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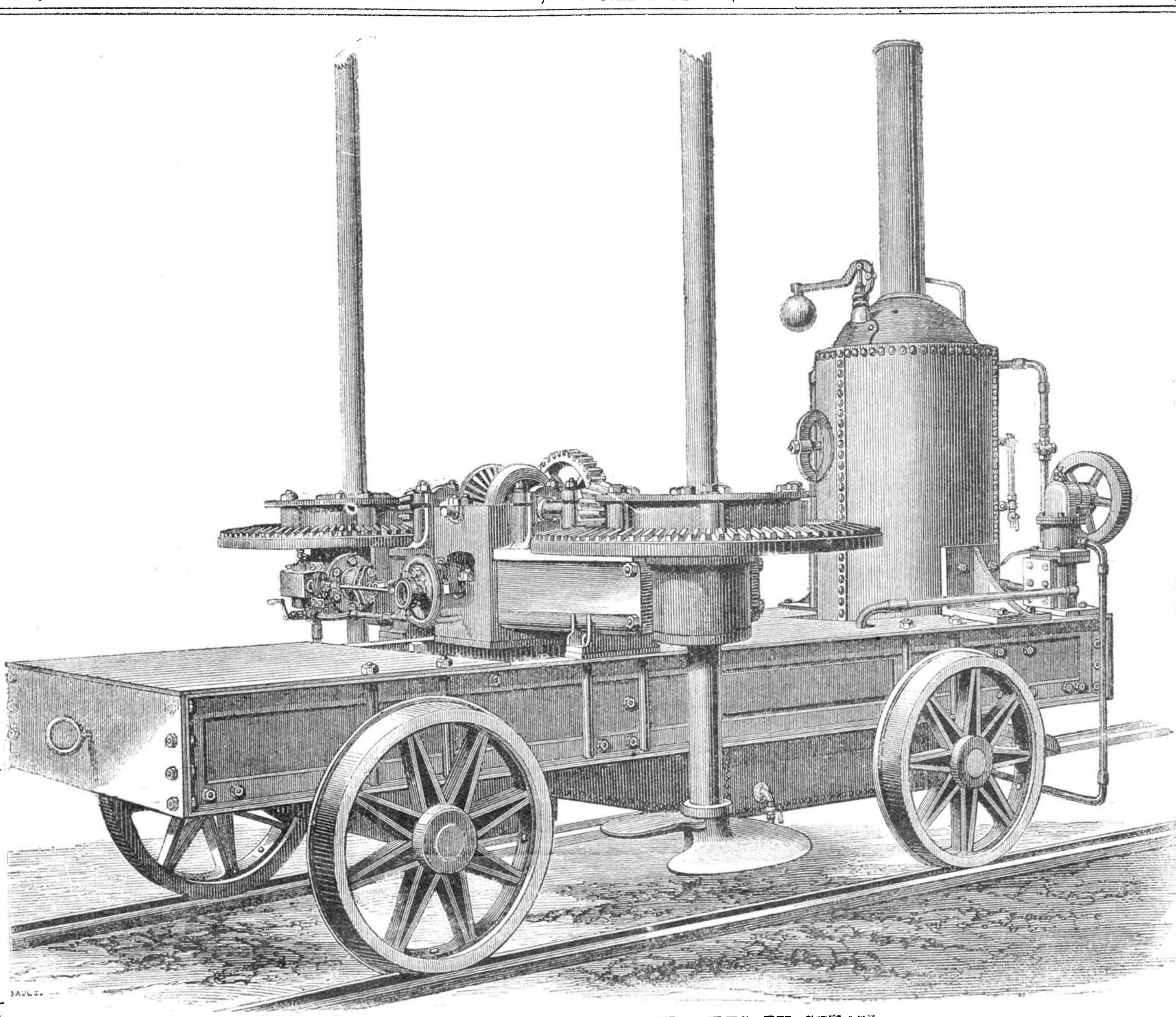
Sinking Screw Piles.

We illustrate herewith a machine which has been lately designed by an English firm, at the request of H. Lee Smith, Esq., chief engineer for the Punjaub Northern Railway, for screwing down the piles to be used in constructing bridges and flood openings on that line of railway. Fig. 1 is a perspective, and Fig. 2 a sectional end view. This machine consists of a wrought-iron under-carriage mounted upon wheels of 5 ft. 6 inch gage, and carrying a vertical boiler at one end. A strong cast-iron beam in the center carries a cylinder in which works a ram, to the top of which a strong crossbeam is bolted which carries the machinery for operating on the piles. This consists of a horizontal steam engine bolted to the side of the crossbeam, and driving a pinion and train of spur and bevel wheels which impart motion to two large horizontal wheels carried in bearings at each end of the crossbeam. A friction clutch is carried in the center of each of these wheels, through the boss of which the shaft of the pile to be screwed is passed. The shafts are rolled with feathers or ribs on each side, which, passing through corresponding recesses or keyways formed in the boss of the friction clutch, form the means of imparting the rotary motion from the horizontal wheels to the piles.



APPARATUS FOR SINKING SCREW PILES BY STEAM.

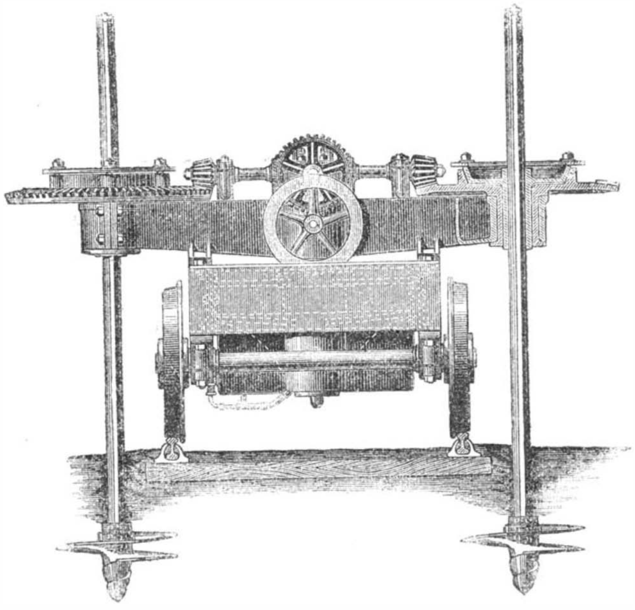
Steam is brought from the boiler through the center of the ram and cylinder which carries the crossbeam by means of a telescope joint, which allows the ram to be raised without interfering with the steam pipe; and a small donkey engine is provided which can pump from a tank situated between the frame, either into the boiler or into the cylinder under the ram which carries the crossbeam. When the machine is at work the crossbeam is held firmly by means of cotter bolts to the frame.

The *modus operandi* is as follows: A temporary road being laid on the center line of the proposed structure, piles are pitched by passing the shafts through the wheels on each side of the machine, and keying them into the screws which are placed in a small hole excavated to receive them. The engine is then set to work, and the piles screwed down as far as possible. The cotters holding down the crossbeam are then removed, and it is raised by the donkey engine pumping into the cylinder in the center of the machine, and lifted off the piles. The machine is then moved forward to the center line of the next piles, and the operation takes place as before.

Should a pile meet with any obstruction, or be found fast enough without screwing down to the estimated depth, it may be either unscrewed by reversing the engine, or the shaft may be cut off to the right hight, so that the crossbeam may be lifted clear, a slide rest and tool holder being provided, which is actuated by the horizontal wheels.

At a trial of this machine, the Editor of *Engineering* recently witnessed two piles screwed into stiff clay 10 feet deep in 23 minutes, and withdrawn at the rate of 3 ft. in 2½ minutes with a mean pressure of 90 lbs. steam in the boiler; and to test the efficiency of the cutting apparatus one pile was cut off in 29 minutes. The machine altogether does great credit to its designer, and from its great handiness and the rapidity with which it performs its work, it will no doubt recommend itself to those having to erect such structures as those on which it is intended to employ it.

FIG. 2.



FIFTEEN HUNDRED DOLLARS, in cash, are to be paid by Munn & Co., February 10, 1870, to the successful competitors for prizes. Send in the names as early as possible that we may know how large an edition to print at the commencement of the new volume. Competitors for cash prizes should write conspicuously "Prize List" on every list of names sent. Circulars and blanks for names sent on application. Those first in the field will stand the best chance.

Acid Rivers.

The Rio Vinaigre, says the Boston *Journal of Chemistry*, in South America, has its source nearly two miles above the level of the sea on the volcano named the "Purace." Humboldt was the first to ascertain that its waters contain free sulphuric and muriatic acids. According to Boussingault, this river empties into the Rio Cauca, into which it falls from a hight of about 400 feet, discharging daily 34,784 cubic meters of water, containing 37,611 kilgr. (more than 40 tuns) of strong sulphuric acid, and 31,654 kilgr. (nearly 35 tuns) of strong muriatic acid. No fish are found in the Rio Cauca for more than ten miles below the point where it receives these acid waters.

In the island of Java there are several small streams and lakes which contain free sulphuric and muriatic acids; and on the island of Sumatra there is a lake which contains free nitric acid. All these phenomena are the result of volcanic action.

Test for the Quality of Soap.

To estimate the quantity of non-saponified fatty matter in soap, Dr. Boley gives the following formula:

"Dry the soap at 100°, in order to eliminate, as much as possible, any water it contains. Treat the soap, after having been previously reduced to thin shavings, or powder, if possible, with rectified benzole, or petroleum naphtha. Boil the soap for several hours with this fluid placed in a retort, and take care to pour back into that vessel any of the hydrocarbon which distils over. Next filter the liquid, and evaporate on a water bath. 11·3 grms. of Marseilles soap (this is made with inferior kinds of olive oil and soda) treated in this manner left a residue, on evaporation, weighing 0·145 grm., or 1·2 per cent; this quantity consisted of the non-saponified fatty matter, and a very small quantity of soap which had been dissolved. On igniting the residue just mentioned, it left 0·002 grm. of ash, equal to 0·13 per cent of the soap submitted to analysis.

The Whitworth Metal.

When it is announced that this metal will withstand any shock or strain that can be brought to bear against it, it ought not to be wondered at that so extravagant and indefinite a statement meets with incredulity. There is, perhaps, little doubt that Mr. Whitworth has succeeded in producing iron and steel of superior strength by his method of subjecting these metals, while in a molten state, to enormous pressure, by which it is claimed all the air bubbles are got rid of and the metal is rendered homogeneous. It will be slow work, however, convincing iron masters that the extravagant results claimed are to be relied upon. If they are even approximated, the proof can only be extended trials under varied circumstances of difficulty, and for ourselves, we had rather wait the test of time than to accept at present what we are asked to believe in regard to it.

A GOOD LIP-SALVE.—Equal parts of sweet lard and suet melted together, colored with alkanet root, and perfumed with essence of bergamot.

THE CELEBRATED CROSSE EXPERIMENTS.

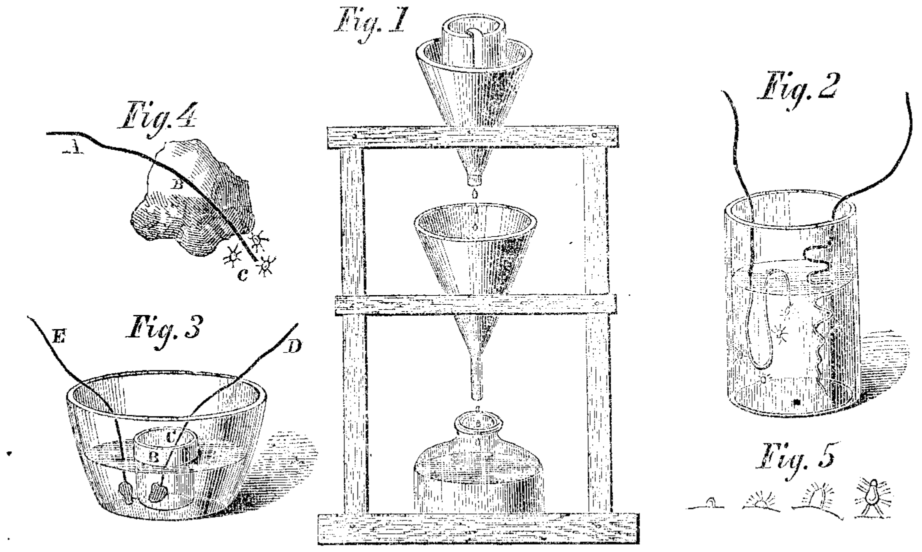
In 1836, Mr. Andrew J. Crosse, while conducting some experiments in the formation of artificial crystals, discovered in a caustic solution a large number of insects of the *acarus* tribe—mites—the announcement of which made a considerable sensation in the scientific world. These mites, since called the "Crosse mites," were never claimed by Mr. Crosse to have been spontaneously generated, although he was charged with impiously trying to imitate creative power. He believed the insects to have originated from germs conveyed by some unknown means into the solution. He repeated the experiment, and his own account of this discovery taken from a magazine of that day, together with an engraving of the simple apparatus he employed, we now present to our readers. He says:

