceilings whitewashed with two or three coats; the floor well washed and then rinsed with water, and unslacked lime or powdered charcoal should be liberally scattered wherever there is any appearance of dampness, so as to absorb all odors arising from moist and dark places. In a large district in a city the cholera appeared in only one house, traced to a pile of kitchen offal in a dark corner of the cellar.—*Hall's Health Tracts.*

### Bosquillon on the Secrets of Longevity.

"To chew well and to walk well," said Bosquillon, "are the greatest secrets of longevity that I know of." One of the most pernicious habits that can be acquired is that of eating fast. The loss of teeth is not necessarily conducive to a short life, if the imperfection in chewing is remedied by a more careful and slower process. Simplicity in diet is another great point. Two, or at the most, three dishes ought to suffice, but monotony should be avoided. There should be variety in simplicity. It is also of importance to preserve a certain degree of regularity in repasts. The number of repasts may vary with age and constitution; but three repasts, a light breakfast, a good dinner in the middle of the day, and a light supper, are admitted more favorable to health than late dinners, which leave the stomach unoccupied for a long interval, and overloaded at night. It is further of importance that the mind should be at ease during meals. That which is pleasant promotes digestion; everything that is the reverse is obnoxious. Plutarch declared laughter to be the best sauce. Exercise should precede alimentation, not follow it.

WELDING IRON TO COPPER.—It is said that the Pennsylvania Railroad Company have just concluded a series of experiments on a new process recently discovered by Mr. Beazel, a Pennsylvanian, which welds copper and all grades of steel and iron together at one heat so that they cannot be separated, even when upset and beaten down under a steam hammer. After subjecting it to every test at their shops at West Philadelphia for the last two months, the company have purchased the right to use it in their workshops.

TO BRONZE GUN BARRELS.—Dilute nitric acid with water, and rub the gun barrels with it; lay them by for a few days then rub them with oil, and polish them with bees' wax.

# Scientific American,

**MUNN & COMPANY, Editors and Proprietors.**

PUBLISHED WEEKLY AT
**NO. 37 PARK ROW (PARK BUILDING), NEW YORK.**

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st., Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXII., No. 20 . . [NEW SERIES.] . . *Twenty-fifth Year*

NEW YORK, SATURDAY, MAY 14, 1870.


**Contents:**

(Illustrated articles are marked with an asterisk.)





## THE AMERICAN MUSEUM OF NATURAL HISTORY.

The want of a public museum of natural history and of a zoological garden in the city of New York, has long been felt, and has been frequently discussed in our papers, but all of the efforts at remedying the defect, that have hitherto been tried, have failed for want of means. It is therefore with pleasure that we observe a new movement on the part of some of our enlightened and wealthy citizens to establish a museum in the Central Park, that shall recall many of the best features of similar European institutions, and be secured from political interference, by remaining the property of a private corporation.

The first annual report of "The American Museum of Natural History" has just been published, from which we gather some interesting facts.

It appears that in December, 1868, a number of gentlemen addressed a letter to the Commissioners of the Central Park, expressing their desire that a great museum of natural history should be established in the Park, and inquiring if the Commissioners were disposed to provide for its reception and development. A favorable answer having been received, steps were taken to obtain an act of incorporation, and to solicit subscriptions.

In a few weeks the sum of $44,550 was secured, and the purchase of collections at once begun. A valuable suite of North American birds, containing over three thousand specimens, was procured of Mr. D. G. Elliot, and Mr. Bell, a distinguished taxidermist, was employed to mount them. The committee to whom the matter was referred, having heard that the collection of the late Prince Maximilian of Neuwied were for sale, at once requested Mr. Blodget and Mr. Elliot, who were traveling in Europe, to take measures to secure them. The price paid for the collection was £1,500 sterling, and it is now on its way to America. The collection consists of 4,000 mounted birds, 600 mounted mammals, and about 2,000 fishes and reptiles mounted and in alcohol.

The presence of Mr. Elliot in Europe has been of great importance to the Board of Trustees, as he is familiar with several departments of natural history, and can aid in making proper collections of objects to be purchased. He found a dealer in birds and animals in Paris, who had accumulated a vast collection of curiosities, and of him he secured specimens to supplement the collection of the Prince of Wied. This was much better than to purchase the whole collection, for which the price of $45,000, gold, was asked. Of M. Verreaux, Mr. Blodget and Mr. Elliot secured 2,800 mounted birds, 220 mounted mammals, 400 mounted skeletons of mammals, birds, reptiles, and fishes, at a cost of $16,000 in gold, and of M. Vedray 250 specimens of mounted mammals and Siberian birds have been purchased. In addition to the above, many valuable objects have been presented to the Society by Baron Osten-Sacken, Mr. Robinson, and others, and they have now a collection that when properly exposed, will be a great source of instruction and amusement to our citizens.

The temporary place of deposit assigned by the Commissioners of the Central Park for the collection is the upper story of the Arsenal. The whole of this floor has been fitted up with cases, at the expense of the Commissioners, and the work of unpacking and arranging can now be rapidly carried on.

The trustees of the American Museum employ their own curators and pay them their salaries, but the police force and servants will be furnished by the Park authorities. The trustees of the Museum have the right to exhibit the collections in their own name, and we suppose for an entrance fee, three days of the week; all the rest of the time they will be open to the public free of charge.

Perhaps the most important clause in the agreement made between the Trustees and the Commissioners, is the one relating to the ownership of the collections. The Trustees have the right to remove their property upon giving six months' notice, and the Commissioners can require them to move the collections upon the same terms. In the event of the control of the Park passing into the hands of politicians, as it may easily do by act of Legislature, and of an attempt to make the Museum a source of speculation, the Trustees can withdraw their collections, and save them from falling a prey to these unprincipled men. The chief anxiety of thoughtful citizens has been to keep the educational facilities of the Park out of the hands of the city authorities, and it has been proposed to put the Zoological garden under the control of a private corporation for this purpose.

The recent unceremonious way in which the former Commissioners of the Central Park were legislated out of office is a fair illustration of what may be expected in the future. It is a pity that the Zoological Society was permitted to become extinct, as it could have occupied the grounds set apart for the garden, on the same terms as the Trustees of the Museum of Natural History now hold possession of the Arsenal, and in case of a change in the rules of the Park, the collection of live animals could have been saved from being sold or used as a source of profit to unplaced office seekers. As it is now, there is no guarantee that the Zoological garden may not be looked upon as a tempting field for a class of biped animals who have a keen scent for rich pastures where the work is light and the pay heavy.

The Trustees of the American Museum of Natural History close their report with an appeal to the public for further assistance; they say that the present subscription list of $52,000 should be increased to at least $100,000, and in this appeal they ought to have the sympathy and practical aid of our citizens. We also notice in this connection that the Legislature of the State of New York have changed the name of the State cabinet at Albany, and have put it under the direction of Professor James Hall. The Albany geological specimens are typical ones, and are of the utmost importance to the scientific men of the whole country, as they afford the key to the geological nomenclature of the United States. There is, therefore, great wisdom in carefully preserving them and intrusting them to the geologist who has given names to the groups of rocks in the State, and has done more than any other to illustrate and explain the relative position of American formations. The Legislature also authorized the presentation of duplicates to the American Museum of Natural History in New York.

## THE DANGERS OF DRUGS.

The public mind has been much exercised of late by recitals of fatal mistakes of those whose business it is to deal out drugs and medicines; and our countrymen have been rather taught to believe that these mistakes were in a great degree attributable to the looseness of our laws and our want of system in this important regard; and that in other countries where a better system prevailed such mistakes rarely or never occur. There is some truth in this prevailing idea, and much might undoubtedly be done and should be done to prevent the recurrence of such accidents.

Indeed the public can hardly be aware of the disgraceful, and, in view of the possible consequences, alarming ignorance of many of those engaged in the retail drug business. We frequently receive letters (from the country of course), asking information relative to some of the most common substances, which the writers had been unable to obtain at their village drug store, simply because the articles had been inquired for by the technical or chemical name of the substance required. We this week received such a letter asking information as to *chloride of sodium*—common salt—and as to the bi-sulphide of carbon—the latter of course not so common as the former, but still a chemical with which every druggist should be familiar.

Is it to be wondered at that when men, so deplorably ignorant of the very rudiments of knowledge necessary to their business, are intrusted with the dealing out of medicines, many of which, as everybody knows, are active poisons, fatal mistakes are frequent? In fact is it not rather a wonder that we are not more frequently called upon to chronicle such sad results?

That such mistakes, however, are possible in other countries than ours, is evidenced by the following case, reported in the *Chemist and Druggist:*

"An inquest was held at Pemberton, near Wigan, on the body of William Richardson, collier, aged 26, who had died on the previous Sunday immediately after taking a powder which he had obtained at the surgery of Messrs. Johnstone and Beaman, surgeons, Upholland. Mr. Peace, solicitor, appeared on behalf of Mr. Johnstone, who had dispensed the medicines, and stated that by an unfortunate mistake strychnia had been administered to the deceased instead of santonine. Mr. Johnstone had only recently entered upon the practice, and was not aware that any strychnia in a crystal state was in the surgery. The bottle was not labeled, and was in a cupboard in which the santonine was kept.—Mr. George Warwick Johnstone, the surgeon who dispensed the medicine, gave evidence. He said he was not at the time aware that there was any strychnia in a crystal form in the surgery. The bottle was not labeled poison, and in several respects it resembled the one in which santonine was kept.—The verdict of the jury was to the effect that death had resulted from censurable oversight on the part of Mr. Johnstone, and that, in the opinion of the jury, great blame was attached to those who placed the bottle in the closet without a proper poison label."

Here we have an instance of gross carelessness, but in this country we fear carelessness and ignorance are often combined. There ought to be legal enactments that shall secure either carelessness or ignorance from tampering with human life.

Educated and competent chemists are now forced to compete with those who have not the first qualification for dispensing drugs. It was only last week that we sent a very plainly written prescription of an eminent practitioner of this city, copied under his supervision in plain, unmistakable handwriting, to a dyspeptic friend in the country. The prescription was returned with the message that the local druggist (sic) could not make it out; yet every drug was officinal, and to each the correct name, as found in the U. S. Dispensatory, was given.

The competent druggists of this country owe it to themselves, as well as to a too credulous public, that this evil shall be corrected. They should ask and press for the enactment of such a law as will forever exclude ignoramuses from their responsible profession.

## STEAM BOILER INSPECTION.

In our issue of April 23d, we published an article upon Steam Boiler Inspection, which has called forth a communication from the steam boiler insurance company therein referred to. This company proves to be the Hartford Steam Boiler Inspection and Insurance Company, whose advertisement has often appeared in our columns.

This letter puts a somewhat different face upon the matter, and corrects a misapprehension derived from the statements of a Chicago paper upon which we based our remarks.

It seems that the company referred to had commenced business in Chicago before the inspection law was passed, and it was simply asked by the boiler owners who had insured and were under guaranteed inspection by the officials of the company, that they should be exempt from the inspection of the city officials. In other words, it is desired by the parties interested that the inspection of the company shall be accepted in lieu of the other, for all such boilers as are under regular inspection by the company. It was not asked that such boilers as are not under the supervision of the company should be inspected by them.

In this point of view we certainly see no injustice in exempting insured and regularly inspected boilers from other inspection. There is certainly the strongest guarantee that such inspection would be faithfully performed, namely, a pecuniary risk attending upon neglect.

We are informed that the company make their inspections quarterly, the inspection being done by salaried experts, whose positions depend upon the faithfulness with which their duties are performed.

Provision was made that if from any reason, for any boiler thus left in charge of the company and exempted from inspection by the city officials, the company should decline to continue a risk, or if the insured should decline to make necessary repairs, the company should at once report the same to the City Inspector so that no boiler might go uninspected.

We are told that although the post of City Inspector has been in several instances proffered to the company, it has been uniformly declined as conflicting with true business policy; and that the company neither ask nor desire any special legislation in their favor.