"In the course of my endeavors to form artificial minerals by a long continued electric action on fluids holding in solution such substances as were necessary to my purpose, I had recourse to every variety of contrivance which I could think of, so that, on the one hand, I might be enabled to keep up a never-failing electrical current of greater or less intensity or quality, or both, as the case seemed to require; and, on the other hand, that the solutions made use of should be exposed to the electric action in the manner best calculated to effect the object in view. Amongst other contrivances, I constructed a wooden frame, of about two feet in hight, consisting of four legs proceeding from a shelf at the bottom, supporting another at the top, containing a third in the middle. (Seen in section in Fig. 1) Each of these shelves was about seven inches square. The upper one was pierced with an aperture in which was fixed a funnel of Wedgwood ware, within which rested a quart basin on a circular piece of mahogany placed within the funnel. When this basin was filled with a fluid, a strip of flannel wetted with the same, was suspended over the edge of the basin and inside the funnel, which, acting as a siphon, conveyed the fluid out of the basin through the funnel in successive drops. The middle shelf of the frame was likewise pierced with an aperture, in which was fixed a smaller funnel of glass, which supported a piece of somewhat porous red oxide of iron from Vesuvius, immediately under the dropping of the upper funnel. This stone was kept constantly electrified by means of two platina wires on either side of it, connected with the poles of a volatic battery of nineteen pairs of 5-inch zinc and copper single plates, in two porcelain troughs, the cells of which were filled at first with water and 1-500th part of hydrochloric acid, but afterwards with water alone. I may here state that in all my subsequent experiments relative to these insects, I filled the cells of the batteries employed with nothing but common water. The lower shelf merely supported a wide-mouthed bottle to receive the drops as they fell from the second funnel. When the basin above was nearly emptied, the fluid was poured back again from the bottle below into the basin above, without disturbing the position of the stone. It was by mere chance that I selected this volcanic substance, choosing it from its partial porosity; nor do I believe that it had the slightest effect in the production of the insects to be described. The fluid with which I filled the basin was made as follows: I reduced a piece of black flint to powder, having first exposed it to a red heat, and quenched it in water to make it friable. Of this powder I took two ounces and mixed it intensely with six ounces of carbonate of potassa, exposed it to a strong heat for fifteen minutes in a blacklead crucible in an air furnace, and then poured the fused compound on an iron plate, reduced it to powder while still warm, poured boiling water on it, and kept it boiling for some minutes in a sand bath. The greater part of the soluble glass thus fused was taken up by the water, together with a portion of alumina from the crucible. I should have used one of silver, but had none sufficiently large. To a portion of the silicate of potassa thus fused, I added some boiling water to dilute it, and then slowly added hydrochloric acid to supersaturation.

"A strange remark was made on this part of the experiment at the meeting of the British Association at Liverpool, it being then gravely stated that it was impossible to add an acid to a silicate of potassa without precipitating the silica! This of course must be the case! unless the solution be diluted with water. My object in subjecting this fluid to a long-continued electric action through the intervention of a porous stone, was to form, if possible, crystals of silica at one of the poles of the battery, but I failed in accomplishing this by those means.

"On the fourteenth day from the commencement of the experiment, I observed, through a lens, a few small whitish excrescences, or nipples, projecting from about the middle of the electrified stone, and nearly under the dropping of the fluid above. On the eighteenth day these projections enlarged, and seven or eight filaments, each of them longer than the excrescences from which it grew, made their appearance on each of the nipples. On the twenty-second day, these appearances were more elevated and distinct, and on the twenty-sixth day, each figure assumed the form of a perfect insect, standing erect on a few bristles which formed its tail. Until this period I had no notion that these appearances were any other than an incipient mineral formation; but it was not until the twenty-eighth day, when I plainly perceived these little creatures move their legs, that I felt any surprise, and I must own that when this took place, I was not a little astonished. I endeavored to detach some from their position on the stone, but they immediately died, and I was obliged to wait patiently for a few days longer, when they separated themselves from the stone and moved about at pleasure, although they had been for some time after their birth apparently averse to motion. In the course of a few weeks, about a hundred of them made their appearance on the stone. I observed that at first each of them fixed itself for a considerable time in one spot, appearing, as far as I could judge, to feed by suction, but when a ray of light from the sun was directed upon it seemed disturbed, and removed itself to the shaded part of the stone. Out of about a hundred insects, not above five or six were born on the south side of the stone. I examined some of them with the microscope, and observed that the smaller ones appeared to have only six legs, but the larger ones eight. It seems that they are of the genus *Acarus*, but of a species not hitherto observed. I have had three separate formations of similar insects at different times, from fresh portions of the same fluid, with the same apparatus.

"As I considered the result of these experiments rather extraordinary, I made some of my friends acquainted with it, among whom were some highly scientific gentlemen, and they plainly perceived the insect in various states. I have never ventured an opinion as to the cause of their birth, and for a very good reason—I was unable to form one. The most simple solution of the problem which occurred to me was that they arose from ova deposited by insects floating in the air, and that they might possibly be hatched by electric action. Still I could not imagine that an ovum could shoot out filaments, and that those filaments would become bristles; and, moreover, I could not detect, on the closest examination, any remains of a shell. Again, we have no right to assume that electric action is necessary to vitality until such fact shall have been most distinctly proved. I next imagined, as others have done, that they might have originated from the water, and consequently made a close examination of several hundred vessels filled with the same water as that which held in solution the silicate of potassa, in the same room, which vessels constituted the cells of a large voltaic battery, used without acid. In none of these vessels could I perceive the trace of an insect of that description. I likewise closely examined the crevices and most dusty part of the room, with no better success.



"In the course of the same month, indeed, these insects so increased that when they were strong enough to leave their moistened birthplace, they issued out in different directions, I suppose in quest of food; but they generally huddled together under a card or piece of paper in their neighborhood, as if to avoid light and disturbance. In the course of my experiments upon other matters, I filled a glass basin with a concentrated solution of silicate of potassa, without acid, in the middle of which I placed a piece of brick, used in the neighborhood for domestic purposes, and consisting mostly of silica. Two wires of platina connected either end of the brick with poles of a voltaic battery of sixty-three pairs of plates, each about two inches square. After many months' action, silica, in a gelatinous state, formed in some quantity round the bottom of the brick, and as the solution evaporated I replaced it by fresh additions, so that the outside of the glass basin being constantly wet by repeated overflowings, was of course constantly electrified. On this outside, as well as on the edge of the fluid within, I one day perceived the well known whitish excrescence, with its projecting filaments. In the course of time they increased in number, and as they successively burst into life, the whole table on which the apparatus stood was at last covered with similar insects, which hid themselves wherever they could find a shelter. Some of them were of different sizes, there being a considerable difference in this respect between the large and smaller; and they were plainly perceptible to the naked eye, as they nimbly crawled from one spot to another. I closely examined the table with a lens, but could perceive no such excrescence as that which marks their incipient state on any part of it.

"While these effects were taking place in my electric room, similar formations were making their appearance in another room, distant from the former. I had here placed on a table three voltaic batteries, unconnected with one another. The first consisted of twenty pairs of two-inch plates, between the poles of which I placed a glass cylinder filled with a concentrated solution of silicate of potassa, in which was suspended a piece of clay slate by two platina wires connected with either pole of the battery. A piece of paper was placed on the top of the cylinder, to keep out the dust. After many months' action, gelatinous silica in various forms was electrically attracted to the slate, which it coated in rather a singular manner, unnecessary here to describe. In the course of time I observed similar insects in their incipient state forming around the edge of the fluid within the jar, which, when perfect, crawled about the inner surface of the paper with great activity. The second battery consisted of twenty pairs of cylinders, each equal to a four-inch plate. Between the poles of this I interposed a series of seven glass cylinders, filled with the following concentrated solutions: 1st, nitrate of copper; 2d, subcarbonate of potassa; 3d, sulphate of copper; 4th, green sulphate of iron; 5th, sulphate of zinc; 6th, water acidified with a minute portion of hydrochloric acid; 7th, water poured on powdered metallic arsenic, resting on a copper cup, connected with the positive pole of the battery. All these cylinders were electrified, and united together by arcs of sheet copper, so that the same electric current passed through the whole of them. After many months' action, and consequent formation of certain crystalline matters which it is not my object here to notice, I observed similar excrescences with those before described at the edge of the fluid in every one of the cylinders, excepting the two which contained the carbonate of potassa and the metallic arsenic; and in due time a host of insects made their appearance. It was curious to observe the crystallized nitrate and sulphate of copper, which formed by slow evaporation at the edge of the respective solutions, dotted here and there with the hairy excrescences. At the foot of each of the cylinders I had placed thick paper upon the table, and on lifting them up I found a little colony of insects under each, but no appearance of their having been born under their respective papers, or on any part of the table. The third battery consisted of twenty pairs of cylinders, each equal to a 3-inch plate. Between the poles of this I interposed likewise a series of six glass cylinders, filled with various solutions, in only one of which I obtained the insect. This contained a solution of silicate of potassa. A bent iron wire, one fifth of an inch in diameter, in the form of an inverted siphon, was plunged some inches in this solution, and connected it with the positive pole, while a small coil of fine silver wire joined it with the negative. This instrument is represented in Fig. 2.

"I have obtained the insects on a bare platina wire, plunged into fluo-silicic acid, one inch below the surface of the fluid, at the negative pole of a small battery of two-inch plates, in cells filled with water. This is a somewhat singular fluid for these insects to breed in, who seem to have a flinty taste, although they are by no means confined to silicious fluids. This fluo-silicic acid was procured from London some time since, and consequently made of London water, so that the idea of their being natives of the Broomfield water is quite set aside by this result.

"The apparatus was arranged as follows: Fig. 3, a glass basin (a pint one), part filled with fluo-silicic acid to the level. A B is a small porous pan, made of the same materials as a garden-pot, partly filled with the same acid to the level, B, with an earthen cover, C, placed upon it, to keep out the light, dust, etc. D is a platina wire connected with the positive pole of the battery, with the other end plunged into the acid in the pan, and twisted around a piece of common quartz; on which quartz, after many months' action, are forming singularly beautiful and perfect-formed crystals of a transparent substance, not yet analyzed, as they are still growing. These crystals are of the modification of the cube, and are of twelve or fourteen sides. The platina wire passes under the cover of the pan; E is a platina wire connected with the negative pole of the same battery, with the other end dipping into the basin, an inch or two below the fluid, and, as well as the other, around a piece of quartz. By this arrangement it is evident that the electric fluid enters the porous pan by the wire, D, percolates the pan, and passes out by the wire, E. It is now upward of six or eight months (I cannot at this moment put my hand on the memorandum of the date) since this apparatus has been in action, and though I have occasionally lifted out the wire to examine them by a lens, yet it was not till the other day that I perceived an insect, and there are now three of the same insects in their incipient state, appearing on the naked platina wire at the bottom of the quartz in the glass basin of the negative pole. These insects are very perceptible, and may be represented thus (magnified): in Fig. 4, A is the platina wire, B the quartz, and C the incipient insects. It should be observed that the glass basin, Fig. 3, has always been loosely covered with paper. The incipient appearance of the insects has already been described. The filaments which project are in course of time seen to move before the perfect insect detaches itself from the birth place. Fig. 5 shows the insects in their various states, magnified."

Brain Work and Manual Labor.

Our excellent cotemporary, the *Herald of Health*, thus discourses on the combining of mental and physical force to the relief of both mind and body:—"The worker with his brains would love brain work more if he had a couple hours of hand work to do every day. If such persons could have their gardens and shops to run to when their heads were tired, they would soon recuperate, and the muscular toil not being in excess would soon be a delight. If, on the other hand, the toiler with the hand could do daily some mental labor, it would add greatly to his happiness. The sharpening of the brain by culture would add effectiveness to the hand. The reason for this, is because man is a composite being. His muscles were not made for non-use more than his brain, and the right use of each is a pleasure and not a pain. After a few generations we shall have what is now the prayer of thousands, more culture for the laboring man, and more physical labor for the cultured man. This will establish a harmony between the two, which will add greatly to the prosperity, happiness, and health of both."

RAILWAY CARRIAGES IN DIFFERENT PARTS OF THE WORLD.

Chambers' Journal complains that railway fares are with few exceptions higher in England than in any other country, and argues therefrom that English people ought to get better accommodation than is afforded in other countries. It asserts, however, that such is not the case, and to make good its assertion, facts are given in relation to royal and luxurious railway carriages, luncheon carriages, sleeping cars, etc., etc., used in various parts of the world, some of which will interest our readers.

" The most right-royal production in the world in this way is the imperial train of France. It may be that each of the great French companies has a similar train of its own; but at any rate the one which is selected as an example is on the Paris and Orleans line —the highway to Biarritz. It is a veritable train, not merely one carriage in a train. First, after the engine and tender, comes a luggage-carriage—not an uninhabitable van, but a structure which, besides ordinary luggage, contains pantry arrangements for refreshments, and accommodation for some of the company's and imperial servants. Next is a carriage adapted as a dining-room—or at least as a refreshment room—with a center table, arm-chairs, and hinged seats; and when, at night, the seats are drawn away from the wall, they fall back so as to form bedsteads for the attendants. Third in the list stands an open or platform carriage which may be opened or closed at the sides at pleasure, and used either as an open-air-look-out or as a refreshment room. Then comes the grand carriage, the imperial saloon, with a retiring room attached, and doors at the sides and ends. All that luxury can do is here done in the provision of couches, arm-chairs, folding-chairs, movable chairs, small tables and stands, curtains, wire-gauze blinds to exclude dust when the windows are open, a time-piece, pendent lamps, and mirrors. The fifth is a sleeping-carriage, divided off into seven distinct compartments; these comprise a sleeping-chamber or bedroom, two dressing rooms, two rooms for the empress' ladies, one for the emperor's valet, and a retiring room. The sleeping chamber contains two beds, on opposite sides of a compartment nine feet wide. Next to the sanctum of the imperial papa and mamma is a carriage for the Prince Imperial, with numerous snuggeries for sleeping, dressing, and attendants. Lastly, there is a luggage carriage the counterpart of the one at the head of the train. All the carriages have doors at the ends, and platforms which make a convenient gangway from carriage to carriage; and there are electric bells from the imperial saloon to all the other carriages and to the engine-driver and guards.