The plan proposed in Chicago was suggested by the steam users themselves, and in the light of our present information we see nothing objectionable in it.

The company further avow their belief in thorough inspection laws, and indorse our views as expressed in the article alluded to above, in regard to the payment of liberal salaries to competent men, and minute examination for defects.

We are, however, informed that in the experience of the company it has been found that the responsibility of city and State officials rests very lightly upon them, and that where there is no competing element their work is generally very much neglected, a statement which the great number of explosions constantly occurring seem to confirm.

As we said in our former article we believe the system of boiler insurance a good one, and regard it with hearty favor; and we are glad that we can thus, on official authority, make a disavowal of what we felt sure was calculated to greatly injure its usefulness.

## MECHANICAL RECREATIONS.

The purpose of this article is to show that mechanical employments furnish the most healthful and delightful recreations for such as are not constantly employed in them.

The purpose of recreation is as the term implies to re-create or renew the exhausted energies of mind and body Perfect rest, such as is secured by good, sound, refreshing sleep, is of all the means by which this is accomplished, the most powerful.

It is true food is the fuel by which the human engine runs and does work, but the analogy between a machine constructed of lifeless material and the animal economy ceases when we consider anything beyond the mechanical power of muscular movement derived from the consumption of food.

The human machine includes within itself a directing

power which wearies and wears, and cannot be continuously employed in a single direction without fatigue. The wise Solomon saw that much study is a weariness to the flesh. And modern physiologists have not failed to see that undue manual labor impoverishes and enfeebles the mind.

The will concentrated long upon compelling the muscles to perform a certain routine of movement, finds itself at length powerless to command. It must then cease exertion entirely as in sleep, or it must exert itself in some new direction. This is what is commonly called recreation, that is, an occupation which affords an agreeable contrast to that which has caused fatigue.

We think it is indisputable that any employment which exacts moderate muscular activity, at the same time interesting the mind by employing its powers upon such topics as do not arouse the animal passions, while they moderately engage the higher mental powers, has in it all the elements of healthy recreation. In our opinion nothing whatever so combines these elements and furnishes so cheaply the needed relief to professional men and hard students as some mechanical occupation, in which originality of design may be united with manual skill in execution.

In such recreation the entire tendency is to gratefully relieve the mind, gently exercise and invigorate the body, and build out and cultivate powers which cannot be developed to the moral hurt of the individual, but greatly increase his intellectual stature.

In such occupations the mind wearied with business cares, or by much study, may revel in refreshing beauties of form, color, and motion, and find the highest of all pleasures in the contemplation of the relation of simple causes to complex effects.

A man who has in this way attained to even moderate skill, may find his lathe a magical instrument by which he can clothe the rudest materials with forms of beauty, and gratify to the utmost that wonderful combination of faculties by which man most asserts his superiority over the brutes.

Imagination here finds, if not so wide a scope as in poetry, or the fine arts, sufficient to give it ample employ, and to banish from the mind all evil thinking and day dreaming, which to the young mind is always hurtful and sometimes fatal.

On this latter account we recommend most earnestly mechanical recreation for the young. Let the boys build windmills and miniature dams. They soil their clothes, but how much better soiled garments than soiled minds. They may cut their fingers with the tools you permit them to employ, but you will find such wounds heal in less time than the foul ulcers of moral corruption.

Every man who can afford it should supply his boys with tools, and a room where they may be used and cared for. A boy takes to tools as naturally as to green apples, or surreptitious and forbidden amusements; and ten to one if he has a chance to develop his mechanical tastes and gratify them to their full extent, his tendencies to vicious courses will remain undeveloped. Such a result is enough to compensate for all the expense and trouble the indulgence we recommend would entail; while the chances that the early development of his constructive faculties may in this mechanical age be the means by which he may ultimately climb to fame and fortune are not small.

## CURIOUS ASSOCIATIONS AMONG ANIMALS.

In the palmy days of Barnum's Museum, one of its chief attractions was what was called "The Happy Family," composed of a large number of abjectly miserable animals, generally supposed to have a natural antipathy for each others' society, living together on compulsion, and whose manifestations of stupid tolerance were accepted by the country visitors to that great institution, as indisputable evidence of their blissful state of mind, and the regenerate condition of their hearts.

Once, while on a visit to the collection alluded to, we remarked a good clergyman, evidently hailing from some remote rural location, highly delighted in the contemplation of "The Happy Family," who remarked, somewhat in the style of the venerable Chadband, "Herein we see a type of the fulfillment of the blessed prophecy, that the 'Lion shall lie down with the lamb.'"

Just at the moment, one of the keepers chanced to pass. At the sight of his familiar face, the wretched little dog—whose confinement had not obliterated fond memories of past days, when he might roam and frisk at will, and choose his own society—rushed frantically to the bars of the cage with doleful cries and piteous pleadings, thrusting out his helpless little paws in vain appeal to be released. It was quite affecting to witness the expression of stolid despair in his little brute countenance, when he found no notice was taken of his petition, and the desperate way in which he walked to a partially secluded corner and threw himself prone, as though all hope had fled. The little episode was not without its effect upon the bystanders; and the clergyman referred to, evinced his goodness of heart by loudly denouncing the affair as a cruel exhibition, in which verdict we heartily concurred.

If the reader will follow us for a little while, we will introduce him to some more curious associations than Barnum's Museum ever displayed; associations originating in the common interest of the parties to them, or in the desire to relieve the oppressive sense of solitude which even the lower animals seem to feel.

The well-known associations of parasites with the animals upon whom they prey, are the most unpleasant and disgusting, as they are the most familiar examples of animal companionships. These are only in the interest of one of the parties, and are generally strongly objected to by those who thus find disagreeable company thrust upon them.

We shall find a more pleasant, if not a more instructive field of contemplation in those voluntary associations and attachments which animals of different species form with and for each other.

Foremost among these is the companionship of domestic animals with man. Familiar as household words are the innumerable stories of faithful attachments mutually existing between man and the dumb creatures, which so largely contribute to his sustenance, protection, and pleasure.

Scarcely less familiar are the stories of apparently incongruous attachments between dogs and cats, cats and mice, fowls of different species, etc. Riding once along one of the pleasant drives radiating from Saratoga Springs, we saw the comical spectacle of a pig sweetly sleeping, literally in the arms of a fond calf. These two creatures, cut off from all society by the external limits of a lonely farmyard had become all in all to each other, and shared their "bit and sup," and their quiet couch in the sunny corner, with mutual satisfaction. Very many similar instances of unusual attachments between domestic animals might be enumerated, but we wish, more particularly, to call attention to such associations as are made, apparently through the instinctive consciousness that a common benefit may accrue from a union of diverse gifts and powers.

For this purpose we find a rich collation of facts, ready to hand, in a paper not long since read before the Belgian Academy, by P. J. Von Beneden, on "Animals as Fellow Boarders." We are told, that the *Donzella*, a graceful little fish, found in different seas, takes up its abode in the stomachs of the sea cucumbers, and that these lodgings are shared by prawns and pea crabs, dining together on the abundant stock of food which the sea cucumbers—being excellent fishers—provide.

In the Indian seas, a modest little fish with an extensive scientific appellation, lodges habitually under a star fish, and feeds on the crumbs which fall from the table of his patron. A Siluroid, of Brazil, of the genus *Platystoma*, lodges a species of very small fish in its mouth and shares its daily food with its *protege*.

Other instances of mouth lodgers might be mentioned; even Crustacea taking advantage, in this way, of the superior predatory ability of more active creatures. In the China seas Dr. Collingwood found an anemone, in whose interior little fish resided, whose name he did not know, but which seemed content and happy in their curious abode. The pea crab lives in mussel shells, and picks up a comfortable living without in the least injuring its hospitable entertainers. The ancients, we are told, thought that the mollusks, having no eyes, were glad to avail themselves of these little crabs, but the probabilities are, that the crabs eyes are employed solely for their own benefit. Like other crustaceans, of the same rank, says Von Beneden, "these little creatures carry on each side of the shell, at the end of a movable stalk or support, a charming little globe, furnished with hundreds of eyes, which they can direct, as an astronomer turns his telescope, to any part of the firmament. What cannot be doubted is, that the little intruders live on perfectly good terms with the mussels and if the latter supply a convenient and safe lodging, they, on their side, profit largely by the morsels which fall from the claws of their guests, who are well placed and well provided with with prey-catching apparatus. Snugly seated in their living house at the bottom of the sea, they possess a movable lair which the mussel carries about, and they can choose the best moment for attack, and fall upon the enemy unawares."

But the most remarkable instance of association for mental profit, is that of the hermit crab. These creatures are decapod crustaceans, somewhat resembling miniature lobsters, who make their abode in deserted shells, and change both their skin and their dwelling as they increase in size. The young ones are contented with very small habitations. The shells they inhabit are derelicts they find at the bottom of the sea, and in which they conceal their weakness and personal disadvantages with obstinate persistence.

These singular creatures have too soft an abdomen to confront the dangers they encounter in their incessant wars, and the shells in which they thrust themselves supply at once lodgings and shields. Armed thus from head to foot the soldier crab marches proudly against his enemies, and fears no danger, because he has a secure retreat. But this soldier, or hermit crab, is not alone in his dwelling. He is not an anchorite like those dwelling in air, for by his side a worm is commonly installed as fellow-boarder with him, forming one of the most remarkable associations which is known. The companion worm is elongated like all the Nereids, and its supple, undulating body is armed along its sides with bundles of lances, pikes, and daggers, the wounds from which are very dangerous. The crab, ensconced in his borrowed armor, and flanked by his terrible acolyte, attacks all he finds before him, and knows no reverse. Thus, around his domain, we observe a prosperity not seen elsewhere, and on his shell there usually flourishes a whole colony of Hydractinia, blooming like a flower-bed, and inside we often find Peltogaster, Lyriope, and other Crustaceans, who convert it into a true pandemonium.

Besides many other associations formed with various species of soldier crabs, there are barnacles, which lodge on the skin of the whale, in company with whale lice and other marine creatures, worms which live as companions in the same sheath with their congeners, and even with included mollusks; creatures which live in freedom in their youth, but, when they approach to maturity, throw away their legs and eyes, change their clothes, and attach themselves permanently to some animal upon which they are ever after wholly dependent.

The Remora, an animal found in the waters of the Mediterranean, attaches itself with vigor to other animals by means of an apparatus attached to its head, and the inhabitants of Mozambique make use of this habit to entrap fish and other marine animals. They catch Remoras, put rings in their tails, attach lines to the rings, and cast the Remoras forth into the sea. Presently the Remora will have stuck to something and is drawn in by the tail, holding fast to the creature it has unintentionally brought to grief.

But we cannot dwell longer upon these curious associations. Our readers will agree with us, that they afford food for much profitable reflection, and that they may instruct as well as amuse. They teach how ample is the provision made for the sustenance and protection of the myriad creatures which people our globe, and lead to the belief that these wondrous provisions cannot be alone confined to this little mustard seed of a planet, among the magnificent heavenly bodies that circle together around the great life-giving, life-sustaining sun.

## CHEMISTRY OF ZIRCONIUM.

Dr. Ernest Melliss has published "Contributions to the Chemistry of Zirconium" that contain much new matter; and as this element is now employed in the zirconium light, it may be of interest to know something more about it than we can learn from any books on chemistry.

There are scarcely more than a dozen minerals that contain zirconium, the most important of which is the zircon, which is so called because it was used as a false jewel, and received the name jargon, or zircon, from dealers in precious stones. There are fine specimens of this mineral in North Carolina, New York, New Jersey, and Pennsylvania.

The pure zircon contains 66·96 per cent oxide of zirconium and 33·04 per cent silica; its specific gravity is 4·05 to 4·75. From this mineral the metal zirconium and all of its compounds are prepared. It is heated to redness and quenched in water so as to be easily pulverized, and the fine powder is mixed with four times its weight of carbonate of soda, and fused in a platinum crucible. The mass from the crucible is treated with hydrochloric acid, evaporated to dryness to separate the silica, again dissolved, and the oxide of zirconium precipitated by ammonia.

By mixing the powdered zircon with carbon, and passing chlorine gas over it, the chloride of zirconium can be formed along with the chloride of silcon, which latter being very volatile, can be expelled by heat, leaving behind the zirconium salt nearly pure.

The resolution of the mineral by fluoride of potassium has also been recommended, but the best method appears to be to fuse it with bisulphate of potash, and thus on subsequent treatment with sulphuric acid to convert it into pure basic sulphate of zirconia.

The reducing agent employed in the preparation of metallic zirconium is aluminum, and the operation is interesting as being applicable to other metallurgical processes. The double fluoride of zirconium and potassium is first prepared by dissolving the oxide in hydrofluoric acid and pouring the liquid into a concentrated solution of neutral fluoride of potassium. The precipitate thus formed is well dried and intimately mixed with twice its weight of finely-divided aluminum, and exposed in a gas carbon crucible to a heat sufficient to melt copper.

The zirconium will be found in the form of leaves and scales penetrating the aluminum, which remain after dissolving out the aluminum by hydrochloric acid. The metal is hard, and crystalline, like antimony, with the specific gravity of 4·15. It is said to exist in three states the same as silicium and boron, namely, amorphous, graphitoidal, and crystalline, and is less fusible than silicium, and burns only at the temperature of the oxyhydrogen blow pipe.

No uses have thus far been suggested for zirconium, and, in fact, it has been too little studied to enable us to speak with certainty about it. In consequence of some of its chemical relations it is now classed with tin, titanium, thorium, columbium, and tantalum; while by other writers it is put in the same group with carbon, boron, and silicon, instead of with aluminum as formerly.

The oxide of zirconium is now employed to point the pencils used in the oxyhydrogen light. It is said not to waste away as magnesia and lime do; but the cost of the oxide and the trouble to prepare it must stand in the way of its general adoption.

Dr. Sorby about a year since published an account of the discovery of a new metal associated with zirconium, which he called "jargonium," but recently he announced his mistake. The reactions attributed by him in the first instance to jargonium he now finds are, in fact, owing to the presence of a small quantity of the oxide of uranium in the mineral zircon, and the supposed new metal must therefore be erased from our list. The compounds of zirconium have thus far no interest in the arts.

## SCIENTIFIC INTELLIGENCE.

### HEATING WITH GAS.

MM. Jacquet and Hauteur, in Paris, have invented a method for heating with gas by reflection, which seems to offer some advantages over previous attempts in this direction. The gas burns with inverted flame, and a double hearth below the burner to absorb all of the products of combustion. The hearth, which is not in sight, throws off all of its heat and light by reflection from a series of mirrors made of red copper, and the effect is said to be remarkable. It is difficult without diagrams to convey a perfect idea of the invention, which is said to be applicable to all kinds of cooking and heating purposes.

### TEST FOR SMALL QUANTITIES OF ALCOHOL.

A few drops of the liquid to be tested are poured into a

test tube with a small quantity of iodine and several drops of caustic soda on potash, and gently heated. If there is any alcohol present a characteristic yellow crystalline precipitate of iodide of formyle is produced. According to Lieben, the presence of one part of alcohol in 2,000 parts of water can be recognized in this way.

EMPLOYMENT OF PHOSPHATES AS MORDANTS.

M. Collas proposes to employ phosphates as substitutes for alum. The goods to be dyed are immersed in a bath of acid phosphate of lime or magnesia, afterwards in a bath of coloring matter, and finally into an alkaline solution. The process is said to be particularly applicable to aniline colors, more especially to aniline purple. Lakes can also be prepared by use of phosphates, preferably phosphate of lime. Thus to prepare a lake of cochineal an infusion of the color is first made ready and a gelatinous precipitate of phosphate is added, the mixture is powerfully agitated for some time. The coloring matter will be found to be as completely precipitated as it is with alumina. Insoluble coloring matters can be used for dyeing by employing gelatin in combination with the phosphate of lime.

COBALT AND MANGANESE.

M. Valenciennes recently presented to the Academy of Sciences, Paris, specimens of pure cobalt and manganese—prepared by reduction in magnesia crucibles. The cobalt had the appearance of polished iron, and when turned in the lathe yielded chips similar to those produced from iron of best quality.

The manganese can be easily broken with a hammer, and exhibits on a fresh fracture a perfectly white color. It alters rapidly in the air, changing into an intermediate red oxide. Cobalt combines more readily with copper than with iron; the alloy melts at the temperature of fusion of copper, and is malleable and ductile if properly annealed. Manganese has great affinity for copper, and five samples were made, containing 3, 5, 8, 12, and 15 per cent of manganese—all of them resembled bronze, are hard, sonorous, and easily fused. The alloy containing 15 per cent of manganese was white like steel, and unaltered after long exposure, and was very hard.

The alloys of 3, 5, and 8 per cent are ductile, and can be reduced to as thin leaves as tin. According to M. Valenciennes the alloys of manganese and copper are capable of extensive uses in the arts if they can be prepared in an economical way.

ZINC REFUSE FROM GALVANIZING IRON.

The zinc refuse contains chlorides, oxychlorides, and oxide of zinc, together with some sal ammoniac. Pattinson fuses it with an equivalent proportion of lime by which the ammonia can be saved and the zinc obtained as an oxide.

## The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company make the following report of their inspections for the month of March, 1870:

During the month, 458 visits of inspection have been made; 784 boilers examined, 731 externally and 224 internally; while 69 have been tested by hydraulic pressure. The number of defects in all discovered, 482; of which 60 are regarded as as dangerous. The defects in detail are as follows:

Furnaces out of shape, 7—1 dangerous; fractures in all, 30—7 dangerous; burned plates, 26—5 dangerous; blistered plates, 73—15 dangerous; cases of incrustation and scale, 81—12 dangerous; cases of sediment and deposit, 5; cases of external corrosion, 34—4 dangerous; internal corrosion, 6—5 dangerous; cases of internal grooving, 7—1 dangerous; water gages out of order, 25; blow-out apparatus out of order, 7—1 dangerous; safety valves overloaded 24—1 dangerous; pressure gages out of order, 92—2 dangerous. These varied from—10 to + 25. Tubes corroded off near tube sheet, 1—1 dangerous; boilers malconstructed, 1—regarded as dangerous; boilers condemned as unsafe and beyond repair, 4. A large number of leaky boilers were reported, some had become so from blowing down and immediately filling up with cold water—this practice will ruin the best boiler in a short time. Before refilling, the boiler should be allowed to become quite cool. The accumulation of sediment about the tubes, keeping the water therefrom, is a source of evil; tubes become burned and corroded, and leaks will of necessity follow.

Steam gages, it will be noticed, have been found out of order in numerous instances. There is no way of ascertaining these variations except by frequent tests, and although they may be light in many instances, in some they are positively dangerous; for instance, if a boiler is being run by the gage at a pressure of 85 pounds, and the gage is 20 pounds "heavy or slow," the actual pressure used is 105 pounds, which may be far beyond the safe limit, hence it is important that these indicators should be often examined.

We had not room for further comment, but the intelligent engineer will see that the boilers under his care are free from the defects and dangers enumerated above.

## Earthquake in Guayaquil.

In Guayaquil, between Point Pasado and Point Venado a peculiar volcanic movement has taken place. In a space of two leagues the surface of the earth undulated slowly, and great chasms and deep circular excavations were opened. A new lagoon was formed, and between the shore and the sea there appeared a large sized hill.

During all this fearful commotion, the hills along the coast were observed to be in a state of unrest, and large land slides took place, carrying with them rocks and trees.

For four days this agitation continued, the undulation being from west to east. These phenomena took place early in the month of March. It would seem from this that the throes of the earth which, a year or two ago, sent desolation and death through some of the most populous districts of South America, are not wholly spent.

## Some Hints about Screws.

Where screws are driven into soft wood and subjected to considerable strain, they are very likely to work loose; and it is often difficult to make them hold. In such cases, says the Canadian *Builder*, we have always found the use of glue profitable. Prepare the glue thick; immerse a stick about half the size of the screw and put it into the hole; then immerse the screw, and drive it home as quickly as possible. When there is an article of furniture to be hastily repaired, and no glue is to be had handily, insert the stick, fill the rest of the cavity with pulverized resin, then heat the screw sufficient to melt the resin as it is driven in. Chairs, tables, lounges, etc., are continually getting out of order in every house; and the proper time to prepare them is when first noticed. If neglected the matter grows still worse, and finally results in laying by the article of furniture as worthless. Where screws are driven into wood for temporary purposes they can be removed much easier by dipping them in oil before inserting.

When buying screws notice what you are getting; for there are poor as well as good kinds. See that the heads are sound and well cut; that there are no flaws in the body or thread part, and that they have gimlet points. A screw of good make will drive into oak as easy as others into pine, and will endure having twice the force brought against it.

## Safety House Lamp.

The article of a safety kerosene lamp is one of importance to nearly every person. It is a subject of vital interest to every household. From the number of inquiries at this office for information as to lamps possessing safety qualities, we conclude that the public are not satisfied with what the manufacturers generally supply.

A few days ago a circular, advertising Perkins & House's safety lamp, was put into our hands, containing references to a number of distinguished gentlemen whose testimonials were appended. We took occasion to interview one of them—the president of one of our prominent New England colleges—as to the merits of this lamp, and asked if on further use he was satisfied that he had not expressed too much in its praise in his testimonial. His reply was, "No; it has given perfect satisfaction, and I think the lamp superior in respect to safety, perfect combustion, freedom from odor, and amount of light given, to any lamp."

From the high and direct source this testimony comes, we think there is no doubt but that the Perkins & House lamp, advertised in another page by Votaw, Montgomery & Co. possesses all the qualities that the advertisers state.

## Iceland Spar.

Joseph D. Price and Benjamin Shunk, of Harrisburgh, Rockingham Co., Va., have discovered in that town large deposits of calcite (carbonate of lime) of the Iceland spar variety. We have received some specimens of the crystals (rhombohedrons), which are clear and excellent. A quarry has been opened and the deposit examined to an extent exceeding eighty acres. The deposit is six feet deep, and promises to be valuable; but the manner of mining and working the mineral is not very well understood in that region.

## Steam Omnibuses.

It is said that a company has been organized in Montreal to introduce into that city Thompson's road steamers for passenger traffic. Our readers will recollect one of these vehicles was tried not long since in Edinburgh, Scotland, where its inventor resides, and was stated to have behaved very satisfactorily. The traction wheels are fitted with broad and thick rubber rims, which enable them to conform to the uneven surfaces of common roads, and prevent slipping.

THE EAST RIVER BRIDGE.—The great caisson for the Brooklyn side of the East River Bridge, the successful launching of which we recently announced, has since our last issue been towed out to its final resting place, and will probably be sunk before this paragraph meets the eyes of our readers. The most perfect success has thus far attended every step in this great work, and everything shows that engineering skill of the highest order is guiding its progress.

## UNITED STATES DISTRICT COURT---SOUTHERN DISTRICT. BEFORE JUDGE BLATCHFORD. PATENT FOR MAKING VENEERS.

*Carmi Hart* vs. *Jeryleman Shaw and Salathiel E. Nickerson.*—This was a bill filed by the complainant to restrain the infringement of a patent issued to him on April 4, 1854, and renewed March 16, 1868, for an improved machine for cutting veneers.

The substance of the invention was placing the log upon a table so that it could be brought against the knife to cut off the veneer at different angles, according to the requirements of the material, and suspending it by clamps, so that when it was being carried back to meet the knife again, it would not bear upon the edge of the knife.

The defendants set up a want of novelty in the invention, and denied any infringement on their part.

*Held by the Court.*—That on the evidence the defense of want of novelty in the invention fails. That in the defendant's machine the same results claimed by the plaintiff are produced by devices which are mechanical equivalents for those of the plaintiff. Decree for plaintiff.

For plaintiff, E. Y. Bell; for defendants, T. M. Wyatt.