"The Czar of all the Russias should by rights have everything as grand as the Emperor of the French; but instead of an imperial *train*, he has only an imperial *carriage*. Such a carriage, however—no less than eighty-five feet long! The saloon for the emperor and empress, in the center of the carriage, has all the luxuries which curtains and carpets, sofas and settees, timepieces and chandeliers, can give it; the emperor's study is a little more like a gentleman's own room, while the empress' boudoir is all that a boudoir should be; and beyond that are rooms for attendants—gentlemen next to the emperor's study, ladies next to the empress' boudoir—with all the knick-knackeries and comforts to make a journey go smoothly. As this carriage is made for comparatively short lines of railway near St. Petersburg, there is no provision for sleeping or night-journeys."

Our American sleeping car system comes in for a good deal of well-merited praise, especially mentioning the celebrated sleeping car, Omaha, which cost $28,000, and which "carries luxury to the extent o a small organ in the middle of the chief saloon; whereby a passenger, whether or not he has rings on his fingers or bells on his toes, can at least have music wherever he goes."

From these extremes of northern luxury, the writer plunges us suddenly into East Indian heat, dust, and squalor, introducing us to the two storied cars, which " are in use on the Bombay and Central India Railway; constructed to hold a hundred and twenty passengers each—seventy on the lower story, and fifty on the upper. As nineteen out of every twenty railway passengers in India are third class (they would travel fourth, fifth, or any other class if cheapness could be thereby obtained), these two-storied carriages are crammed with Hindus of all castes (for the Brahmin and the Rajpoot may be poor as well as the Pariah), who squat on their hams as a compact mass of humanity; seeing that some of the carriages, like the third class originally used on our Greenwich line, are without seats. On the western and eastern railways of France (Paris to Brest, and Paris to Strasbourg), two-storied carriages are used on some of the branches, where slow speed would render loftiness possible without danger. Some of these carriages are composite, the lower story having first and second class compartments, and the upper third class; some are third class throughout, the upper having open sides, and the lower closed with windows and glazed panels. These carriages accommodate about eighty passengers each. They are nearly fourteen feet in hight by nine broad, and would therefore be unavailable under low-crowned arches and bridges."

THE TOAD AS AN ENTOMOLOGIST.

[BY A. S. RITCHIE.]

The toad is of a retiring disposition, loving dark corners and shady places. It has a slow, crawling motion, and is of a very timid disposition. Numerous instances might be cited of pet toads, and of their becoming quite tame.

The toad differs in some respects from the nearly related frog. The structure of the mouth is, however nearly the same. The tongue is attached by the root, as it were, to the base and front of the mouth, the tip being reversed and pointing down the throat when the animal is at rest.

The moment it sees an insect its eyes brighten and sparkle, the toes twitch, and quicker than the eye can follow, the tongue is thrown out, the insect transfixed, and withdrawn into the mouth.

Unlike the frog, the toad does not spring after its prey, but remains seated. Having kept frogs in the aquarium, I have noticed that they will spring two or three times their own length from the moss to catch a fly on the glass, using their tongue, as it were, on the jump. They seldom miss their mark. As far as my experience goes, neither of these animals will eat anything without life or motion. I have, however, often deceived a frog by moving a dead fly in the sight of the creature, which it always took readily. Many stories have been told of toads in rocks, and reasons have been given by authors as to the way in which they have become so embedded. My subject has, however, nothing to do with these " old great toads," but to one of our own day and generation. After this digression, I shall now introduce my friend, the toad, in his capacity as a collector of beetles.

The true naturalist, in the pursuit of his study, is a very teachable individual; he never refuses assistance from any one, whatever his station in life is, or however meager his knowledge of the science may be. The many ways he uses the animal creation to advance his knowledge, in the particular branch of study, may be illustrated as follows:

The conchologist wearies for the pleasant days of summer, to take a trip to the sea-side, with his dredges and lines, his bottles and store-boxes, where he adds to his collection many interesting and perhaps new forms of molluscan life.

A trip to the sea-side is not always easily obtained; but the naturalist may be seen in the market buying the several species of flat fish, such as flounders and other species which live and feed at the bottom of the sea. Knowing them to be good collectors, he takes advantage of this fact to procure many and sometimes rare species, and thus adds to his cabinet, without the trouble of dredging for them.

The entomologist, likewise, has recourse to different methods to obtain the object of his interesting study. The following is one of many:

Starting at six o'clock one morning, in the summer of 1864, for a walk to our beautiful mountain, to collect insects, provided with the requisite apparatus, a wide-mouthed bottle, with spirits, for beetles, and a small flat box, lined with cork, for butterflies, etc., my success was particularly good. The first captures were eleven specimens of carrion beetles, comprising three species, viz., *Silpha peltata*, *S. marginales*, and *S. inæqualis*. These were obtained from the body of a dead hawk-owl (*Surnia ulula*). Having secured them in the bottle, and walking leisurely along, I noticed a toad (*Bufo Americanus*) sitting contentedly at the root of a basswood-tree (*Tilia Americana*). Having never made use of my dingy friend as an insect-collector, although aware of his propensity that way, my mind was made up to press him into the service—but how? He must be dead first. As he sat looking at me with his beautiful eyes (for although his appearance is not very prepossessing still those beautiful, bright, yet languid eyes go a great way to improve his appearance), I had certain qualms of conscience about taking life; still it was in the cause of entomology, and for the furtherance of science his life was sacrificed. Now he was dead; how was I to proceed? I had cut up and dissected many insects as well as birds, but to cut up a toad, and before breakfast—" there's the rub"—that gray, warty toad, no beautiful eyes now. One slash of the knife through the skin, another through the walls of the stomach, and the poor creature's breakfast was exposed.

I was a little disappointed at first, as one or two common forms of beetles presented themselves, that might have been obtained without sacrificing the poor animal; still, I reasoned as he had been up nearly, or perhaps all night, collecting, and I had not, he must have taken some species not in my collection. Having scraped the contents of his stomach into my bottle of spirits, I started home, resolved to see what the insects were before breakfast.

I spread them out on a sheet of blotting paper and counted them; the result being thirteen perfect specimens.

I have killed several toads since, with similar results; one, I may mention, had the stomach filled with a species of *Chrysomelidæ, Doryphora trimaculata*, amounting to eleven specimens. He had evidently come across a colony of that insect, and made a hearty breakfast. I may state that this insect was in great abundance, during 1864, on the Island of Montreal. The same may be said of last summer, 1868; taking them by the score on the Mountain, along the river at Hochelaga.

The earlier you go out in the morning the better; before sunrise, if possible, before the process of digestion has gone too far.

Latent Heat of Metals.

The quantity of heat latent in the metals, and which becomes apparent when they are compressed, is admirably illustrated by the faint flash of light which is emitted when a bullet from a steam gun strikes a wrought-iron target. The bullets are completely flattened, and when directed against a plate of lead placed in front of the target, the two surfaces of lead become firmly united as if melted or soldered together. The flash of light is only visible in a darkened room. Another still more striking illustration is seen in the flash of light produced when the 80-lb. hexagonal bolts fired from the Whitworth gun strike the thick iron-plated sides of a floating battery: "Notwithstanding the immense resisting power of the iron plates, the hexagonal bolt passed completely through them. The shot when discovered was found to be so hot that no one could touch it, and was ascertained to have been compressed to the extent of an inch in length. It was noticed that at the instant of concussion between the shot and the vessel, a broad sheet of intensely bright flame was emitted, almost as if a gun had been fired from the vessel in reply."

The same effect has been repeatedly noticed when the balls from the heavy Dahlgren guns of the monitors struck the stone fortifications against which they were directed. The heat, in these cases, was that previously latent in the iron, made sensible by the compression of the metal and the diminution of its specific heat. In like manner, the intense heat which is evolved when iron bars are subjected to the process of rolling, and not unfrequently by the axles of cars and carriages when in rapid motion, and in the processes of boring and planing metals, is due to the same cause. It is the heat previously latent in the metals, evolved and converted into heat of temperature by the diminution of their specific heat in consequence of compression. The heat set free in the simple operation of boring a hole with a gimlet, is sufficient to inflame a friction match. The heat produced by the rapid drawing of a string tightly around the neck of a glass flask, is sufficient to crack it. And in the whale fishery, the heat evolved by the inconceivably rapid motion of the rope over the side of the boat, after the whale is struck, would be sufficient to set it on fire if it were not kept cool by the continual pouring of cold water. In the best constructed steam engines, the bearings of the shafts are made hollow, and a steady stream of cold water caused to circulate through them, in order to prevent them from becoming excessively heated, and the axles from expanding to such a degree as to be incapable of moving. These are illustrations of a general principle. Whenever any body is expanded, heat is absorbed and temperature sinks. Whenever any body is compressed, latent heat is given out and temperature rises. This is true of solids, liquids, and gases. Liquids, if compressed, grow warm; if relieved from compression, they grow cold again. Gases, if compressed, grow hot; if released from compression, temperature declines. So, in like manner, when bodies change from the solid to the liquid or gaseous state, there is an absorption of heat, because of the large amount which is expended in making the change. The difference between the same substance as a solid and as a liquid, is, that in the latter case the particles are so far removed that they can slip readily upon each other. This separation can only by maintained by the addition of a large amount of heat. Consequently, whenever a solid is liquefied there is an immense absorption of heat, and temperature sinks; whenever a liquid is solidified, the reverse takes place and temperature rises. The latent heat, no longer required, becomes sensible. When a liquid is vaporized, heat is absorbed, and temperature sinks. When a vapor is condensed into a liquid latent heat is given out, and temperature rises.—*Pynchon's Chemical Forces.*

What a Man Knows.

What a man can write out clearly, correctly, and briefly, without book or reference of any kind, that he undoubtedly knows, whatever else he may be ignorant of. For knowledge that falls short of that—knowledge that is vague, hazy, indistinct, uncertain—I for one profess no respect at all. And I believe there never was a time or country where the influences of careful training were in that respect more needed. Men live in haste, write in haste—I was going to say think in haste, only that the word thinking is hardly applicable to that large number who, for the most part, purchase their daily allowance of thought ready made. You find ten times more people now than ever before who can string words together with facility, and with a general idea of their meaning, and are ready with a theory of some kind about most matters. All that is very well as far as it goes, but it is one thing to be able to do this and quite another to know how to use words as they should be used, or really to have thought out the subject which you discuss.—*Lord Stanley.*

An Ingenious Method for Drying Vegetable and Animal Substances.

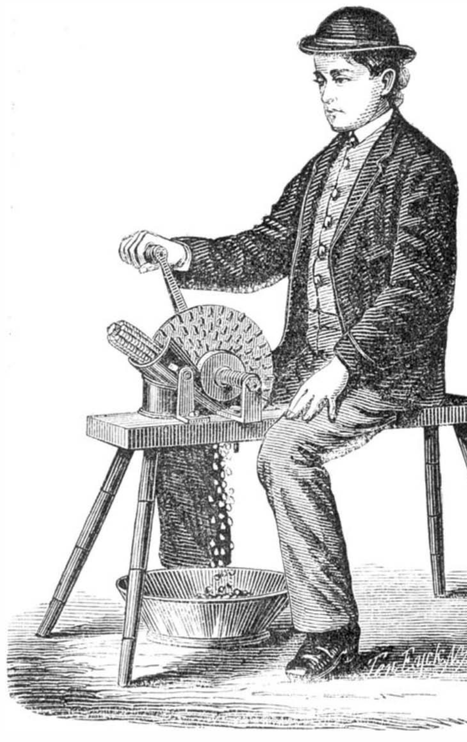
A method recently adopted for drying vegetable and animal substances, consists in filling a vessel half full with fused chloride of calcium, pouring ether upon it, and then placing above it a vessel containing the material to be dried. The vessel is placed upon a glass plate, and over this a bell glass, fitting completely to its surface. The chloride of calcium abstracts the moisture from the ether, which then constantly takes away a new quantity from the substance in the vessel above, until it is quite dry. Articles dried in this manner have quite a different appearance from those from which the moisture is removed by the ordinary process; vegetables retaining their natural color, and animal substances their elasticity and flexibility.

SMITH'S IMPROVED CORN SHELLER.

There are, as our readers are well aware, numerous machines in market for shelling corn, and some of these have justly won a large share of public favor. The corn sheller shown in our engraving has, however, some advantages which we have not met with in other efficient machines, the most prominent of which is its cheapness, the price of single machines being only five dollars. Another great advantage is its simplicity. It has no gearing, and there are no parts liable to get out of order. With these essential qualities of success it combines strength, durability, and efficiency.