## APPLICATIONS FOR EXTENSION OF PATENTS.

PEGGING JACKS.—Alfred Bailey, Amesbury, Mass., has petitioned for the extension of the above patent. Day of hearing July 13, 1870.

MACHINE FOR MANUFACTURING SPOOLS.—A. D. Waymoth, Fitchburg, Mass., has petitioned for an extension of the above patent. Day of hearing July 13, 1870.

MACHINERY FOR FORMING HAT BODIES.—Alva B. Taylor, Newark, N. J., has petitioned for an extension of the above patent. Day of hearing July 13, 1870.

WATER CLOSETS.—William S. Carr, New York city, has applied for an extension of the above patent. Day of hearing July 20, 1870.

ROTARY KNITTING MACHINES.—Sidney W. Park, Albany, N. Y., and Edgar S. Ells, Fremont, N. Y., have applied for an extension of the above patent. Day of hearing July 20, 1870.

LIGHTNING ROD.—David Munson, Indianapolis, Ind., has applied for an extension of the above patent. Day of hearing July 20, 1870.

CART SADDLES.—Henry A. Rains, Bloomfield, N. J., has petitioned for an extension of the above patent. Day of hearing August 3, 1870.

## Recent American and Foreign Patents.

*Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.*

WASHING MACHINE.—Charles Bean and Suel Logee, East Douglass, Mass—This invention has for its object to furnish an improved washing machine which shall be simple in construction and effective in operation, washing the clothes quickly and thoroughly, and without injuring them.

EARTH CHAMBERS.—William H. Bliss, Newport, R. I.—This invention has for its object to furnish an improved earth chamber or portable earth closet which shall be simple in construction and effective in operation, wholly preventing the escape of any offensive odor into the room.

EXCAVATING APPARATUS.—Philo W. Clark, Oblong, N. Y.—This invention has for its object to furnish an improved excavating apparatus designed for use in transferring the soil from the place of excavation, and loading it upon a cart, or throwing it upon an embankment.

HOISTING APPARATUS.—H. A. Schneekoth, N. Y. city.—This invention has for its object to so construct the hoisting apparatus, which is operated by men, that power may be applied to it by means of the lower extremities and not by the arms, as usually.

LAP BOARDS.—William F. Gammel, Elizabeth, N. J.—This invention has for its object to improve the construction of lap boards, so as to make them more convenient and effective in use.

BOILER FURNACE.—J. A. T. Overend, San Francisco, Ca.—This invention consists in the application to the furnaces of metallic fire-backs and bridge walls, arranged for ready removal for the substitution of others, when worn out, and, in a manner, calculated to resist the heat to the best advantage, and to provide an air chamber behind the bridge wall to facilitate the combustion of the gases.

ORE SEPARATOR.—T. Bates, Pinos Altos, New Mexico.—The object of this invention is to provide a simple and efficient arrangement of means for receiving the tailings of gold, and other ores, from the battery, pulverizing, burnishing, and separating the same. The invention comprises an arrangement of grinding mills and amalgamating apparatus together, and, with a battery.

WASHING MACHINE.—Wm. Badger, Hastings-on-the-Hudson, N. Y.—This invention relates to improvements in washing machines, and consists in a simple and inexpensive attachment to ordinary wash tubs, for converting them into washing machines, with oscillating beaters, the same being suspended on a cover arranged for detachable connection to the tub by means of keys wedging into the holes of the handles, and dumping the cover down on the top of the tub.

STUMP PUPPER.—J. M. Eason, Charleston, S. C.—This invention relates to improvements in machinery for pulling stumps, and consists in suspending the chain hook from any suitable portable frame, by two pairs of arms, toggle-jointed to nuts, on a right-and-left-threaded horizontal screw, which is provided with a hand lever ratchet and pawl at the center for applying the power for raising the stumps by screwing the nuts away from each other, and with short levers at one end for turning it rapidly to force the nuts together to let the weight or chain hook down.

NURSING BOTTLE.—Edward Jones Mallett, Jr., and Wm. S. Ward, New York city.—This invention relates to improvements in nursing bottles and other vessels, for containing liquids, and from which they are to be drawn through faucets, cocks, or bungs, and it consists in a novel arrangement of automatic vent valves, in connection with the bungs or plugs, by suspending the valve by a spring secured in the vent passage, or at the top of the plug, and extending through to the lower side, and holding the valve up against a flexible seat of India-rubber, or other like substance.

HUB-BORING AND BOX-SETTING MACHINE.—Abraham Troup, Louisberry, Pa.—This invention consists of a pair of clamps for embracing the sides of a hub provided with feet for resting on the top of the same; and combined with an instrument for boring a recess in the end of the hub suitable to receive a box, in such manner that said instrument may be accurately adjusted to the center of any hub.

TOBACCO ROLLER.—C. A. Jackson, Petersburgh, Va.—This invention consists of a wheel, whose rim is provided with any desired number of circumferential flanges, said wheel working in connection with a belt, whose inner surface is furnished with an equal number of longitudinal grooves into which the tobacco is pressed by the flanges of the wheel; these two devices being combined with scrapers that take the strips of tobacco out of the grooves in the belt, and also with a knife, operated by the wheel, that cuts the strips into plugs.

CORN PLANTER.—James W. Magers, Reinersville, Ohio.—This invention consists of divers improvements in the corn planter, all tending either to simplify its construction or render it more efficient in operation.

ATTACHING POLE OR SHAFTS TO WHEELED VEHICLES.—James McMillin, Ripley, Ohio.—This invention has for its object to enable the occupant of a carriage to detach the pole or thills when the horses become unmanageable, and thus allow the animals to go on their way dragging the pole with them, and leave the carriage in safety.

CAR COUPLER.—John Coleman, Lynchburgh, Va.—This invention consists in the combination, with a bumper open at the sides of a hinged detent arranged within the bumper, so as to allow the head of the coupling bar to pass under it and then to fall by its own weight upon the body of the bar and retain it, and of a coupling link having bevelled heads which pass easily under the detents, against the inner sides of which heads the free ends of the detents bear, which inner sides of the heads are rounded off at the corners so as to allow them to slip out at the open sides of the bumpers and uncouple when one car runs off the track so as not to draw the next car off; the coupling being automatic, and universal in its application.

PAPER WEIGHT.—Max Patzauer, New York city.—This invention relates to a new paper weight, which is so constructed that it can be used as an insect catcher or paper file.

MACHINE FOR COVERING WIRE.—A. Giraudat, New York city.—This invention relates to a novel spool carrier and holder attachment to a machine for covering wire with cotton, silk, or other thread. The object of the invention is to so construct the apparatus that the spool can be readily removed and put on, and that the thread will be applied to the gummed wire and pressed to firmly adhere to the same.

FRUIT BASKET.—Lauren Carpenter, St. Joseph, Mich.—This invention has for its object so to construct fruit baskets, that the same will be strong and simple and that they can be placed one upon another without injuring their contents.

CARVING KNIFE.—Owen W. Taft, New York city.—This invention has for its object to so provide carving knives that they can be used to extract skewers from the meat. The invention consists in forming a hook or aperture on the blade of the knife, whereby a clamp for holding and withdrawing the skewer is obtained. The removal of skewers from meat is at present a process connected with considerable difficulty and annoyance, and although many instruments may be used, it is evident that only the carving knife is appropriate and handy for that purpose.

SHOE LACE.—Rufus Wright, Brooklyn, N. Y.—This invention relates to a new and useful improvement in mode of lacing or fastening and unfastening shoes, whereby that practice is greatly simplified, and much more expeditiously and perfectly performed than it has hitherto been, and the invention consists in an arrangement whereby the shoe is fastened around the instep or ankle by simply drawing upward the lacing, and is loosened by the same movement downwards toward the toe.

HORSESHOE.—George Copeland, Denver, Colorado.—This invention relates to improvements in horseshoes and the nails for fastening them on the hoofs of the animals, and consists in making the nails with large, double, conical, or pyramidal heads, and the shoes with counter-sunk sockets, or other enlargements around the holes for the reception of the parts of the enlargements of the heads with which the smaller parts of the nails are joined, all arranged so that the enlarged heads of the nails shall serve as the calks of the shoe, the said heads being made of either iron or steel, and hardened or not, as preferred.

CRUPPER FASTENER.—Wm. R. Wing, Newark, Ohio.—This invention relates to a new and improved fastening for crupper straps, to be used in substitution of the buckles and straps now used. The invention consists of a pair of cylindrical metal fastenings with one flattened side, one for each end of the strap to be connected, and a correspondingly shaped ring fitted to slide on the said fastenings, one of which has a T-headed projection at the end, and the other is fitted to receive and hold it when turned a quarter of a revolution of the entering, which brings the flattened sides in line, so that the slide may be adjusted to confine them in this position.

COAL SCUTTLE.—S. J. Anderson, Cazenovia, N. Y.—The object of this invention is to provide a coal scuttle or hod for general use which shall be more useful and convenient than they are when constructed in the ordinary manner, and it consists in a loose bottom so arranged that the coal is discharged from the bottom of the scuttle or hod instead of from the top.

VENEER FORMER.—L. A. Johnson, New York city.—This invention relates to a new and useful improvement in the method of bending and forming veneers for fitting legs of billiard tables, pianos, and for other purposes, and consists in the method of heating the veneer, and thereby rendering it pliable, so that it may be made to assume the desired form.

DITCHING PLOW.—I. S. Sheets, Troy, Ohio.—This invention has for its object to improve the construction of the ditching plow, patented by the same inventor February 10, 1869, so as to make it more simple in construction, more effective in operation, and more conveniently adjusted as the ditch increases in depth.

HORSE POWER.—P. W. Clark, Oblong, N. Y.—This invention has for its object to furnish an improved horse power designed more especially for use in cases where it is desired that the direction of the draft may be changed or shifted without stopping or changing the direction of the power.

CORD CATCH.—C. C. Moore, New York city.—This invention has for its object to furnish an improved cord-catch, designed especially for holding the cord of window shades, and which shall be equally applicable for holding other cords, such as picture cords, cords for tying up packages, and various other purposes.

DISTILLING APPARATUS.—J. M. Weyand, St. Louis, Mo.—The object of this invention is to facilitate the generating, dephlegmatizing, aromatizing, and refrigerating of alcoholic vapors, and to thereby simplify and economize the process of distillation. The main feature of the present invention is to so construct the apparatus that steam and mash are made to pass in opposite directions through the same compartments, the steam taking up, and the mash giving off alcohol during such passage. By this method the temperatures can be so completely regulated, that spirits of the requisite grade can be produced with great exactness. The invention consists also in a novel construction and arrangement of the generating compartment, in which the mash is absolutely mingled with steam and brought in contact with heated surfaces, to evaporate all its alcoholic contents.

ELASTIC TIP FOR CHAIRS.—S. Van Patten, Albany, N. Y.—This invention relates to a new elastic attachment to the ends of chair legs, which has for its object to deaden the noise of removing the chair, and to protect the floor or carpet upon which the same may be placed.

GASOLINE BURNER.—Franklin Gould, Paterson, N. J.—This invention relates to a new burner for producing light from gas prepared from gasoline, or other hydro-carbon liquid. The invention has for its object to so construct the burner that it will by its heat produce its own gas from the liquid which it consumes.

PRUNING HOOK.—Andrew Downer, Hammondsville, Ohio.—The object of this invention is to provide an efficient instrument for pruning trees, hedges, vines, or briers, and it consists in a pruning hook, and in a saw combined therewith.

WASHING AND WRINGING MACHINE.—J. B. Wakeman and A. R. Field, Hampden, N. Y.—This invention relates to combined washers and wringers, and consists in certain improvements thereon specified in the claim of the invention.

DUST RING FOR WATCH MOVEMENTS.—J. H. Flint, South Bend, Ind.—This invention relates to improvements in the construction and arrangement of dust rings for watch movements. It consists in the arrangement for fastening the ends at the joint by the movement screw, and the manner of fitting it between the plates, and against the pillars, and to the recess in the upper plate under the barrel bridge.

STUMP EXTRACTOR.—G. L. Howland and Wm. M. Howland, Topsham, Me.—This invention relates to improvements in machines for pulling stumps or lifting heavy weights, and consists in a combination on a portable frame of a vibrating, guiding frame, a hoisting bar, a pair of gripe pawls, operating levers and adjusting springs, the latter for shifting the action of the pawls to cause them to raise or lower the bar.

COMPENSATING LET-OFF FOR LOOMS.—John Day, Paterson, N. J.—This invention relates to improvements in let-off motions for looms, and consists in the application in addition to the ordinary warp-roll of an auxiliary roll, mounted on a vertically sliding and weighted frame, under which the warp is carried from the warp-roll and to another guiding roll, which together with the warp-roll are elevated in a vertical extension of the loom frame, so that the weight of the auxilliary roll frame and weight is suspended in the bight of the warp, which passes over another guide roll in the plane of the first, and down under a third guide roll, and thence through the sley to the work beam. Previous to passing under the final guide roll the warp passes through a sley, or reed, for guiding it evenly on the said roll.

NEEDLE CASE.—Wm. Avery and Albert Fenton, Redditch, England.—This invention relates to improvements in that class of needle cases in which the needle packet is caused to rise up above the top of the needle case, when open, to admit of obtaining a needle therefrom more easily, and it consists in effecting the raising of the packet by the raising of the cap of the case, which is hinged at one side of the top of the case, by providing the said cap with a cranked projection extending downward into the case, and jointed to the side of the packet by a connecting link, or other suitable connection.

BUNG.—David Leichtnstadt, Brooklyn, N. Y., and R. Pentlarge, New York city.—This invention relates to improvements in bungs for barrels, casks, and the like, and consists in a deep bush, screw threaded, and with a collar on the exterior, for screwing down into and upon the side of the cask, and having a smooth, conical interior surface, extending from the bottom upward and a suitable distance, with an annular recess at the top, above which an annular internal groove is formed by a flange at the top of the bush, into which through radial notches a bridge tree which carries a tightening screw with a plug at the lower end, is inserted, and secured by turning the ends away from the notches, under the flange, so as to screw the plug down upon the shoulder above the conical hole of the bush.

TIN TUBING MACHINE.—J. N. Adams, Chillicothe, Mo.—This invention relates to an improved machine for bending sheets of tin into tubing, lapping the edges and the ends of the sections, and holding them for soldering, and it consists of a sectional tubular shell, capable of expanding and contracting, and having a slot along one side for the admission of the tin to the interior, wherein is a mandrel, divided longitudinally, and capable of receiving and pinching the edges of the tin, to hold and draw it in while the said mandrel is turned, and winds the tin around it, after which the apped edges are held opposite the slot in the shell for soldering, and pressed together by a hinged presser attached to the shell and projecting through the slot. The section thus formed is then shoved along on the mandrel, so that the next sheet bent up will be lapped on the end of it.

TAILORS' SCALE.—W. G. Cummins, Civil District No. 10, Tenn.—This invention relates to improvements in scales for measuring and laying out the several parts of men's clothes for cutting, whereby it is designed to provide a simple arrangement of the same, adapted to all the parts of the different garments under a system that may be easily learned and used by persons little skilled in the art.

TABLES.—Asa Forrest, Moingona, Iowa.—This invention relates to improvements in apparatus for supporting the fall leaves of tables, and consists in the application of jointed braces pivoted at one end to the lower edge of the rail, or other part of the table, and at the other to the under side of the fall, near the outer or lower edge, and so arranged that when the fall is raised to the horizontal position, the joint of the brace may be turned above the right line between the end pivots, and retain the position, by reason of the tendency of the weight of the fall to prevent the braces assuming the right line, which they must do before folding down. The tendency of the weight to force the joint upward, and of the two parts to fold down the other way, is counteracted by the arrangement of the arms, so that the joint will strike the under side of the table.

TIN GUTTER MACHINE.—J. N. Adams, Chillicothe, Mo.—This invention relates to improvements in machines for making tin gutters, and consists of a sheet metal cylinder, of the same radius as the gutter to be formed, provided with guides by which the previously bent up sheets of tin are confined to it while being shoved along from end to end for soldering, and also provided with a socket for supporting it while in use on a "candle mold stake," a tool in common use in tinners' shops.

STRAW CUTTER.—Julius Ambrun, Leavenworth, Kansas.—This invention has for its object to simplify the connection between the two reciprocating frames which hold the cutters, and to provide an effective automatic feed apparatus, which will not operate while the straw is being cut, but only when the cutters are moved apart.

PLANING CHUCK.—Augustus Newell and William Pim, Chicago, Ill.—This invention relates to a new "chuck," or "vise," to be used on a lathe, or planer, its chief object being to hold the work perfectly true. The invention consists in the arrangement and combination of the leading screw and swivel bed, with a T-bolt, a movable jaw, all parts operating so that the article to be planed cannot be upset, but will be held perfectly true.

MACHINE FOR PRINTING SPOOLS.—G. Hall, Jr., South Wilmington, Conn., and G. W. Averell, New York city.—This invention relates to a new and useful improvement in a machine for printing or labeling spools for holding thread, or other material of like nature, and consists in the use of a series of dies, and in connection therewith the several mechanisms for producing the movements necessary to accomplish the object in view; the main object being to print both ends of the spool directly upon the wood while the spool is passing through the machine.

ROPE CLAMP FOR SETTING RIGGING.—Slaight and Androvatt, Prince's Bay, N. Y.—This invention has for its object to provide an instrument for clamping and holding ropes for hoisting different kinds of articles, or for stretching or applying such ropes to the sides of ships, or other places, without requiring knots to be tied or eyes formed in such ropes.

HEMP BRAKE.—George Rymel, Paris, Ky.—The object of this invention is to provide a simple, durable, and effective machine for braking and cleaning hemp.

STREET MOISTENING COMPOUND.—Moritz Marcus, New York city.—This invention has for its object the production of a substance by which the paved streets in cities and towns can be kept clean, and whereby the air in such streets will be purified, and greater health insured.

SAWSET.—Erastus Y. Clark, New York city.—This invention relates to new and useful improvements in sawsets, whereby they are made more perfect, and consequently more useful than they have hitherto been.

GANG PLOW.—J. W. Sursa, San Leandro, Cal.—This invention relates to new and useful improvements in gang plows, whereby they are made more effective and convenient than such plows have hitherto been.

SHAFT AND POLE COUPLING FOR CARRIAGES, ETC.—Charles G. Dudley and Jacob Gulden, Key Port, N. J.—This invention relates to a new device for facilitating the ready removal and application of wagon and carriage poles, with an object of leaving the clip undisturbed,

ADJUSTABLE AWNING FRAME.—Louis Yenne, New York city.—This invention relates to a new awning frame, so constructed that it can readily be expanded or folded together, with a view of preserving the awning and all the material connected therewith.

BORING APPARATUS.—Thomas St. John, Dunbar, Pa.—This invention relates to a new and useful improvement in an apparatus for boring soapstone or ores, or similar material in the process of mining, whereby the operation of getting out the softer kinds of stone and ores is greatly facilitated.

PLOW GRINDER AND POLISHER.—Michael Devault, Charleston, Ill.—This invention has for its object to furnish a simple and convenient machine for grinding and polishing plows, which shall be so constructed and arranged as to support and hold the plow securely, and in such a way that it may be moved about and adjusted to the stone or wheel quickly and accurately.

RUDDER.—Capt. W. C. Law, New York city, now residing at Ningpoi China.—This invention has for its object to improve the construction and manner of hanging rudders for ships, boats, and other vessels, so as to make them more easily shipped, less liable to be accidentally unshipped, and so that they will serve as a center board for sail boats.

OFFICE REGISTER, OR DAILY, HOURLY, AND MONTHLY DIRECTORY.—Henry Rentchler, Belleville, Ill.—This invention has for its object to furnish an improved device, simple in construction and convenient in use, for enabling business men and others to keep their memoranda of matters and things to be attended to, in such a shape that they can see at a glance what they have to attend to, what engagements to keep, etc., for each day of the month, and for any hour of the day.

VENTILATORS FOR WINDOWS, ETC.—William C. Betts, Brooklyn, N. Y.—This invention has for its object to furnish a simple, convenient, and detachable ventilator for attachment to openings in the windows, doors, or walls of a room, to remove the impure air, and introduce fresh air in such a way that no injurious currents will be established, and which may be adjusted to adapt it to different conditions of the atmosphere.

STENGTHENING JOINTS OF RAILS OF RAILWAYS.—C. E. Spooner Bron-y-Garth, Port Madoc, and George A. Huddart, Brynkir, Wales, Great Britain—This invention relates to improvements in the mode of strengthening the joints of the rails of railways. The abutting ends of the rails, whether they be double-headed or formed with a flat base, it is proposed to clip between two plates suitably shaped to embrace the web and the foot or lower head of the rail, and of such depth that when applied they will extend vertically a sufficient distance below the rail to form a girder or stiff rib, and admit of being secured by spring clamps.

FELLY BENDING MACHINE.—W. D. Williams, Raleigh, N. C.—This invention relates to improvements in machines for bending fellies, and consists in a fixed curved block with a curved extension hinged at each end, and provided with holding devices, a confining strap of steel or iron and operating levers, arranged for attaching the timber and bending it up into a semicircle.

FEED MOTION FOR SEWING MACHINES.—Wm. Cooney, Bridgeport, Conn.—The object of this invention is to arrange the feed arms in those machines used for sewing tubular articles, and also in other machines, so as to feed, not only longitudinally or transversely of the said cylinders, but at any angle between the two directions, or it may be in any direction whatever within a circle; also to arrange them to move vertically in the rising and falling movements through the slotted feed plates when moving up to and away from the work.





## Business and Personal.

*The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines. One Dollar and a Half per line will be charged.*

## Answers to Correspondents.

*CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.*

*SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."*

*All reference to back numbers should be by volume and page.*

L. L., of Ohio.—The notation given in Silliman's Physics with reference to pitch of sounds is rather puzzling. You will understand it, however, by the explanation that $C_1$ is identical with C, and $C_2$ with $C_1$, etc., also bearing in mind that the vibrations spoken of are simple vibrations, that is, from center line out and back again to central line. The number of vibrations constituting the fundamental C, or $C_1$, varies in different countries. The accepted meaning of the term vibration also varies in different countries. In France the term is accepted as the excursion of the vibrating body in one direction only. In England and Germany it means an excursion in both directions. The French vibrations are therefore only halves of the English and German, and twice as many are required to produce the same pitch. See "Tyndall on Sound," page 69.

O. L. L., of Me.—Having lately discussed the question of saw filing at length in our columns, we prefer not to re-open the subject at present.

C. T., of Mass.—From your description we do not think the blister on the boiler you describe renders it dangerous at the present time. It is, however, a subject upon which we do not like to give advice at this distance. The advice of experts who can see the boiler is the best guide for you.

G. V. P., of ——.—Directions for obtaining the true sidereal time and computing the solar time, cannot be given in the space we can allot to your query. You will find the subject simply and concisely treated in "Norton's Astronomy," published by John Wiley & Son, New York.

T. C., of Ky.—The edges of spectacle glasses may be smoothed and polished after grinding by using a wooden wheel fed with pumice stone and water for smoothing, and putty and water for polishing.

C. D., of ——.—Gum shellac is a good cement for broken queensware. It should be melted, and applied thinly to the heated broken edges, which should then be pressed together and allowed to cool.

J. O. B., of ——.—A shallow stratum of fluid will evaporate under a given heat applied at the bottom, faster than a deep one.

C. H. C., of Mass.—Paint over the interior of your water tank with asphaltum. It will not injure your boiler.

O. S. M., of Va.—In so much as the oxide of zinc enters the human system it is hurtful. Of course care and cleanliness reduces the liability of poisoning in the manufacture and use of any kind of paint. Zinc is not as directly injurious as lead paint. The device you name would be effective as a protection, but we doubt if you could get workmen to wear it.