Its more important working parts are a toothed revolving shelling disk and a segment of a tube with its concavity facing the shelling disk into which the corn is fed. This tubular segment is forced toward the shelling disk by a coiled spring which surrounds the shaft of the shelling disk, and acts between one of the bearings of that shaft and the segment, which thus forms a kind of adjustable hopper.

The lower part of this hopper is expanded into a drum which surrounds the shaft, and also certain teeth of the shelling disk described below. The coiled spring above described acts against the outside of this drum to press it toward the shelling disk, and from the inner side of the drum projects a tube which surrounds the shaft, and is made of such a length that its end, when pressed up by the spring, reaches the face of the disk, and thus prevents the too near approach of the hopper to the disk.



The shelling disk is armed with teeth, as shown in the engraving, which, engaging with the ear of corn as it is pressed forward by the hopper, tear off the grains from the cob. Between the drum of the hopper and the tube which surrounds the shaft above described, and which gages the approach of the hopper to the disk, are long teeth arranged concentrically with the shaft and parallel to it; and the concave part of the hopper extending down past these teeth enables them to seize the ear and feed it down, thus bringing all parts of the ear under the action of the shelling teeth.

The end of the tube which limits the approach of the hopper to the shelling disk is notched, so that grains of corn may fall through and not interfere with the action of this feature of the device by their lodgment around the shaft.

The whole is attached to a wooden bench in the manner shown, upon which the operator sits, the shelling disk and its attachments being actuated by a winch.

The inventor states that the machine may be advantageously used for shelling green corn, though it will not accomplish the work as fast as it will shell ripe corn.

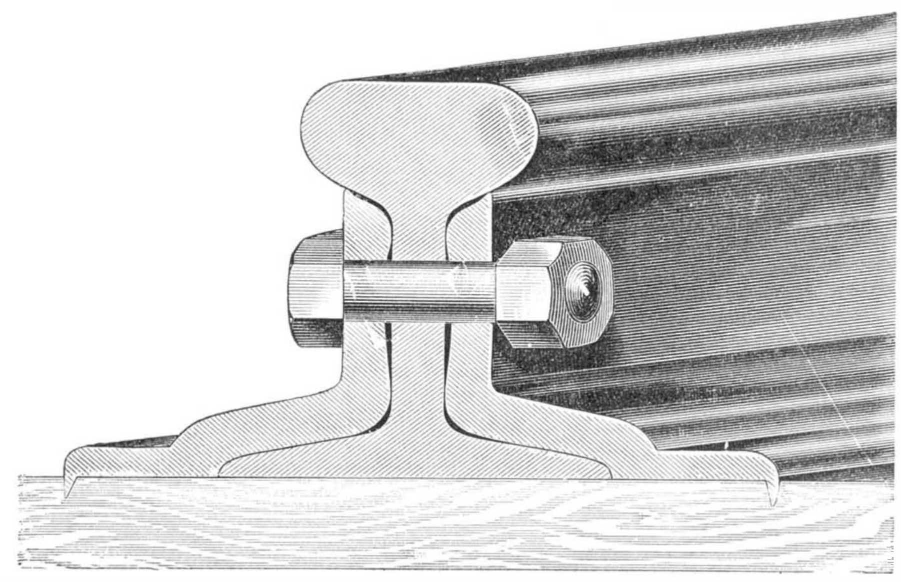
Patented June 22, 1869, by J. P. Smith, whom address at Hummelstown, Pa.

Brazilian Flour.

The *St. Louis Republican* says that, at the request of the Union Merchants' Exchange, E. D. Morgan, Esq., of New York, shipped them two barrels of flour used generally by the higher classes in Rio de Janeiro—one barrel manufactured at Pesth, Hungary, and the other at Trieste, Austria—samples of which were exhibited on 'Change yesterday. The flour is very much like our Minnesota flour in the " feel," being exceedingly high ground, but is much whiter and entirely free from specks. We are indebted to Mr. Frank Feiner, of the Southern Mills, who was formerly a miller in Hungary, for a description of the process of its manufacture. The wheat is first dampened and remains so for twenty-four hours, when it is hulled, then run through a set of burrs that simply crack it; then through a cleaning apparatus where it is cleaned and dusted; then through another set of burrs; then bolted, cleaned again, and back through the same process some fifteen times. During the first four runs there is nothing taken out but the feed and coarse black flour; after that the best flour commences to bolt through. The flour, it is asserted, will keep any length of time in a hot climate, but the process of making it is so slow and so costly, that we have no idea that it will ever be made in this country, and we doubt whether its keeping or breadmaking qualities are any better than our best brands of St. Louis flour. A mill with six run of burrs will only grind about 400 bushels of wheat in twenty-four hours; while in St. Louis, a mill of the same capacity can flour over 2,000 bushels of wheat. The barrels that contain the flour are poor and not near as good in the cooperage as those sent from our mills.

Improved Railway-Rail Splice and Chair.

The use of fish-joints on railways is daily increasing, and there can remain no doubt in the minds of practical men that the employment of even the most costly forms which have been found desirable in all respects except cost, is economy in the long run. The invention we herewith illustrate,



THOMAS J. ADAMS' COMBINED FISH-BAR AND CHAIR.

is, however, a combination of fish-joint and chair, and it is claimed that while it is an excellent and permanent joint, it can be made at scarcely greater cost than ordinary fish-plates, without the chair, and that its use therefore saves a large proportion of the cost of chairs.

The engraving is a section of the joint and rail, where one of the bolts, which hold the fish-plates flush to the sides of the rails, is placed.

There are two of these bolts; one on each side of the point where the rails meet. The upper edges of the plates support the heads of the rails, and their lower parts are formed into outward projecting flanges, as shown, lapping over the base of the rails and extending over and resting upon the sleeper.

The outer edges of the projecting flanges are curved downward and formed into sharp ribs which enter into and engage with the wood of the sleeper, and resist lateral displacement.

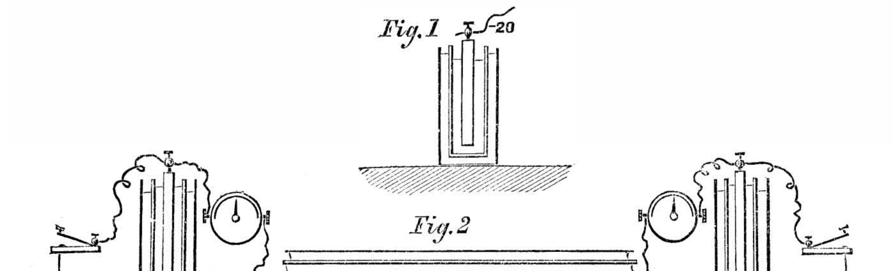
The strain is thus equally divided between the rail, chair, and sleeper, and does not, as in many forms of fish-plate heretofore used, come directly upon the bolts. Thus the nuts on the bolts do not so readily work loose, and when the device is well spiked down to the sleeper, it would seem almost impossible that the joint should not keep tight.

Each plate with its ribbed base can be rolled in one piece, and is therefore strong and reliable.

This invention was patented, through the Scientific American Patent Agency, August 10, 1869, by Thomas J. Adams. Address patentee at Marietta Iron Works, Marietta, Ohio, for further information.

Electrolytic Insulation.

In this system, patented by D. G. Fitzgerald, which is equally applicable to aerial, underground, and submarine lines, no insulating material, properly speaking—that is to



FITZGERALD'S SYSTEM OF ELECTROLYTIC INSULATION.

say, no dielectric—is employed; the lateral passage of the signaling current being prevented by a combination of metallic and electrolytic conductors, so arranged as to generate an electromotive force which opposes the escape to earth of the current. The principle upon which is based this somewhat startling innovation in telegraphy, will be seen on reference to the accompanying diagrams. Fig. 1 represents a battery of two cells. The outer vessel is of lead or copper, the inner vessel of the same metal, covered externally with zinc, and the central element is a cylinder of zinc. The two cells may thus be said to be included in one. Supposing the tensions of the poles of a single couple constructed of similar elements, and excited with dilute acid or a saline solution, to be respectively + 5 and — 5 when the couple is insulated, the tension of the zinc pole of the battery here represented will be — 20 when the outer vessel is in contact with earth. The same will be the case if hemp, slightly impregnated with a good electrolytic conductor, be interposed between the metallic elements in lieu of the ordinary exciting fluid.

It is to be observed that the zinc pole of this arrangement constantly retains its minus charge, although it is directly connected with earth by a series of metallic and electrolytic conductors. In the case of ten cells, similarly arranged, the free negative pole would constantly retain a charge at the tension of — 100; and under no circumstances could electricity at this or a lower minus tension escape to earth by traversing the conductors intervening between earth and the central zinc element. It is evident, therefore, that a series of metallic and electrolytic conductors, disposed as shown in the diagram, is capable of effecting the insulation, or preventing the passage to earth of a negative charge, or of a current from the negative pole of a battery. In order to distinguish this mode of insulation from that which is effected by non-conductors of electricity, Mr. Fitzgerald terms the former " electrolytic insulation," and the latter " dielectric insulation."

The rationale of the construction and working of an electrolytically-insulated telegraph line will be explained by Fig. 2, in which an underground cable, constituting an elongated battery analogous to that which has been above described, is supposed to extend between two signaling stations. The central conductor, both in the cable and the station batteries, will here acquire a negative tension, precisely as in the case of the battery shown in Fig. 1, since the arrangement may be regarded as simply a longitudinal extension of this battery.

Until the signaling key at either station be depressed, no current can traverse the line and influence the receiving instruments; the conductive circuit being otherwise incomplete, or the negative pole of the longitudinally-extended battery insulated from earth. To trace the effect of depressing the key at the right side of the figure, for instance, it is necessary only to consider that this key is in connection on the one hand with the line conductor, that is to say, with the negative pole of the battery on the left side of the figure, and on the other hand with earth, that is to say, with the positive pole of this battery, which is in contact with earth. By working the key at one station, therefore, the circuit of the battery at the other station is completed through the line, instruments, and earth, and signals are thus transmitted to the latter station. The fact that the circuit is completed in the case of the batteries at both stations, does not influence the result; were it otherwise, it would be easy to insulate from earth the positive pole of the battery at the signaling station by the same movement of the key which completes the circuit of the battery at the receiving station.

The electrolytic conductor employed in the construction of the cable, is hemp or other vegetable fiber which has been saturated with a saline solution and subsequently dried, though it still retains sufficient moisture to allow of its generating, by contact with dissimilar metallic surfaces, the electromotive force which opposes and prevents the lateral passage of the signaling current. In overland lines, the electrolytic insulation of the conductor, instead of being continuous, is effected only at the points of support along the line, the dielectric air being, as in the ordinary system of overland construction, the principal insulating medium.

Galvanized Iron Tiles

A new kind of meta roofing has been introduced in France. The covering, instead of being continuous, like corrugated iron, zinc, or lead, is composed of separate tiles formed of galvanized iron, and shaped something like our ordinary pantiles, but susceptible, of course, of various forms, according to convenience or fancy. The tiles are remarkably handy. The metal being thin, they are easily cut to fit a sloping line of roof, corners, etc.; and they are fastened by a single nail of galvanized iron, with which is used a small leaden washer, to render the nail-hole perfectly tight. The advantages of such tiles are numerous. In the first place, they are not affected by fire, like zinc; they do not oxidize, and their dilation and contraction have no effect on the roof. They cost from 3f. to 3f. 25c. per square meter, with 50c. for laying, making in all 3f. 50c. to 3f. 75c., without the scantling. This is about half the cost of a zinc covering. If the new tile presented any tone or picturesqueness, we should recommend them strongly; as it is, we think nothing could be better adapted for roofs out of reach of the eye. Their lightness and durability are invaluable qualities. It is right to add that the new tiles are patented by a company at Montataire.—*London Architect.*

THE EJECTOR CONDENSER.

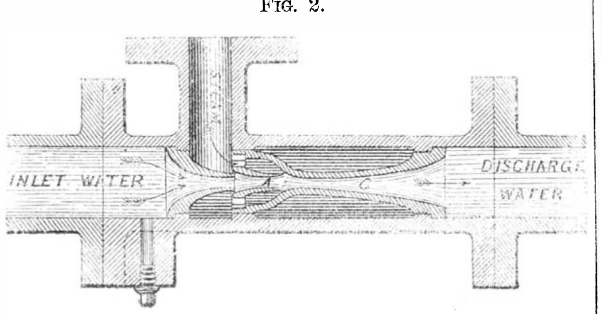
This instrument is the invention of Mr. Alexander Morton, of Glasgow, Scotland. It has been before the public scarcely a twelvemonth, yet in that brief time it has taken rank among the most remarkable improvements in steam engineering of modern times. It is seemingly paradoxical in its operation, and therefore its action is somewhat difficult of comprehension. The principle of its operation is, however, very plainly stated in the following extract from a paper, by James K. Napier, F. R. S., read before the Franklin Institute, Oct. 20th:

"It is well known that the ordinary jet condenser requires a pump to remove the air and the water used in condensation. Mr. Morton, while experimenting on a Giffard's injector, discovered that the pump could be dispensed with; that the exhaust steam itself could do that work, that the steam after forcing its piston to the end of the cylinder had sufficient energy left to take itself, and any air with which it might be combined, out of the cylinder and produce a vacuum equal to that produced by the best condenser and air-pump of the ordinary construction.