S. T. S., of Ohio.—We published in our last issue the specification of Dr. Adams' patent for electro-plating with nickel. *Ormolu* articles are made of brass, and being gilt, are colored by first rubbing the articles with a scratch brush—but not so hard as when it is intended to burnish them—exposing them to a moderate heat, and when partially cooled, brushing them over with a mixture of pulverized hematite, alum, and common salt, leaving the burnished parts untouched. The pieces are then heated upon burning charcoal till they are hissing hot, and the color begins to change to brown. They are then plunged into cold water, washed and rubbed with a brush wet with vinegar, or if the work is chased, with dilute nitric acid. They are then thoroughly washed with pure water, and dried by a moderate fire.

J. C. K., of Pa.—The distance to which sound will travel depends upon the original intensity and the density of the medium which conveys it. Two voices pitched upon the same key and each producing a sound of given intensity, will unite to produce a sound of double the intensity of that produced by either voice alone, provided they are so placed with reference to each other that the sound waves do not interfere with each other. Silliman's Physics contains some observations upon this subject, which are not noticed in Tyndall's Lectures on Sound.

H. H. T., of Pa.—We think superheating your steam after carrying it five or six hundred feet in pipe, must prove beneficial. Unless such a pipe was felted, or covered by some other non-conducting material, considerable condensation must inevitably ensue. We think by proper clothing you might remove the necessity for superheating, and if so, it would be the most economical plan.

J. T. S.—There is no work specially on silvering glass in the English language that we know of. You will find articles on the subject in Dr. Ure's "Dictionary of Arts and Manufactures," Muspratt's Chemistry, and other technical works. You will find the subject of gilding well treated in the "Painter, Gilder, and Varnisher's Companion," published by Henry Carey Baird, 406 Walnut street, Philadelphia.

M. H. K.—The positions taken in the pamphlet you send us on the subject of steam boiler explosions, are as you say, queer, so queer that we do not think it worth while to burden our colums with further criticism upon them.

## Official List of Patents.

### Issued by the United States Patent Office.

FOR THE WEEK ENDING May 3, 1870.

*Reported Officially for the Scientific American*

SCHEDULE OF PATENT OFFICE FEES:

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MUNN & CO.,
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102,465.—TIN GUTTER MACHINE.—Jas. N. Adams, Chillicothe, Mo.

102,466.—TIN TUBING MACHINE.—Jas. N. Adams, Chillicothe, Mo.

102,467.—STAVE DRESSING MACHINE.—M. Pascal Adams, Pittsburgh, Pa.

102,468.—DIE FOR DRAWING WIRE.—J. D. Alvord, Bridgeport, Conn.

102,469.—GUIDE FOR SEWING MACHINE.—J. S. Alter, Leavenworth, Kansas.

102,470.—STRAW CUTTER.—Julius Ambrun, Leavenworth, Kansas. Antedated April 28, 1870.

102,471.—NEEDLE CASE.—Wm. Avery and Albert Fenton, Redditch, England, assignors to William Avery.

102,472.—WASHING MACHINE.—William Badger, Hastings-on-Hudson, N. Y.

102,473.—FASTENER FOR BEDSTEADS, TABLES, ETC.—Jas. M. Baird, Wheeling, West Va., assignor to himself, John McLure, Jas. W. Ward, and John B. McLure. Antedated April 20, 1870.

102,474.—SANDPAPER HOLDER.—Joseph Barker, Chicago, Ill.

102,475.—DEVICE FOR ATTACHING PICKER TO PICKER STAFF.—John D. Barrie, Lawrence, Mass.

102,476.—ORE SEPARATOR.—Thomas Bates, Pinos Altos, New Mexico Territory.

102,477.—WASHING MACHINE.—Charles Bean and Suel Logee, East Douglass, Mass.

102,478.—VENTILATOR FOR WINDOWS.—William C. Betts, Brooklyn, N. Y.

102,479.—POTATO DIGGER.—Joseph H. Billmeyer, Raisin, Mich.

102,480.—EARTH CHAMBER VESSEL.—Wm. H. Bliss, Newport, R. I.

102,481.—CHURN.—Charles A. Boone, Shickshinny, Pa.

102,482.—RACK FOR CARS.—Albert Bridges, New York city.

102,483.—WORKING AND LOCKING RAILWAY SWITCH AND SIGNAL.—John Brunton, Kensington, England.

102,484.—PREPARING THE PITH OF CORNSTALKS FOR USE IN THE ARTS.—William M. Bryant, Alexandria, Va.

102,485.—FEED CUTTER.—Cornelius H. Cain, Dayton, Ohio.

102,486.—DIRECT ACTING ENGINE.—Adam Scott Cameron, New York city.

102,487.—CLAMP.—Charles B. Canfield, Oriskany, N. Y.

102,488.—FRUIT BASKET.—Lauren Carpenter, St. Joseph, Mich.

102,489.—DRAWER SLIDE.—John L. Chapman, West Roxbury, Mass.

102,490.—DEVICE FOR SECURING THE FEATURES OF A CORPSE IN PLACE.—Amos S. Chesebrough, Hartford, Conn.

102,491.—HORSE POWER.—Philo W. Clark, Oblong, N. Y.

102,492.—EXCAVATING APPARATUS.—Philo W. Clark, Oblong, N. Y.

102,493.—LIFTING JACK.—William Clark, Decatur, Ill.

102,494.—EARTH CLOSET.—Wm. R. C. Clark, New Orleans, La.

102,495.—EARTH CLOSET.—Wm. R. C. Clark, New Orleans, La.

102,496.—LIME KILN.—James Clarkson and Geo. W. Decker, Washington, D. C.

102,497.—CATTLE POKE.—Samuel P. Clemons, Dansville, N.Y. Antedated April 22, 1870.

102,498.—REVERSIBLE SEAT FOR RAILWAY CARS.—Thos. J. Close, Philadelphia, Pa.

102,499.—MATCH CASE.—Frank B. Coleman, Southampton, Mass.

102,500.—CAR COUPLING.—John Coleman, Lynchburg, Va.

102,501.—MANUFACTURE OF MALLEABLE IRON.—John J. G. Collins, Philadelphia, Pa.

102,502.—POT FOR SMELTING GLASS.—Roy Combs and Henry J. Leasure, Wheeling, West Va.

102,503.—APPARATUS FOR BLASTING LOGS.—Matthew Cooke, Sacramento City, Cal. Antedated April 27, 1870.

102,504.—HORSESHOE.—George Copeland, Denver, Colorado Territory.

102,505.—TAILORS' SCALE.—Wm. G. Cummins, Civil District No. 10, Tenn.

102,506.—LET-OFF MECHANISM FOR LOOM.—John Day, Paterson, N. J.

102,507.—COVER FOR KETTLES AND OTHER VESSELS.—E. K. Dean, Bangor, Me., assignor to Wm. C. Lovering, Taunton, Mass.

102,508.—PLOW GRINDER AND POLISHER.—Michael Devault, Charleston, Ill.

102,509.—CHURN.—J. L. Devol, Parkersburg, West Va. Antedated April 29, 1870.

102,510.—PUNCHING APPARATUS.—Thomas De Witt, Detroit, Mich., assignor to John T. Maxson, De Witt, Iowa.

102,511.—PUMP.—Thomas De Witt, Detroit, Mich., assignor to John T. Maxson, De Witt, Iowa.

102,512.—WASHING MACHINE.—Thomas De Witt, Detroit, Mich., assignor to John T. Maxson, De Witt, Iowa.

102,513.—PRUNING HOOK.—Andrew Downer, Hammondsville, Ohio.

102,514.—SPINDLE STEP CAP.—William F. Draper and Jos. B. Bancroft, Hopedale, Mass.

102,515.—SHAFT OR POLE COUPLING FOR CARRIAGES.—C. G. Dudley and Jacob Gulden, Key Port, N. J.

102,516.—STUMP EXTRACTOR.—James M. Eason, Charleston, S. C.

102,517.—MAINSPRING BARREL ATTACHMENT FOR WATCHES.—Ola L. Eliason, Salt Lake city, Utah Territory.

102,518.—CHURN.—Arthur H. Elliott, Albion, Mich.

102,519.—COFFEE CLEANING MACHINE.—William H. Elton, Baltimore, Md.

102,520.—SAW.—James E. Emerson, Trenton, N. J.

102,521.—STEAM BOILER FOR COOKING FOOD FOR STOCK.—William J. Estes, Penn township, Ill.

102,522.—SECTIONAL STEAM GENERATOR.—H. W. Evans, Philadelphia, Pa.

102,523.—CHURN.—Francis T. Fairchild, Sheboygan, Wis.

102,524.—COMBINED HAY AND PRUNING KNIFE.—John Fasig, West Salem, Ohio.

102,525.—HARVESTER RAKE.—V. H. Felt, Kendall, N. Y.

102,526.—BEEHIVE.—Charles Finn, Des Moines, Iowa.

102,527.—DUST RING FOR WATCH FRAME.—Jas. H. Flint, South Bend, Ind.

102,528.—TABLE LEAF SUPPORT.—Asa Forrest (assignor to himself and O. L. French), Moingona, Iowa.

102,529.—SETTING UP DEVICE FOR CIRCULAR KNITTING MACHINES.—William Franz and William Pope, Crestline, Ohio.

102,530.—LAP BOARD.—W. F. Gammel (assignor to himself and Jacob A. Weible), Elizabeth, N. J.

102,531.—FASTENING TUBE IN GRAIN DRILLS.—Franklin Gardner, Carlisle, Pa. Antedated April 18, 1870.

102,532.—CORN HARVESTER.—M. A. Getzendaner, Polo, Ill.

102,533.—COOKING STOVE.—Henry G. Giles, Troy, N. Y.

102,534.—WORK HOLDER.—Jane E. Gilman, Hartford, Conn.

102,535.—SEEDING MACHINE.—M. L. Gorham, Rockford, Ill. Antedated April 29, 1870.

102,536.—EMBROIDERY HOLDER.—Henry Gundaker, Lancaster, Pa.

102,537.—SELF-ACTING MULE FOR SPINNING.—Wm. Hackley (assignor to himself and Charles T. Almy), Moosup, Conn. Antedated April 25, 1870.

102,538.—REVERSIBLE BUTT HINGE.—D. F. Hale, Chicopee, Mass.

102,539.—STOVE PIPE DAMPER.—Rich. M. Hermance, Half Moon, assignor to Joseph B. Wilkinson, Troy. N. Y.

102,540.—SHOE BRUSH.—F. D. Holland (assignor to Henry J. Holland), Lewiston, Me.

103,541.—COTTON CHOPPER.—Wilson Holt, Dawson, Ga.

102,542.—SCAFFOLD.—E. R. Holzer, Philadelphia, Pa. Antedated April 29, 1880.

102,543.—CULTIVATOR PLOW.—Louis Homrighouse, Baltimore, Ohio.

102,544.—STUMP EXTRACTOR.—George L. Howland and Wm. M. Howland, Topsham, Me.

102,545.—WASHBOARD.—Saunders Hubbell, Jr., West Salem, Ohio.

102,546.—MANUFACTURE OF SOAP.—Charles Wager Hull, New York city,

102,547.—WEATHER STRIP.—J. H. Hull, Irasburg, Vt.

102,548.—CLOTHES-LINE HOLDER.—A. L. Hurtt, Monticello, Ind.

102,549.—TOBACCO ROLLER.—Chas. A. Jackson, Petersburg, Va.

102,550.—PROCESS FOR TEMPERING STEEL.—Jabez Jenkins, Philadelphia, Pa.

102,551.—LANTERN.—J. M. Jenness (assignor to himself, J. D. Jenness, and S. D. Jenness), Boston, Mass.

102,552.—LAMP BURNER.—J. H. Johnson, Newark, N. J., assignor to Holmes, Booth & Haydens, Waterbury, Conn.

102,553.—CAUL FOR LAYING VENEERS.—L. A. Johnson, New York city.

102,554.—DRY DOCK.—William Jones, New York city.

102,555.—SOLDERING FIRE-POT.—Elias W. Kimball, Hudson, N. Y.

102,556.—SUBMARINE TORPEDO.—W. R. King, Washington, D. C.

102,557.—SHOE FASTENING.—A. E. Kroger, Norwalk, Conn.

102,558.—COAL STOVE.—Joel Laforge and Jonathan T. Crane, Rahway, N. J. Antedated April 18, 1870.

102,559.—BOAT RUDDER.—Wm. C. Law, New York city.

102,560.—MACHINE FOR GRANULATING TOBACCO.—C. H. Lilienthal, Yonkers, N. Y.

102,561.—PRINTING-TELEGRAPH INSTRUMENT.—L. T. Lindsey, Jackson, Tenn.

102,562.—ELECTRO-MAGNETIC MOTOR.—L. T. Lindsey, Jackson, Tenn.

102,563.—POLICEMEN'S NIPPERS.—George Lutz, D. H. Rice, Michael Trenor, and Robert Chadwick, Columbus, Ohio.

102,564.—CORN PLANTER.—James W. Magers, Reinersville, Ohio.

102,565.—COMPOSITION FOR FINISHING WAX-LEATHER.—Patrick Maguire, New Boston, Mass.

102,566.—MANUFACTURE OF BOLTS.—Alexander Mailer (assignor to G. C. Bell and R. H. Plumb), Buffalo, N. Y.

102,567.—STREET MOISTENING COMPOUND.—Moritz Marcus New York city.

102,568.—MACHINE FOR FOLDING POWDERS.—J. W. Maxwell, Louisville, Ky.

102,569.—FARM GATE.—John Mayben, Milroy, Pa. Antedated April 23, 1870.

102,570.—COMPOUND FOR DRESSING TEXTILE FABRICS.—John McGill, Boston, assignor to Benjamin S. Goodwin, Boston, and Hiram Whitney, Watertown, Mass.

102,571.—WATER MOTOR.—William McGinniss, Auburn township, Ohio.

102,572.—TUBE WELL.—James McMillan, Fairport, N. Y. Antedated February 15, 1870.

102,573.—BIRD HOUSE.—Henry Miller, Johnston, R. I.

102,574.—DOOR CLAMP.—Benjamin Moore, Hart, Mich.

102,575.—CORD-CATCH.—C. C. Moore, New York city.

102,576.—FENCE AND GATE.—Enoch Muirheid, Greenfield, Ohio.

102,577.—PLANING CHUCK.—Augustus Newell and Wm. Pim, Chicago, Ill.

102,578.—HORSE HAY RAKE.—George Notman, Deerfield Ohio.

102,579.—ROSETTE FOR BRIDLES.—J. O. Brien, Geneseo, Ill.

102,580.—CARRIAGE HUB.—James O'Connor, Jackson, Mo.

102,581.—BOILER FURNACE.—J. A. T. Overend, San Francisco, Cal. Antedated April 23, 1870.

102,582.—FIRE EXTINGUISHER.—W. M. Parker, Boston, Mass. Antedated April 19, 1870.

102,583.—ANCHOR.—Gurney C. Pattison, Baltimore, Md.

102,584.—ANCHOR.—G. C. Pattison, Baltimore, Md.

102,585.—FLY TRAP.—Max Patzauer, New York city.

102,586.—SEWING MACHINE.—Rufus H. Peabody, Chelsea, Mass.

102,587.—BOBBIN FOR SPINNING, ETC.—Oliver Pearl, Lawrence, Mass.

102,588.—GRINDING MILL.—Walter Peck, Rockford, Ill.

102,589.—AUTOMATIC WAGON BRAKE.—Frank M. Pickerill, Indianapolis, Ind.

102,590.—HEATING AND VENTILATING ATTACHMENT FOR STOVES AND FIREPLACES.—Emily S. Potter and B. R. Potter, Boston Mass.

102,591.—APPARATUS FOR POLISHING COFFEE, ETC.—J. T Randall (assignor to F. W. Elder & Co.), Baltimore, Md.

102,592.—OFFICE-REGISTER AND DIRECTORY.—Henry Rentchler, Belville, Ill.

102,593.—CORN SHELLER.—J. W. Ricker, Chelsea, Mass.

102,594.—BALL TOY GUN.—Charles Robinson, Boston, Mass.

102,595.—WATER COOLER.—John Rutter, West Chester, Pa.

102,596.—HEMP BRAKE.—George Rymel, Paris, Ky.

102,597.—HOISTING APPARATUS.—Hans A. Schneekloth, New York city.

102,598.—BARLEY OR GAVEL FORK.—D. P. Sharp, Ithaca, N. Y.

102,599.—DITCHING PLOW.—I. S. Sheets, Troy, Ohio.

102,600.—LOCK NUT.—E. R. Shepard, Scranton, Pa.

102,601.—RAILWAY RAIL.—E. R. Shepard, Scranton, Pa.

102,602.—COMPOUND RAILWAY RAIL.—E. R. Shepard, Scranton, Pa.

102,603.—BOB-SLED.—S. C. Shepard, Richfield, Ohio.

102,604.—SASH HOLDER.—R. L. Sibbet, New Kingston, Pa. Antedated April 29, 1870.

102,605.—CLAMP FOR SETTING RIGGING.—J. W. Slaight and J. W. Androvatt, Prince's Bay, N. Y.

102,606.—SAWING MACHINE.—Addison Smith, Perrysburg, Ohio. Antedated April 23, 1870.

102,607.—COMBINED CORN SHELLER AND VEGETABLE-SLICER.—J. P. Smith, Hummelstown, Pa.

102,608.—CULINARY VESSEL.—J. C. Smith (assignor to himself and J. H. Poppy), Rochester, N. Y.

102,609.—ROLL FOR MAKING RAILS FOR STREET RAILWAYS.—G. A. Springer, Chicago, Ill.

102,610.—ROCK-BORING APPARATUS.—Thomas St. John, Dunbar, Pa.

102,611.—HAND CORN PLANTER.—Wm. D. Stroud, Oskosh, Wis.

102,612.—SHIRT.—S. H. Strouse and Joseph Strouse, New York city.

102,613.—HAT-BLOCKING MACHINE.—Jacob Surerus and W. H. Behrens (assignor to A. T. Finn), Newark, N. J.

102,614.—OVEN.—Charles Swain, Laconia, N. H.

102,615.—MOLD FOR ARTIFICIAL TEETH.—Eli Sweet, Whitney's Point, N. Y.

102,616.—BAG-HOLDER.—Geo. D. Sweigert (assignor to himself and Samuel Eshleman), Martic township, Pa.

102,617.—CARVING KNIFE.—O. W. Taft, New York, assignor to himself and Ernest Mitchell, Flushing, N. Y.

102,618.—CORN PLANTER.—L. B. Tarbox, Colliersville, N. Y

102,619.—APPARATUS FOR THE COMBUSTION OF PETROLEUM AND OTHER HYDROCARBON LIQUIDS.—Homer Taylor, Montreal Canada.

102,620.—COMBINATION PADLOCK.—George Thompson (assignor to himself and J. H. Cogill), Trenton, N. J.

102,621.—WASHING MACHINE.—H. N. Thompson, Auburn N. Y.

102,622.—SASH FASTENER.—Theodore R. Timby, Saratoga, N. Y.

102,623.—DRAIN AND WATER PIPE.—G. H. Titcomb and J. P. Culver, Jersey city, N. J.

102,624.—FAUCET.—W. H. Triscler, Cleveland, Ohio.

102,625.—MACHINE FOR BORING HUBS.—Abraham Troup (assignor to himself and Herman Kirk), Lewisberry, Pa.

102,626.—BLOWER FOR BLACKSMITHS' FORGE.—J. G. Tscheulin, Baltimore, Md.

102,627.—ELASTIC TIP FOR LEGS OF CHAIRS, ETC.—Silas Van Patten, Albany, N. Y.

102,628.—WASHING AND WRINGING MACHINE.—J. B. Wakeman and A. R. Field, Hamden, N. Y.

102,629.—STONE PAVEMENT.—Chas. G. Waterbury, New York city.

102,630.—ATTACHING HANDLE TO JOINERS' PLOW.—C. H. Weigle, York, Pa.

102,631.—CULTIVATOR.—Nicholas Werts, Magnolia, Ill.

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102,633.—EVAPORATING AND DISTILLING BY SOLAR HEAT.—Norman W. Wheeler, Brooklyn, and Walton W. Evans, New Rochelle N. Y.

102,634.—PUMP.—J. T. Whipple, Chicago, Ill.

102,635.—SAFETY SOCKET FOR WHIPS, UMBRELLAS, BILLIARD CUES, ETC.—J. W. Whiteman, Christiana, Del.

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102,638.—FORMER FOR HOOP SKIRTS.—C. C. Wilson, Baltimore, Md. Antedated April 18, 1870.

102,639.—COAL HOD.—William Wilson, Boston, Mass. Antedated April 18, 1870.