"The apparatus which he invented to enable the steam to do this work, he calls an Ejector Condenser. It is very similar in arrangement and mode of action to a Giffard's Injector. The cold water wanted for condensing the steam, if below the apparatus, is raised by a jet of steam in the same manner as in Giffard's or Sellers' Injectors."

As soon as a vacuum is formed in the cylinders of the engine the steam jet is stopped by means of a double piston valve arrangement, which is adjustable as will be shown below. The condensed steam, condensing water, and air are received into a chamber or "hot well," from which the water may be drawn to supply the boiler; the surplus contents of the well being discharged as is shown in the following from the London *Artizan*:

FIG. 2.

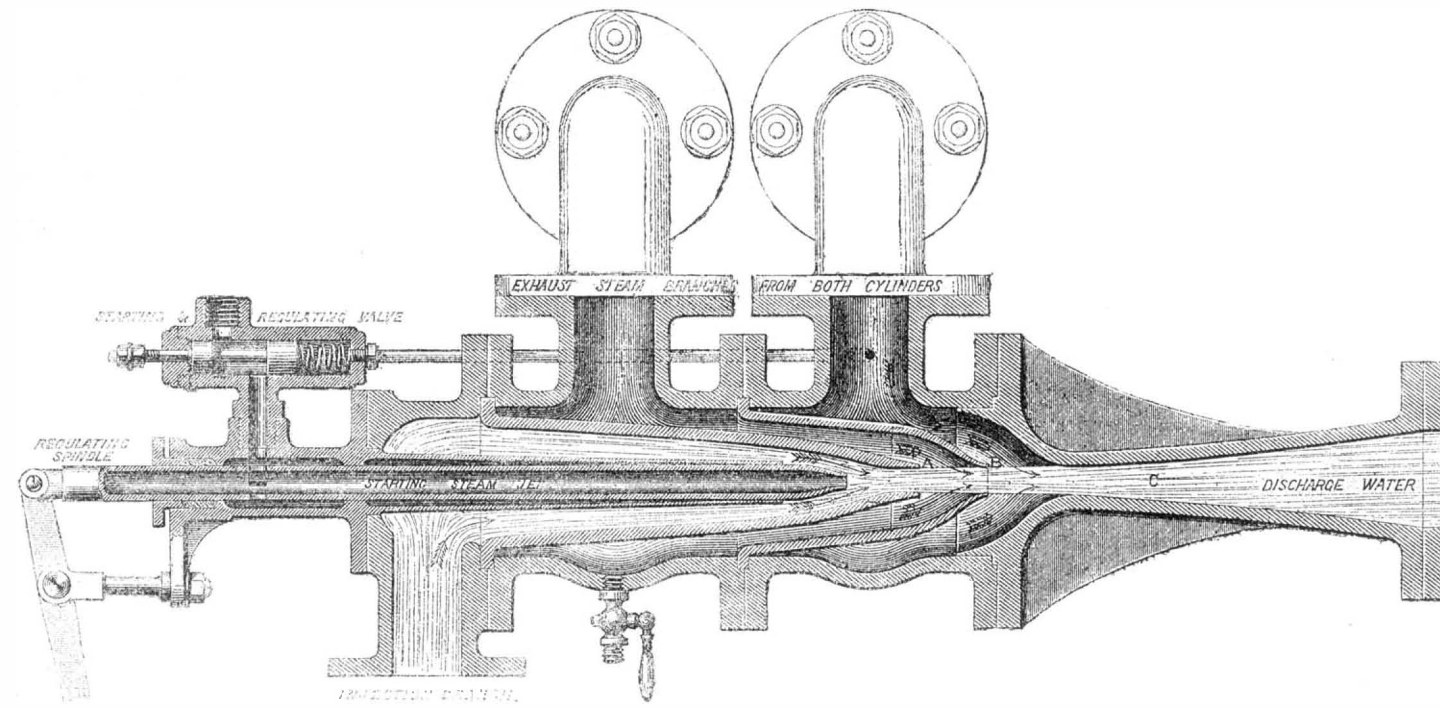


"The large engraving, Fig. 1, is a complete longitudinal section of the condenser, in the act of being started by a small starting and regulating steam jet shown open, but which is closed automatically by the vacuum as soon as that is formed and enabled to draw and discharge its own injection water, the valve being used to restore the vacuum when required. This regulator is considered an important part of the practical application of the apparatus, and has been remarked as such by most engineers who have seen it, although other arrangements for a regulating valve might be made, and equally well worked by the action of the vacuum, for the same purpose.

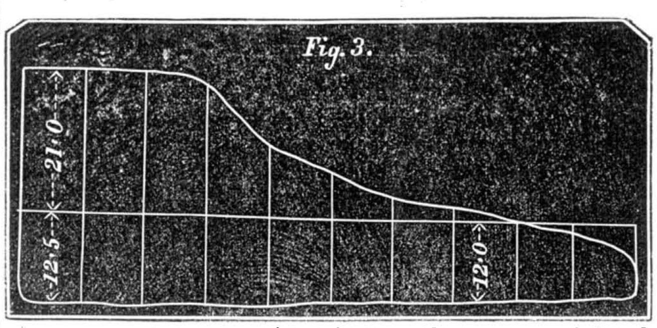
"The exhaust steam, entering from the exhaust steam branches, after surrounding the injection branch passes on to the parts A and B respectively, where it meets the condensing stream of water, and is condensed and carried away through the pipe C. The starting and regulating valve is remarkably ingenious. It consists of a piston valve for regulating the admission of steam from the boiler or main steam pipe into the steam jet, for the purpose of assisting the current of injection water when the vacuum is not so perfect as to effect this in sufficient quantity, unaided. The chamber behind the piston of the regulating valve is connected by a small pipe with one of the exhaust pipes, as shown; so that the vacuum when strong enough shuts the valve against the power of a small helical spring, which is so adjusted as to admit the initial steam the moment the vacuum falls below what is necessary to keep up a sufficient stream of condensing water through the condenser. Thus a jet of fresh steam is instantly supplied when necessary. A small spindle on the piston passes out through the end of the chamber, with a thumb-screw on it, by which the valve may be held open to enable the engines, after standing still, to work with full power and vacuum at any moment, being made self-acting again after the engines are fairly at work. The starting steam jet, conducting the steam to the point of the water nozzle, is formed conoidal at the point, and actuated by a handle to regulate the quantity of injection water allowed to pass through this nozzle. To prevent the injection water condensing the steam in the steam jet, it is surrounded by a hollow casing to prevent the direct metallic contact of the hot and cold surfaces.

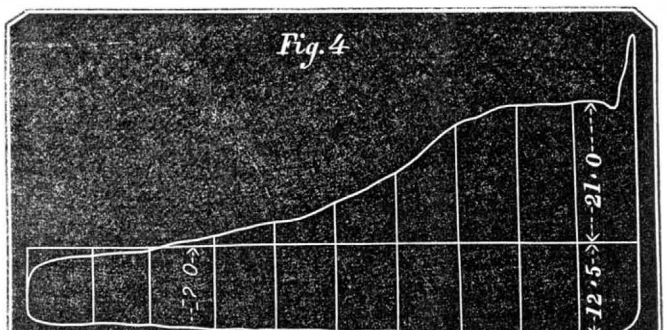
"Fig. 2 is a vertical section of a somewhat similar apparatus, constructed for the lifting and forcing of water. This apparatus is placed in the main range or length of pipes through which the water is to be raised, at any distance above the surface of the water within the limits of the atmospheric pressure. The hight to which the water can be raised in the pipes above it, depends wholly on the velocity of the actuating steam passing through the branch pipe, as shown, and regulated by a valve or cock attached to that branch, so as to act with any desired lateral force through the annular narrow jet around the end of the central nozzle. The water passes up by the inlet water pipe, and is forced or drawn in through the short induction central tube or nozzle by the annular jet of steam, and thence up through the main long curvilineal induction tube, or pipe C; the small induction tube *a*, by preference being cased as shown. The small portion of condensed steam on the outer surface of the tube is forced through the annular slit or jet at its end, into the neck of the induction tube, C, which expands in area in an increasing curve. The lateral branch pipe, made to lead into the main water pipe, close below the nozzle, is only for experimental purposes.

"The action of this new condenser, although very different from that of the ordinary condenser and air pump is even more simple. The injection water in rushing into the condenser through the conoidal nozzle, attains a velocity proportional to the vacuum, and this velocity, which the jet of water retains, is found sufficient to enable it to discharge itself through the induction tube C, which is so formed, that its area increases inversely with the velocity of the issuing jet. As the result of many experiments, the inventor has adopted the parabolic curve shown in the engraving. The jet of water in passing through the 'ejector condenser' no doubt loses some of its energy by friction in the nozzles, but this loss is made up by the alternate discharges of exhaust steam, from the cylinders in the same direction with, and surrounding the water jet. In maneuvering the engines ahead or astern, the piston starting valve is set open, so that the central steam jet maintains a constant vacuum whether the engines be at work or not; consequently they may be stopped for any period of time, and instantly started at full power when required. As soon as the engines are fairly at work, the starting valve is disengaged, and the vacuum, as before described, shuts off the starting steam jet. The vacuum in the condenser then becomes the regulator of that valve; and should any person open a grease cock, or otherwise admit air into either cylinder, or into the condenser, to impair the vacuum, that instant the starting valve opens and admits a jet of steam to dispel such air, and keep up the stream of injection water until the vacuum is restored. The point of the central spindle through which the starting steam jet passes, serves the purpose also of an injection valve, whereby more or less water is admitted by its insertion into, or withdrawal from the water nozzle by the hand lever."



THE MORTON EJECTOR CONDENSER.





The accompanying indicator diagrams were taken from the lower end of each of the two cylinders of a steam engine, having their exhaust pipes connected with the exhaust steam branches of one of their instruments. It will be observed the vacuum is maintained remarkably steadily.

The original form of the nozzles was somewhat different from those shown in the engraving. With the present form no difficulty is experienced in maintaining an average vacuum of 26½ inches of mercury.

Professor Rankine has shown that by the use of this instrument all the power required to work an air-pump is saved. He estimates this saving at four per cent of the indicated power of the engine upon which he experimented.

Reserve Power.

It is not wise to work constantly up to the highest rate of which we are capable. If the engineer on the railroad were to keep the speed of his train up to the highest rate he could attain with his engine it would soon be used up. If a horse is driven at the top of his speed for any length of time he is ruined. It is well enough to try the power occasionally of a horse or an engine, by putting on all the motion they will bear, but not continuously. All machinists construct their machines so that there shall be a reserve force. If the power required is four-horse, then they make a six-horse power. In this case it works easily and lasts long. A man who has strength to do twelve honest hours of labor in twenty-four and no more, should do but nine or ten hours' work. The reserve power keeps the body in good repair. It rounds out the frame to full proportions. It keeps the mind cheerful, hopeful, happy. The person with no reserve force is always incapable of taking on any more responsibility than he already has. A little extra exertion puts him out of breath. He cannot increase his work for an hour without danger of an explosion. Such are generally pale, dyspeptic, bloodless, nervous, irritable, despondent, gloomy—we all pity them. The great source of power in the individual is the blood. It runs the machinery of life, and upon it depends our health and strength.

A mill on a stream where water is scanty can be worked but a portion of the time. So a man with a little good blood can do but little work. The reserve power must be stored up in this fluid. It is an old saying among stock raisers, that "blood tells." It is equally true that blood tells in the sense in which we use the word. If it is only good blood, then the more of it the better. When the reserve power of an individual becomes low it is an indication that a change is necessary, and that it is best to stop expending and go to accumulating, just as the miller does when the water gets low in the pond. Such a course would save many a person from physical bankruptcy.—*Herald of Health.*

DOUBT, discontent, deceit, and debt, are deadly foes to peace of mind.

Correspondence.

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

Origin of the Solar Spots.

MESSRS. EDITORS :—I notice in No. 23, current volume of your journal, the speculations of various persons on the origin and nature of the spots on the surface of the sun. I have also noticed more or less speculation on the subject in different publications for some years past. None of them seems to have resulted in anything reliable or satisfactory. Not being myself fully acquainted with the entire field of scientific research, it is possible that a true and satisfactory explanation of this solar phenomenon may exist; but judging from the hypothetical character of the speculations offered, and the spirit of inquiry that is yet abroad in the matter, and seemingly unsatisfied, especially among more learned men by far than I am, I am led to believe that a true solution of the problem has not yet been found. Having long noticed and meditated on the various theories presented, I am led to offer the following unscientific (it may be) yet to me, plausible theory on the topic, which I have maintained ever since I became acquainted with the "nebular theory" of the creation, and which may—and seems to me must—explain the above phenomenon. My theory is certainly in perfect harmony in its principles with the nebular theory of Laplace, now generally accepted as the most plausible; and though it may not be scientifically written, its force will not be impaired in consequence. The theory I have entertained, and do now, is as follows:

According to the nebular theory the sun is what is left of the raw material out of which all the other planets were formed. Allowing that the process of creation is still going on, it is reasonable to presume that the method is the same. It follows then that as the surface of the sun becomes cooled, it contracts, and as it contracts, it becomes condensed, also rendered more opaque, thus obstructing more or less, according to the extent of such condensation, the fierce flames and light which emanate from such an intensely heated body as the sun is known to be. You will doubtless ask, if the surface of the sun on becoming more opaque, obstructs the flow of heat and light from the sun to the earth, why, as the cooling and contracting of the sun's surface would probably be uniform on its entire surface, is not the phenomenon of such cooling and condensation uniform also? Because the surface of the sun must necessarily be constantly subject to violent commotion and upheavings of volcanic character, and should a uniform crust be formed, it could not remain intact long, but being burst asunder by the central fires and gases, this opaque matter would be thrown aside, and large vents would be created for the escape of these gases. But being thrown aside it is not lost for the purpose in view, but must still continue large additions of opaque matter consequent upon the further cooling of the sun; this matter once cooled must remain so, and increase, and the now very large vents must gradually diminish in size, until the condensed matter has so accumulated that its superincumbent weight could not be supported by the central gases, then it would break off and a new planet be formed; or, in case it did not so break off, the sun would gradually cool down, and in so doing the opaque or solid matter would constantly increase, and the vents constantly diminish, and in time would present the same appearance as that of our earth, allowing for the loss of the influence of a sun shining upon it. The proportionate size of its vents or volcanoes, would some day, far in the future, be about the same as that of the earth at the present time.