102,640.—STRAP FASTENER.—William R. Wing, Newark, Ohio.
102,641.—BENDING MACHINE.—Henry Winter, Honesdale, Pa., assignor to himself and T. W. Ball, New York city.
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102,647.—WELL TUBE.—Isaac Ayres, Elkhart, Ind., and D. C. Payne, Delavan, Wis. Antedated April 25, 1870.
102,648.—DRYING GUANO.—Edwin P. Baugh, Philadelphia, Pa.
102,649.—CLAPBOARD GAGE.—Joab S. Biddlecom, Macedon, N. Y.
102,650.—LIQUID METER.—N. L. Blanchard, Spuyten Duyvil, N. Y. Antedated April 25, 1870.
102,651.—HAY CARRIER.—C. S. Boothby, Saco, Me.
102,652.—PLOW CLEVIS.—Thomas E. C. Brinly, Louisville, Ky.
102,653.—SAW.—Henry Broomell and A. W. Wilson, Christiana, Pa.
102,654.—PYROMETER.—Edward Brown, Philadelphia, Pa.
102,655.—WATER ELEVATOR.—Geo. C. Canfield, Mechanicsburg, Ohio.
102,656.—SLATE-FRAME CLAMP.—J. H. Coffin, Danielsville, Pa. Antedated March 17, 1870.
102,657.—CARRIAGE WHEEL HUB.—A. F. Cooper, San Francisco, Cal.
102,658.—SASH BALANCE.—William Damerel, Brooklyn, N. Y.
102,659.—STAPLE MACHINE.—J. T. Darnell, Florence, N. J. Antedated April 22, 1870.
102,660.—COMPOSITION FOR AND MODE OF ORNAMENTING WOOD.—T. H. Davis (assignor to Cheney Kilburn and J. H. Gates), Philadelphia, Pa.
102,661.—PADLOCK.—J. M. A. Dew, Chicago, Ill.
102,662.—PROCESS AND APPARATUS FOR USING LIQUID FUEL FOR PRODUCING HEAT AND LIGHT.—T. S. Dickerson and R. M. Whipple, Chicago, Ill.
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102,665.—SEASONING WOOD.—Richard A. Douglas, Philadelphia, Pa.
102,666.—MACHINE FOR CUTTING VEGETABLES.—W. R. Dunn, Alton, Ind.
102,667.—SASH HOLDER.—W. A. Eisenhower, Friedensburg, Pa. Antedated April 29, 1870.
102,668.—PIANOFORTE.—Geo. Ely, New York city.
102,669.—BOTTLE STOPPER.—William Ely, New York city.
102,670.—ROUGHING ROLL.—David Eynon (assignor to Tredegar Co.), Richmond, Va.
102,671.—AGRICULTURAL BOILER.—Francis Farquhar, Richmond, Ind.
102,672.—WASHING MACHINE.—Benjamin F. Fellman, Sellersville, Pa.
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102,679.—COAL SCUTTLE AND SIFTER.—Wm. Hazlet and W. H. Flanigan, Philadelphia, Pa.
102,680.—REFRIGERATOR.—W. G. Holden, Jr., Covington, Ky. Antedated Feb. 2, 1870.
102,681.—VENTILATOR FOR MINES.—Jenkin B. Jones, Laure Run, Pa.
102,682.—BASE-BURNING STOVE.—Wm. J. Keep, Troy, N. Y.
102,683.—COOKING STOVE.—Edward Kirk, Sharon, Pa.
102,684.—SEEDING MACHINE.—Hermann Koeller, Adams County, Ill.
102,685.—BOTTLE STOPPER.—G. W. Ladd and F. W. Copcutt, New York city.
102,686.—COMPOUND FOR TREATING RHEUMATISM.—Wm. Landert and John Deggeller, Chicago, Ill.
102,687.—PLOW.—W. M. Lanham, Noblesville, Ind.
102,688.—BARBER AND DENTAL CHAIR.—Michael Leidecker, Rochester, N. Y.
102,689.—MANUFACTURE OF FERTILIZER AND OIL FROM FISH.—Orazio Lugo, Baltimore, Md.
102,690.—PIPE TONGS.—Stephen Lynch, New York city.
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102,692.—LANTERN GLOBE.—I. C. Mayo (assignor to himself and J. J. Currier), Gloucester, Mass.
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102,694.—SHOE FASTENER.—A. McKenney, Portland, Me.
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102,698.—HYDRANT.—John Myers, Cincinnati, Ohio.
102,699.—WELL TUBE.—Simon Neff, Clymouth, Ind.
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102,701.—ROCKING AND RECLINING CHAIR.—T. J. Palmer, New York city.
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102,705.—WASHING MACHINE.—S. B. Peugh, Salem, Ind.
102,706.—GRADING MACHINE.—James Preston, Atchison, Kansas.
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102,708.—DIE FOR TRIMMING KING BOLTS.—F. B, Prindle, Southington, Conn.
102,709.—HUBS OF ROAD CARRIAGES.—John Raddin, Lynn, Mass.
102,710.—SEWING MACHINE.—George Rehfuss, Philadelphia, Pa., assignor to American Button-hole Over-seaming and Sewing Machine Co., Pa.
102,711.—MACHINE FOR MAKING CHAIN LINKS.—Henry Reynolds, Aurora, N. Y.
102,712.—WASH BOILER APPARATUS.—Jacob Ringle, Jersey City, N. J.
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102,714.—WASHING MACHINE.—W. T. C. Runnalls, Searsport, Me.
102,715.—COMPOUND FOR REFINING CIDER, WINE, ETC.—Oliver Schaffer, Dayton, Ohio.
102,716.—CASK FOR LAGER BEER.—John J. Schillinger, New York city.
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102,724.—RAILWAY SWITCH.—William H. Staats, Crescent, N. Y.
102,725.—APPARATUS FOR PRESERVING WOOD.—Francis A. Stevens, Chicago, Ill.
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102,733.—BOOK COVER PROTECTOR.—Philip F. Van Everen, Brooklyn, N. Y.
102,734.—HAND STAMP CANCELER.—L. B. Van Kleeck, New York city. Antedated March 16, 1870.
102,735.—REFRIGERATOR.—G. W. Walker, Malden, Mass.
102,736.—STRAW CUTTER.—Columbus M. Weathers, Rocheport, Mo.
102,737.—LAVATORY APPARATUS.—Darius Wellington, Boston, Mass.
102,738.—WATER-CLOSET BOWL.—Darius Wellington, Boston, Mass.
102,739.—LUBRICATOR FOR LOOSE PULLEYS.—I. P. Wendell and S. P. M. Tasker, Philadelphia, Pa.
102,740.—MANUFACTURE OF WROUGHT IRON FROM ORE, CINDER, OR SLAG.—James D. Whelpley and Jacob J. Storer, Boston, Mass.
102,741.—AUTOMATIC GATE.—Samuel Whitaker, Bel Air, Md.
102,742.—DRYER.—G. W. White, Malden, and L. E. Wentworth, Melrose, Mass.
102,743.—PUMP.—F. C. Wilson, Watkins, N. Y.
102,744.—HAY RAKE AND LOADER.—Geo. A. Wing, Albany, N. Y.
102,745.—APPARATUS FOR DISTILLING SPIRITS.—Francis M. Young, Nashville, Tenn.
102,746.—UMBRELLA.—S. W. Young, Providence, R. I.
102,747.—PROPELLING WHEEL.—A. C. Loud, San Francisco, Cal.

## REISSUES.

3,945.—CULTIVATOR.—A. R. Blood, Alexander Hathaway, and V. R. Beach, Independence, Iowa.—Patent No. 19,304, dated June 30, 1868.
3,946.—BREECH LOADING FIREARMS.—W. N. Ely, Stratford, Conn., trustee and assignee of J. C. Symmes.—Patent No. 22,094, dated November 16, 1858.
3,947.—MOWING MACHINE.—John P. Greely, Boston, and Levi W. Buxton, Lynn, for themselves and Thomas H. Dodge (assignee of one third interest), Worcester, Mass.—Patent No. 39,288, dated July 21, 1863.
3,948.—ORE CRUSHER.—John Hamilton, George W. Hamilton, and Joseph Hamilton, for themselves and Joseph Hamilton, assignee of L. E. Hanson, Wheeling, West Va.—Patent No. 90,532, dated May 25, 1869.
3,949.—EXTENSION TABLE.—C. P. Lenz, Poughkeepsie, N. Y.—Patent No. 94,617, dated September, 7, 1869.
3,950.—STEAM GAS GENERATOR.—H. S. Maxim, New York city.—Patent No. 71,400, dated Nov. 26, 1867.
3,951.—BREECH-LOADING FIREARM.—B. S. Roberts, U. S. Army.—Patent No. 36,531, dated Sept. 23, 1862; reissue 2,067, dated Sept. 5, 1865.
3,952.—Division 2.—BREECH-LOADING FIREARM.—B. S. Roberts, U. S. A.—Patent No. 36,531, dated Sept. 23, 1862; reissue 2,067, dated Sept. 5, 1865.
3,953.—BREECH-LOADING FIREARM.—B. S. Roberts, U. S. A.—Patent No. 36,531, dated September 23, 1862; reissue 2,067, dated Sept. 5, 1865.
3,954.—RAILWAY CAR WHEEL.—J. K. Sax and G. W. Kear, Kingston, Pa.—Patent No. 88,743, dated April 6, 1869.
3,955.—Division A.—HARVESTER.—John F. Seiberling, Akron, Ohio, assignee of George Esterly.—Patent No. 23,666, dated April 19, 1859.
3,956.—Division B.—HARVESTER.—J. F. Seiberling, Akron, Ohio, assignee of George Esterly.—Patent No. 23,666, dated April 19, 1859.
3,957.—Division C.—HARVESTER.—J. F. Seiberling, Akron, Ohio, assignee of George Esterly.—Patent No. 23,666, dated April 19, 1859.
3,958.—HARVESTER.—Richard M. Williams, Rockville, Md.—Patent No. 95,864, dated Oct. 12, 1869.
3,959.—MANUFACTURE OF YEAST FOR DISTILLERS.—Joseph Wolff, Cincinnati, Ohio.—Patent No. 99,615, dated Feb. 8, 1870.
3,960.—HORSE HAY RAKE.—Alzirus Brown, Worcester, Mass., assignee, by mesne, assignments, of Mathias Raezer.—Patent No. 16,294, dated Nov. 29, 1859.
3,961.—CONSTRUCTION OF SEWING MACHINE COVER.—John Johnson, Hartford, Conn.—Patent No. 72,739, dated December 31, 1867.
3,962.—BRONZING AND GILDING.—John L. Duffee, Washington, D. C., for himself and John H. Johnston, assignee of one third interest.—Patent No. 102,198, dated April 19, 1870.

## DESIGNS.

4,002.—GLASS COLUMN FOR COACH LAMPS.—Thos. Boudren, Bridgeport, Conn.
4,003.—STOCKING FABRIC.—Thomas Dolan, Philadelphia, Pa.
4,004.—BRAND.—Max Hoffheimer, Cincinnati, Ohio.
4,005.—TRADE MARK.—Otto Kornemann and Julius Jungbluth, New York city.
4,006.—BURIAL CASKET.—Philipp J. Marchal, Hartford, Conn.
4,007.—FLOOR CLOTH PATTERN.—James Patterson, Elizabeth, assignor to R. H. and B. C. Reeve, Camden, N. J.
4,008.—TYPE.—Richard Smith (assignor to Mackellar, Smiths and Jordan), Philadelphia, Pa.
4,009.—CROSS-CUT SAW.—W. G. Tuttle, Chelsea, Mich.
4,010.—TRUNK LOCK.—Cornelius Walsh, Newark, N. J.

## EXTENSION.

SEAMLESS METAL TUBES.—W. F. Brooks, New York city.—Letters Patent No. 14,551, dated April 1, 1856.

### Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

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806.—CRIMPING MACHINE.—S. W. Jamison, New York city. March 18, 1870.

816.—MACHINES FOR SEWING STRAW.—S. S. Turner, Wellborough, Mass. March 22, 1870.

796.—PRINTING PRESSES.—Charles Parker, Meriden, Conn. March 17, 1870.

834.—MANUFACTURING BARRELS, AND OTHER ROUND VESSELS OF WOOD.—D. H. Howard, Grand Rapids, Mich. March 21, 1870.

837.—WHEELS.—J. A. Woodbury, Boston, Mass. March 21, 1870.

872.—AMMONIATED SULPHURIC ACID.—C. U. Shepard, Jr., Charleston, S.C. March 24, 1870.

856.—IRON AND STEEL WORKING.—John Absterdam, New York city. March 18, 1870.

870.—TURBINE WATER WHEELS.—H. A. Chadwick, Burnet, Texas. March 24, 1870.

885.—STEAM ENGINE VALVES.—G. E. Noyes, Washington, D. C. March 25, 1870.

882.—VALVES.—G. Sickels and J. H. Thorndike, Boston, Mass. March 25, 1870.

896.—MACHINERY FOR COMPRESSING PEAT, ETC.—T. Ellis and W. A. Ellis, Philadelphia, Pa. March 25, 1870.

904.—WRENCH.—G. C. Taft, Worcester, Mass. March 28, 1870.

905.—ANCHOR.—G. C. Pattison, Baltimore, Md. March 28, 1870.

923.—ARTIFICIAL FUEL AND APPARATUS EMPLOYED IN ITS MANUFACTURE.—Anthracite Fuel Manufacturing Company, Philadelphia, Pa. March 30, 1870.

932.—MACHINES FOR REAPING AND MOWING.—C. H. McCormick, Chicago, Ill. March 30, 1870.

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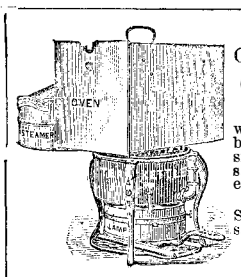


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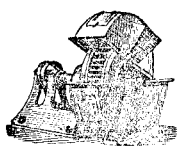

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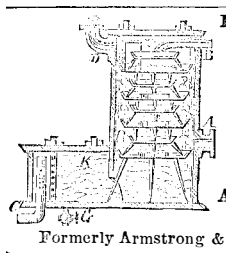

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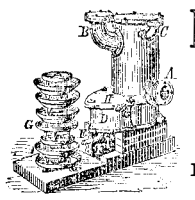

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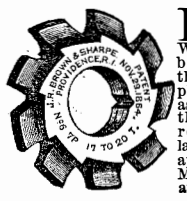


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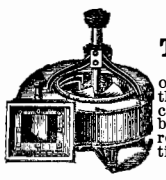

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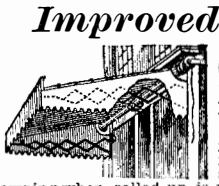

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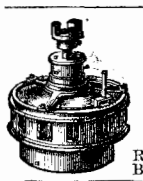

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