Granting that this cooling process will ever continue—and the nebular theory is founded on this process—the sun will eventually become as cold as the earth is now, though owing to its size it must consume a longer period in doing so. That another planet will at some future time be born of the sun, is more probable than that it will cool down in one large mass. The probability consists in the fact that the sun is so much larger than any of the other planets already born of the sun, that there is plenty of material in the sun for several more planets of large size, and there would still be enough left to give the new born planets and the old ones light and heat.

In case another planet should break off from the sun, it might possibly affect the earth less than the formation of subsequent ones. Undoubtedly the spots on the sun will continue to increase, and their effect will be felt on our earth until a new planet is formed, then the light and heat from the central and remaining portion will pass out into space unobstructed, until other accumulations of condensed matter obstruct it again. It is fair to presume that for a limited period our earth would be warmer and lighter after the formation of a new planet, than just before. The unobstructed heat and light from the sun, together with that from the new and uncooled planet, which would probably be nearer to us than the sun, would materially add to the heat received on the surface of the earth. How long it will be before another planet is formed (if more are to be created from the sun) is of course uncertain. Scientific men are better able to note the increase in size and opaqueness of the spots on the sun than I am, but could the intervals between the formation of other planets by the nebular process be found, the time that must elapse before another will come forth could be ascertained with tolerable certainty. These intervals are subjects worthy of inquiry among scientific men.

But, in case the sun cools down without parting with any more of its material, it is evident, as before mentioned, that the light and heat from it will continue to decrease, that the condensed matter will continue to increase, covering more and more of the sun's surface; at the same time being continually tossed and upheaved by the forces within, until sufficient is accumulated to partially resist the expansion of these forces. They will, however, find vent in the weakest point. Constant cooling will increase and strengthen the strong points, and they will gradually encroach on the vents; the central fires of the sun gradually narrowing down at the same time the central forces growing weaker, their vents, in time will become similar to the vents, or volcanoes, of our earth, though all on a larger scale, perhaps. Should the sun retain all its material, and its two antagonistic forces—heat and cold—continue to war with each other, and could we be near enough to see, what a picture of grandeur, what a scene of magnificence would the struggle present, until one of the mighty warriors should succumb to the more mighty strength of the other, till one shall gradually lose its strength, and the sun's light become fainter and fainter; its warmth and vigor gradually diminishing until its former mighty influence upon others of the universe is no longer felt.

However erroneous these views may seem, or may be, they are more plausible than some I have seen published in your journal, and in various other publications, in regard to the spots on the sun. As this is an age of persistent inquiry and investigation, every theory, however extravagant, or vague, may stimulate inquiry until a correct solution of the problem is obtained.

I submit the foregoing theory, and though, perhaps, containing scientific errors, yet the principles on which it is based, and with which it harmonizes, are just as plausible as any embraced in the famous nebular theory itself, so generally accepted. C. A. HOPPIN.

Worcester, Mass.

Ventilate your Sewers---A Cheap Deodorizer.

MESSRS. EDITORS :—I was much interested reading an article in your paper of 27th November, headed "Ventilate your Sewers." One such article may be of more direct benefit to a family than all the pages of general news published in a thousand daily papers.

It is a serious question of direct application. Are the majority of low fevers and putrid diseases in cities and villages owing to, or caused by gases arising from sewers, drains, and out-houses? My family physician has traveled through many foreign cities, and his experience corresponds with the article you copied from the *New York Medical Journal*. When called to attend a family suffering from any lingering or periodical disease, he at once examines all the waste pipes leading to sewers or vaults, and almost universally finds a local cause, and orders it at once remedied, and so checks the spread of the disease. There is scarcely a family that would not be directly benefited and made happy by the use of a cheap deodorizing material. Most of the articles used are too expensive or have an unpleasant smell of themselves. Caustic lime or chlorine has a too active effect, liberating a gas that irritates the lining membranes of the throat and nose, which perhaps are already partially diseased, and the immediate effect is catarrh, asthma, etc.

The present ventilation of sewers is only through the pipes and imperfect traps under, and leading up into our houses, poisoning the inmates. The pipe ventilators separate from the house, and delivering the gas above the houses, would at least reduce the poison and obviate its worst effects.

I would suggest that no waste but water be allowed to enter the sewers. In France a clay marl is used for deodorizing the waste matter, and one quart each day answers for an ordinary family. The clay marl can be had near to most of our cities. Here it can be put on to New York Central or New York & Erie cars at five dollars for the tun or 2,000 lbs. It is composed of about equal parts of alumnia, silica, and calcareous powder. Pure clay is too plastic, and requires mechanical mixing, while the marl readily dissolves and combines with any acid matter or gas until the whole is converted into a fine mold and valuable fertilizer. Our present out-houses are nuisances most of the time, and can be kept free from all smell at one half the price paid for cleaning, and even made a source of revenue. I have tried the clay marl, and find it answers the purpose perfectly. The moment it is touched by acid matter it begins to fry or effervesce until every particle is used, and by its own nature of affinity, bringing every particle of clay in contact with the matter to be deodorized. Stone, or pure lime, or sand marls would not act by their own chemical and mechanical arrangement.

Buffalo, N. Y. O. COBB.

Shooting Fish Under Water and Flattening the Bullets.

MESSRS. EDITORS :—Some months ago myself and a companion were out sporting when we accidentally discovered a school of fish at the bottom of the flume, at the outlet of a pond. The number of fish in the school was about forty, and they lay as close together as they possibly could on the bottom of the flume at a depth of just eighteen inches below the surface of the water. We had no fishing tackle with us, and we much desired to capture this prize. Myself and companion had with us each a fine sporting rifle, and we were not strangers to the use of the weapon. We had, many times before, killed fish by shooting them under water, but not at so great a depth.

At length we concluded to try the effect of our rifles, and, having first secured the passage of the stream below so that the fish could not escape, we commenced operations by discharging our pieces directly at the center of the finny tribe. We fired shot after shot, until more than thirty shots had been fired, and, in the mean time, we had only disabled two or three fish, and none of these was struck by bullets. We shot at these fish, sometimes at an angle with the surface of the water, and sometimes directly downward.

We were disappointed and laid down our arms and waded into the stream. With the aid of our hands and some skillful engineering, we caught nearly all the fish. It now occurred to me that we had used quite too heavy charges of powder to kill fish at so great a depth under water, and on looking carefully into the water, I discovered several of our bullets lying on the bottom of the flume. I again entered the water and gathered up six of them, and, to my surprise, I found them all flattened out by striking the surface of the water, very similar to what they would have been had they been shot directly against a rock.

The balls we used were elongated ones, with flat points. These balls were flattened the instant they struck the surface of the water. The points of them were upset and driven back toward the butt, and spread out until they were twice the diameter of the butt, and very much resembled a low-crowned hat; while the butt of the ball remained in perfect shape. We now loaded our rifles with just one half the usual charge of powder, and killed the two remaining fish at a depth of twenty-two inches under water, by making two shots at each fish, and one of the fish received a ball directly through him. The next day I went again to the place and killed several more fish, and some of them at a depth of more than two feet under water.

I afterwards made a number of experiments by shooting at a target that was placed at the bottom of a large watering tub, eighteen inches under water, and found the average penetration of the balls, in a pine target, to be one half an inch. I also tried round balls, under the same circumstances, and found the penetrations in the target nearly as great, while, at the same time, they went more truly.

The quantity of powder used in these experiments was just sixteen grains, which was just one half of the usual quantity used for common sporting purposes. The bore of the rifles used was just 130.

The reason that 16 grains of powder would cause the deepest penetration in water was, that this quantity was the greatest that could be used without upsetting the point of the ball. I also found that this same quantity of powder for a charge, when shot in the air, only caused a penetration of two and one half inches in a pine target. I also found, in shooting at a target, under water, at an angle of 45° with the surface of the water, that, in order to strike the mark, I was obliged to aim under the mark (apparently) at least one inch for every six inches that the mark was below the surface. This was to compensate for the refraction of the rays of light as they left the surface of the water.

I will here remark, that when a fish, or other object, is seen in the water, it is always at a far greater depth than it appears, and, oftentimes, nearly double that amount; hence, the great difficulty of aiming correctly at a fish in the water. Yet, with a little practice, a rifleman can kill fish, quite often, at a depth of from one to two feet under water. It is not necessary that the fish should be struck by the bullets, for if the ball should pass close by the fish, the violent agitation of the water, caused by the ball, instantly stuns and renders the fish insensible, and it immediately turns over on its back.

I send you two samples of bullets, which were shot with full charges of powder. One of these bullets was shot at an angle of about 45° with the surface of the water, and the other was shot directly downward. You will instantly perceive which is which. Every bullet, shot with full charges of powder, was found flattened at precisely the same angle that the bullet touched the surface of the water; hence, it is plain, that this flattening of the bullets all takes place at the surface, and before they enter the water at all.

Jaffrey, N. H. JOHN S. DUTTON.

Letters from Inventors.

MESSRS. MUNN & Co., *Gentlemen*:—I have received my patent, dated Nov. 9, 1869, and I am highly pleased with the way in which the business has been done. The ability which carried it through and the scrupulous care bestowed on its preparation are worthy of praise, and I will gladly intrust to your hands any further business I may have to do.

I remain, very truly yours, SAMUEL BONSER.

Dover, N. H., Nov. 15, 1869.

Gentlemen:—I have just received my patent, and I am very much pleased with your promptitude in securing it. I can assure you that any of my friends who contemplate taking out patents—if I have any influence—will take them out through your Agency. Respectfully yours,

Middletown, Ind., Nov. 23, 1869. J. RICE.

Gentlemen:—I have just arrived home after being absent for some time. Permit me to express my gratification in being so fortunate as to obtain your professional services in securing my patent. For the prompt and highly satisfactory manner in which you have conducted my business at the Patent Office, please accept my thanks. I cannot too highly commend your mode of doing business to any one who may need your services. Yours very truly,

DAVID P. STEWART.

Spruce Creek, Pa., Nov. 27, 1869.

Gentlemen:—The letters patent on my animal trap are received. You will please accept my thanks for the prompt, gentlemanly, and satisfactory manner in which the business has been accomplished through your Agency. I have examined the claims thoroughly, and could not add or take away a single word to make them better.

Very respectfully yours,

C. G. FRUSHOUR.

Lagro, Ind., Oct. 29, 1869.

For the Scientific American.

THE MANATEE: THE HUMAN FISH.

[BY I. CANTINI.]

To believers in the Darwin theory it will be of interest to know that in the quiet bays and rivers on the eastern coast of Central and South America there lives an animal, which might be rightfully considered as the connecting link between men and fish. It is the manatee, the water siren, the sea-calf, or sea-cow, as this strange animal is sometimes called. It belongs to the order of the Cetacea, and is altogether herbivorous; living on grass which grows under water, or on herbs which it seeks on shore.

The body is pisciform, and measures some fourteen or more feet in length; the skin being very thick, without hair, and of a dark color. The upper part of the body, especially of the females, much resembles that of a woman, the breasts being of the same form. In place of the fins of the ordinary fish, the manatee has a short arm of only one joint, which terminates in a sort of hand, on which the nails are distinctly visible, and which the animal uses with much dexterity, in moving about when on land, and in carrying its young. This limb has caused this animal to be called manatee, from the Latin word "*manus*" the hand.

The writer, who for several years resided in those countries where these animals abound, has seen the animal, and has been told repeatedly by the natives, that the female holds her cub to suckle as the mother does her babe.

The tail of the manatee is shaped like an open fan, and the close observer will perceive ten divisions, which mark the ten toes.

Manatees swim by the help of this broad tail, which moves up and down, and not from right to left like that of the fish. This limb, which at first sight appears to be a mere fin or nerve, melts almost entirely into butter when fried in a pan, and is highly prized by the natives for ointments and for other medicinal purposes.

The animal weighs from a thousand to fifteen hundred pounds, and the meat is considered a great relish. It looks and tastes much like pork, and needs a good deal of cooking. It is a strange fact that the flesh keeps longer from decay than any other, and it is therefore salted and preserved like pork.

They are caught with harpoons by the Indians, who know their haunts and customs, and it seems as if they were becoming more scarce every year.

Much has been fabled about these water sirens, that needs corroboration from scientific men, who seem to have taken but little interest in these strange animals. Some have assured me that their voice resembles the bellowing of an ox, others that it was perfect music. I am induced to believe the latter, as they are well known under the name of "sirenia," or "sirens," which appellative they could only derive from their charming voice. Whether this be so or not, remains yet to be confirmed, like the harmonious song of the dying swan.

HOW TRAINS ARE MOVED BY TELEGRAPHIC SIGNALS.

From the Evening Post.

The importance of the telegraph in connection with railways, was recognized many years ago; but the first practical application of telegraphic signals in moving trains was made on the Erie line in 1850. Previous to that time, locomotive engineers and conductors were distrustful, and there are several instances on record of their positive refusal to obey telegraphic orders, especially when their trains were directed to proceed beyond stations, to meet and pass trains going in opposite directions, except in cases where such orders were plainly expressed in printed orders upon their regular timetables. In 1850, however, when the Erie road had but a single track between Piermont and Elmira, it was plainly demonstrated to the superintendent (the late Charles Minot) that the telegraph would be a great assistance to the road, and it became plainly evident that the telegraphic service must eventually be adopted upon all main trunk lines.

When the first telegraphic message was sent over the Erie wires a train filled with western bound passengers was lying at Turner's Station, awaiting the arrival of an eastern-bound train, which, by the time-table, should meet and pass at that point; but owing to an accident two hundred miles west, it could not possibly arrive until five or six hours later. Mr. Minot was a passenger upon the train lying at Turner's. He immediately decided to test the accuracy of the telegraph, and make a beginning of the plan of ordering trains to proceed to points further in advance, and not further delay the stationary train when the track was known to be clear as far as Port Jervis, a distance of one hundred and fifty miles further west. Orders were accordingly sent over the wire to the station agent at Port Jervis to hold all easterly-bound trains until the arrival of the western train. This order was given in order to make all safe, and prevent a collision in case the former should arrive at Port Jervis before the latter. An answer was immediately given by the station agent, announcing that he fully understood the order and would do as directed. All appeared safe, and the engineer was ordered to start west; but, to the astonishment of Mr. Minot, he positively refused to move the train from Turner's upon any such arrangement. Mr. Minot immediately mounted the locomotive, pulled out the throttle valve and ran the train himself, assisted by the fireman, and reached Port Jervis according to programme.

The ice was broken, and since that time the telegraph has been acknowledged as a positive necessity on all long railroad lines in this country. The form of giving the necessary directions, however, has been somewhat changed; and now the conductors and engineers of each train who receive telegraphic directions are telegraphed the name of the particular point at which they are to meet, and answers are required from them to ascertain whether they understood orders, before any movement is made.

The following is the form of message required to be sent and received:

By telegraph from —— station to conductor and engineer: You will run to —— station regardless of train number ——. 31. —— Dispatches.

The numeral abbreviation means "How do you understand?"

The answer to this dispatch must read as follows:

32. (I understand I am to) run to —— station regardless of train number ——. —— Engineer.
—— Conductor.

Upon receiving the announcement from the receiving operator that all is right, the trains are started without further orders.

All special orders for the movements of trains are required to be communicated in writing, and extraordinary precautions are taken against the possibility of misunderstanding directions. Not more than one person on a division at the same time has power to issue train orders. The telegraph operator is required to read the messages aloud, in the hearing of the conductor and engineer addressed. Trains when in motion must approach stopping places in the supposition that another train is there to be met. Whenever a passenger train receives orders to meet and pass a freight train at a specific station, the conductor must not leave the depot until notice is received from the conductor that his train is safe upon the side track, out of the way.

No orders are given to move a slow train in the same direction, on the time, and ahead of a faster train, unless it has started—if a passenger train—at least ten minutes; and if freight, not less than twenty-five minutes in advance of the time the faster train may be reasonably expected to arrive at the station from which the slow train is first started. In cases where a slow train is moved by telegraph the following form of order is given to the conductor of said train:

To —— Conductor and —— Engineer:

You will run ahead of train No. —, to —— station, conditioned as follows: Should you from any cause be unable to make *your running time*, you must as soon as you discover such to be the case leave your flagman to warn the following train in advance of which you are running, and report your arrival at the next telegraph station, 31.

In case of an accident where orders cannot be obtained by telegraph, the station agent has power to stop trains. The speed of live-stock and freight trains is restricted to eighteen miles an hour; and extra freight trains, commonly called "wild cats," which have no time upon the regular table, are not permitted to attain a higher rate of speed than fifteen. Coal trains' time average twelve miles an hour. The latter cars being very light, cannot be kept upon the track at a high rate of speed.

Many of these orders and forms were original with Col. D. C. McCullum, formerly superintendent of the Erie road, and during the late war were in general use while he was military superintendent of all the railroads in the United States. Vast armies were moved in this way in a very successful manner.

A chronometer in the principal depot is the standard time of the road, and the time is telegraphed to all stations at precisely twelve o'clock each day. Fresh engines and men are attached to all through trains at the end of each division.

The salaries of division superintendents average $5,000 a year; conductors and engineers, $100 a month; of baggage masters, $75 a month; brakemen, $1·75 a day; telegraphers, from $60 to $125 a month; station agents, from $500 to $2,000 a year.

The Hartford Steam Boiler Inspection and Insurance Company.

This Company makes the following report of inspections for the month of October:

During the month 540 visits of inspection have been made; 817 boilers examined, 715 externally and 156 internally; while 73 have been tested by hydrostatic pressure. The number of defects in all discovered are 280, of which 23 are regarded as especially dangerous. These defects in detail are as follows: Furnaces out of shape, 11; fractures in all, 19—3 dangerous.

One of our inspectors remarks as follows on fractures which he discovered: In the fracture marked dangerous, a rip seam occurred 36 inches long, which I attribute to three causes; first, defect in plate at rivet seam; second, blowing water out of boiler while hot; and third, bridge wall too high, allowing fire to concentrate too much at one point.

The blowing out of boilers while hot, and especially filling up directly with cold water, are not unfrequently attended serious consequences. The unequal contraction strains joints, loosens tubes and flues, preparing the way for leaks, which, in time, are the occasion of no little trouble and danger. Another inspector finds the upper tube sheet of an upright boiler badly fractured, and the boiler generally so badly strained as to be unfit for use, and hardly worth repairing.

Burned plates, 18—2 dangerous; new crown sheets were necessary; blistered plates, 43—1 dangerous. A blister was found on a crown sheet some two feet long and four inches wide, taking away nearly half the thickness of plate. Blisters are occasioned by a want of homogeneity in the iron. From various causes sheets become laminated in rolling, and the surface over the fire receiving the greatest heat, expands most, and bulges down. Sometimes these blisters are three, four, and even six-leaved. All such defects should be carefully examined, and the blisters trimmed off by an expert. If the portion of the plate remaining is sound, and the plate has been effected but little, it may not be dangerous; if, however, the plate is considerably reduced in thickness, it should be repaired at once.

Cases of internal corrosion and grooving, 6; external corrosion, 22—4 dangerous; incrustation and scale, 55—3 dangerous; water gages out of order, 22—1 dangerous. While water gages are very convenient boiler appliances, they should not be depended on to the exclusion of *gage cocks*. The first thing an engineer should do in the morning is to try his gage cocks, then proceed to unbank and start up his fires. Blow apparatus out of order, 3—1 dangerous; safety valves overloaded and inoperative, 29—5 dangerous; five of these were in such bad condition that they had to be taken entirely off, and the valve "backed out" with a bar fitted for that purpose. We have frequently referred to the neglect of safety valves. They should be raised carefully every day to see that they are in good working order. Pressure gages out of order, 52, varying from 12 to +20; improper staying, 3—all dangerous; boilers condemned as unsafe and beyond repair, 1.

The Doom of the Maories.

"As the Pakeha fly has driven out the Maori fly;
As the Pakeha grass has killed the Maori grass;
As the Pakeha rat has slain the Maori rat;
As the Pakeha clover has starved the Maori fern
So will the Pakeha destroy the Maori."

These mournful words of a well-known Maori song, are considered both by the Maories themselves, and by the Pakehas, or European settlers, as prophetic of the fate to which the native race of New Zealand is doomed. We trust the prophecy will fail in its fulfillment. We are well aware that in giving expression to our hope in regard to this matter, we are running counter to the ideas entertained by the majority of men at the present day—a majority composed of the thinking and the unthinking alike. Even intelligent travelers, like Mr. Wentworth Dilke, regard the fulfillment of the prophecy as certain. "Nature's work in New Zealand," he says, "is not the same as that which she is quickly doing in North America, in Tasmania, in Queensland. It is not merely that a hunting and fighting people is being replaced by an agricultural and pastoral people, and must farm or die. The Maori does farm; Maori chiefs own villages, build houses which they let to European settlers. We have here Maori sheep-farmers, Maori ship owners, Maori mechanics, Maori soldiers, Maori rough-riders, Maori sailors, and even Maori traders. There is nothing which the average Englishman can do which the average Maori cannot be taught to do as cheaply and as well. Nevertheless the race dies out. The Indian dies because he cannot farm; the Maori farms and dies." As a mere matter of fact, destruction has no doubt gone on to such an extent as to threaten extinction; but is the utter extinction, therefore, inevitable; if so, is it the result of a divine law, and how is it such a result? That is the question we ask.

Now, as it must surely be admitted that the extinction of any race involves a wrong, we are compelled to inquire if there be no remedy applicable before the process of wrong has reached its consummation? The ruin of races which have perished aforetime, has been owing to the unrestricted operation of what, in Bible language, is called the law of sin; in the language of civic life, vice and crime; in the language of economists, self interest; and in that of our modern *savans*, the law of natural selection and struggle for existence. Grant full swing to the operation of any or all of these principles of human nature or laws of human action, and the Pakeha will, as a matter of course, crush his Maori brother, just as the strong beats the weak all the world over, and as the strong have done through all ages since the day of Cain. But is there no other force than that of the strong, no other principle than that of self interest, no other law than that of a mere selfish struggle for existence? Is it in vain that Christianity has proclaimed a higher law of fraternity between man and man, rich and poor, between race and race, a law of justice or respect for equal rights, and above all a law of philanthropy or kindness towards the weak, the helpless, and the erring? Talk as they will of the lower races of humanity dying out by operation of a natural law, it would be a more scientific way of putting it to say that their destruction, whenever it does occur within the reach of Christian civilization, is owing to the violation, by a professedly Christian people, of the laws of Christian ethics. In a word, the superior race on coming in contact with the inferior, has repudiated not only fraternity and kindness, but common justice.—*Illustrated Australian News.*

A PRIZE FOR EVERYBODY.

Improved Railway.

The object of this invention is to enable cars to be run with safety at great speed, to give sure warning of their approach to a station, and to permit the ready ascension of steep grades.

Our readers are well aware that the smooth traction wheel, though answering admirably for such ordinary grades as are employed on railways, fail when applied to the ascension of very steep grades, examples of which are found in the Mount Washington railway in New Hampshire, and Fell's railway over Mont Cenis, in Switzerland. They are also aware that the danger of running off the track increases with the speed of the train; any slight obstruction or unevenness in the track under such circumstances causing the wheels to bound, as it were, vertically.

For the ascension of steep grades many devices have been employed, among which may be mentioned a central toothed rail with horizontal wheels gearing into both sides. This device necessitates considerable complication in the construction of the locomotive, which it is desirable to avoid.

The plan shown in our engraving, while it does not require much variation from the form of locomotive employed at present, so that the wheels may be used as ordinary smooth traction wheels on level or slightly ascending grades, provides for additional tractive power when steep grades are reached.

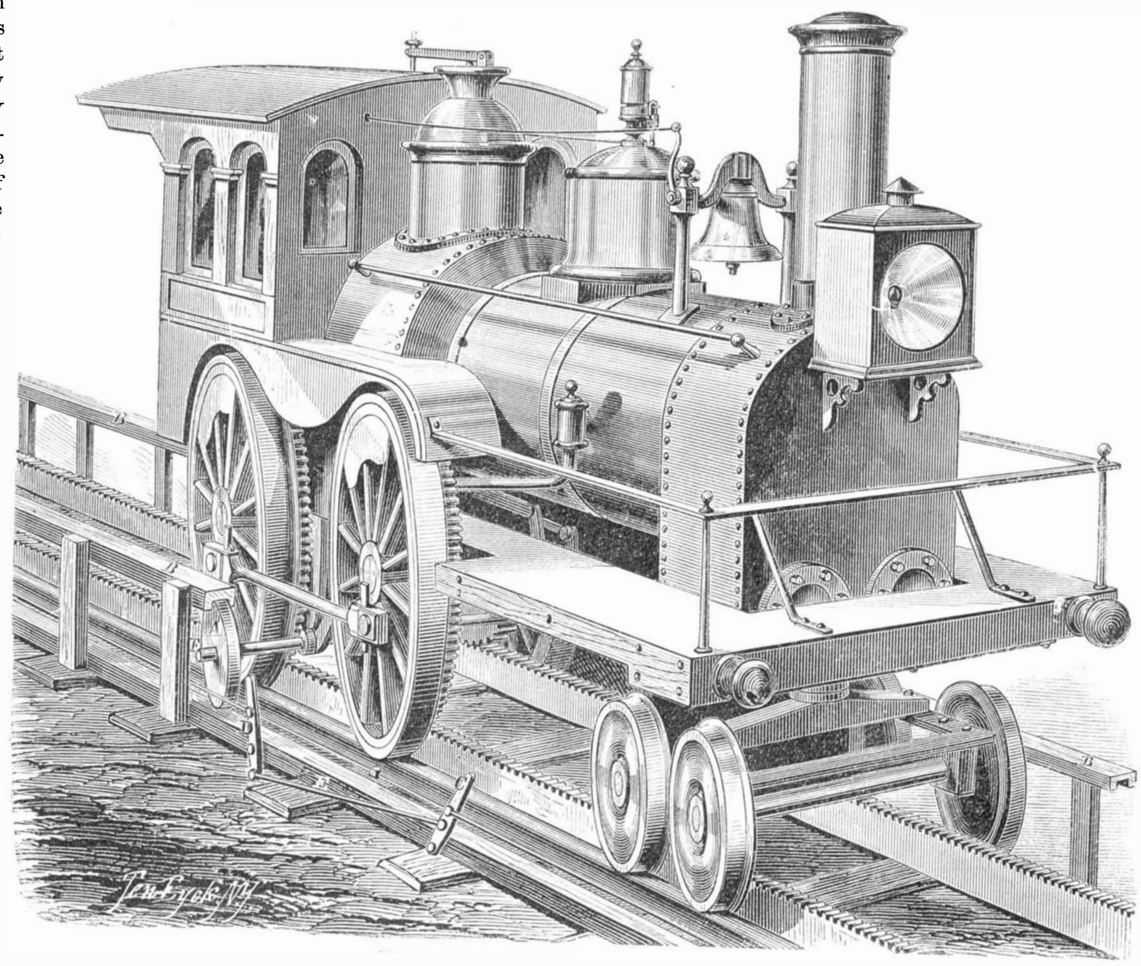
The first object desired to be attained in this form of construction, is to secure safety at high speed. To this end the locomotive is provided with extra wheels, A, attached to a shaft connected with the engine in the manner shown, or in any other suitable and convenient manner; which wheels run along the grooved under side of elevated rails, B, connected with and supported from the sleepers just outside the principal rail upon which the locomotive runs. Cars are provided with wheels attached to and playing upon the ends of the axles, to which the ordinary wheels are attached.

At stations and other places where these rails are not required, they may be interrupted; the entrances to their grooves being made flaring to insure the easy entrance of the wheels, A.

The adaptation of locomotive and track to the ascent of heavy grades is accomplished by placing toothed rails on the inner sides of the ordinary rails at such grades, into which toothed wheels fixed to the axles of the driving wheels, and on the inner sides of the driving wheels, mesh and prevent slipping which would otherwise occur. On exceedingly steep grades, where even the toothed wheels would otherwise be liable to slip from the teeth of the rails, the elevated rails above described hold them to their work.

To give warning of the approach of a train to a station, wires running parallel to the track and extending a mile or more from the depot, but interrupted at intervals and connected with systems of levers, C D, are employed; the end of the wire at the station being connected with a bell. The levers are pivoted to a support placed along the side of the track and are joined by a connecting rod, E, in such a manner that when the projecting end of the axle, F, strikes the one more remote from the station, D, it draws the one at C nearer to the station, into a vertical position which in its turn is depressed; and thus a reciprocating movement is imparted to the wire, and through it to the bell at the station, which is thus sounded. The length of time through which the bell will ring, depends, of course, upon the number of the pairs of levers, and the frequency of its strokes upon their proximity to each other.

A patent on this improvement was obtained through the Scientific American Patent Agency, October 5, 1869, by David Harrison, of Fayette, Mississippi, the inventor of the railway supply apparatus illustrated and described in our last issue.



HARRISON'S PATENT RAILWAY.

Improvement in Velocipedes.

In the ordinary method of applying the power of the feet to the propulsion of velocipedes, each foot has to pass through the arc of a semi-revolution of its respective crank beneath the center of the shaft, during which time it can exert no propulsive force upon the vehicle, while a large proportion of muscular force is required to carry the leg through this arc.

If this motion could be utilized in propulsion, it is clear there would be a great gain. This cannot be done, however, with the ordinary crank, and with a loop over the foot so that the force of the flexor muscles could be applied to the crank, there would be but a slight gain, as these muscles are very weak in comparison to the extensors. The loop is, however, inadmissible for several reasons.

The invention we herewith illustrate is a novel and unique method of applying the power of the foot to a crank motion, and might perhaps be called a radially-expanding and contracting crank motion. It has for its object the application of the extensor muscles of the leg, with the advantage of a long leverage, while the circumferential motion of the foot and crank wrist is not increased.

The method employed to secure this result is ingenious and will be admired for the simple manner in which the required motion is attained.

LEWIS' IMPROVED VELOCIPEDE.

A grooved circle is attached to the standard, as shown in the engraving, eccentric to the action of the wheel, and strengthened by lateral braces. The arm of the crank passes through a hole in the end of the axle, but is not fastened to it. In the groove of this circle plays a small friction roller attached to the crank behind the foot-piece, which causes the crank to slide through the hole in the axle to and from the center during each revolution; its nearest approach to the center being during the time it passes under the center.

Thus a greater leverage is obtained for the forward thrust of the foot, and as the grooved circle can be made of the same size as the circle described by the common velocipede crank, the motion of the leg is no greater than before. But the leg during the forward thrust is more extended and a more advantageous application of the muscular power can be made than when the leg is more flexed.

The inventor claims that the increased ease with which a velocipede can be propelled with this attachment, will be found a great aid in ascending grades, and will greatly mitigate the fatigue of velocipede travel on ordinary roads.

The inventor of this ingenious device is Mr. Edward A. Lewis, of St. Charles, Mo., to whom was granted a patent for it, through the Scientific American Patent Agency, October 26, 1869.

The Foot Lathe.

The foot lathe—the terms hand and foot lathe are synonymous—is generally used, at the present time, by small machinists, manufacturers of gas fixtures, amateurs, etc.; men who do not work a lathe constantly, but are called to braze or solder, or, perhaps, to fit some detail with a file. For these uses the foot lathe is one of the cheapest of tools; for the same person that does the work furnishes the power also, so that a man working on a foot, or hand lathe, as it is often called, ought to have first-class wages. Moreover, a first-rate foot lathe turner is always a good mechanic, for it takes no small degree of dexterity to perform the several jobs with ease and dispatch and certainty. To always get hold of the right tool, to use the same properly, so that it will last a reasonable time without being ground or tempered, to rough-turn hollow places with a square edge, to chase a true thread to the right size every time, without making a drunken one, or a slanting one, to make a true thread inside of an oil cup or a box—all these several tasks require good judgment, dexterity, and a steady hand. Of course, where a slide-rest is used, the case is different. We allude, specially, to a cutting tool managed by the hand.

To do all these things, however, it is necessary to have tools, and good ones, or none. It is an old saying, that a bad workman quarrels with his tools, but a good workman has a right to quarrel with bad tools if he is furnished with them through chance or design. It is impossible to execute good work with a dull tool, one badly shaped or unsuited to the purpose, and, therefore, it is important to set out right at the beginning.

There is no tool more efficient in the hands of a good workman, than the diamond point. For roughing off a piece of metal, for squaring up the end, for facing a piece held in the chuck, for running out a curve, or rounding up a globe, it is equally well adapted. It may be truly called the turner's friend.—*Watson's Manual of the Hand Lathe.*

A Valuable Cement.

A correspondent, J. M. Benthall, finds the following recipe good. He says: "I have used the compound of glycerin, oxide of lead, and red lead, for mending a large cast-iron kettle that had been fractured across the bottom by allowing water to freeze in it, with the happiest results. It takes some little time to dry, but turns almost as hard as stone, and is fire and water-proof. For mending cracks in stone or cast-iron ware, where iron filings cannot be had, I think, it is invaluable.

"My method was as follows: Take litharge and red lead, equal parts, mix thoroughly and make into a paste with concentrated glycerin to the consistency of soft putty, fill the crack and smear a thin layer on both sides of the casting so as completely cover the fracture. This layer can be rubbed off if necessary when nearly dry by an old knife or chisel."

"If this will be of any service to the readers of your valuable paper they are welcome to my experience."

DURING the gale, on the night of the 19th ult., the water rose in the Niagara River at the rate of two feet per hour till the gale reached its hight. The new suspension bridge was severely tried. Some of the guys were broken, and the structure swayed two and fro like a reed, and it was regarded by many as certainly doomed to immediate destruction. It was closed against the public, but if it had not been no one would have ventured upon it while the gale lasted.

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VOL. XXI., No. 25...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, DECEMBER 18, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

The next number will terminate the present volume, and with it will expire several thousand subscriptions. We have never had the intention to force our journal upon any one who does not wish it, or who does not feel it to be money well laid out; hence we apply, in all cases, the strict business rule of discontinuing the paper when the term paid for runs out. This we think is the best plan.

Our subscribers don't want to be dunned to pay up, and we do not wish to undertake a duty so unpleasant as to dun them.

We believe that the SCIENTIFIC AMERICAN has been worth during the past year, more than it has cost any one of its subscribers—indeed, it is almost a wonder to ourselves how we have been able to give a weekly journal of the size and quality, at so low a price. We are anxious to increase our circulation, and we know that thousands more would be glad to take it, if some one would but invite their attention to it. No other journal has had better friends in this respect than the SCIENTIFIC AMERICAN. We feel grateful for all the solid interest which has been shown to us in this respect, and we propose with the new year to reward our friends for making an extra effort, with cash prizes, and an elegant work of art as a premium for clubs. Read the announcement on another page, and be kind enough to let us hear from you on the subject. Successful competitors for the prizes will be sure to get their money when pay-day arrives.

A REMEDY FOR STRIKES.

We have often thought that most of the difficulties between employers and employés resulting in strikes and consequent distress to workmen and their families, with embarrassment as well as loss to the employers, might be adjusted by some system of arbitration, in which both parties should be ably and equally represented, and the result of which should be regarded as binding upon each. The difficulty has been to suggest a feasible plan for such a system, as it is always easier to point out faults than to suggest remedies for them. We have therefore been, and doubtless our readers will be, interested in an account of two different systems now in very satisfactory operation in England. Both these systems are based upon the principle of direct and equal representation of all the masters and workmen of the particular trade for which boards of arbitration are formed. In one system both masters and workmen choose their own mode of conducting elections. In the other, elections are conducted according to prescribed rules.

In one system the president is an independent umpire, whose decisions are final upon all points upon which the board is equally divided; in the other he is a member of the board, but has the casting vote in case of a tie.

The London *Mining Journal*, to which we are indebted for the particulars of these organizations, states that "another difference in practice between the two systems, is, that in the first the board meets at fixed periods, whether any dispute has arisen or not; and under the last it only meets to settle some dispute then pending. A third difference is, that on the Wolverhampton plan the board forms a code of trade rules, which are to be taken to be the foundation of the contract of service in the particular trade for a given district; while on the Nottingham system the trade rules are not incorporated with, and do not form part of, the constitution of the arbitration system. As to these three heads of difference, it is found, as the result of a now very extensive experience, that the best parts of each of the two systems are generally combined. In reference to the first, an independent umpire is usually preferred. The system of regular meetings is undoubtedly best. In fact, where meetings have been held at fixed periods it has been found that differences of opinion are reconciled, and disputes prevented, before any warmth of feeling is excited between the contending parties. Upon the third point the difference is rather in form than substance. Where workmen pass frequently from one locality to another it is found expedient to have written codes of trade rules, but where the whole trade is grouped in and about one center, then by a tacit understanding certain regulations are accepted as binding, without being formally declared to be so by the arbitration board."

In one system all compliance with the action of the board on the part of individuals is voluntary; in the other the submissions to the decisions are considered as absolutely binding upon individuals.

Many such boards of arbitration, organized in accordance with one or the other of these systems, have been established in England, and have proved admirably adapted to the amicable settlement of trade disputes.

The question as to whether such boards will be able to permanently settle the relations of labor and capital, need not, we think, be raised at this time. It would certainly seem that a long step is taken toward such a settlement, when labor and capital can thus meet on common ground, acknowledging a community of interest, and by equal representation tacitly admit equal rights for both.

We should rejoice to see the plan of arbitration tried in America, as we believe it to be, even if considered in the light of an experiment, one which tends to bring labor on to a higher plane, and which, by the promotion of free discussion of labor topics, must inevitably result in the enlightenment of both labor and capital.

CAUSES AND PREVENTION OF FIRES.---THE METROPOLITAN FIRE DEPARTMENT.

The president of the Metropolitan Fire Department, Gen. Shaler, has recently written a letter on the causes and prevention of fires. The season for the employment of all kinds of heating apparatus, and also for the increased use of lighting materials has commenced, and as the careless use of such apparatus and materials is, perhaps, the most fruitful cause of fires, we deem it important to aid in giving currency to the opinions and valuable suggestions of Gen. Shaler.

The most frequent cause of fires is considered to be the use of inferior kerosene oil. Gen. Shaler thinks no law can be enacted to reach personal carelessness in the use of this material, but suggests that those who sell it ought to be taught that "honesty is the best policy," by the infliction of severe penalties for the sale of any article of the kind which will vaporize below 100 degrees, Fahrenheit. To this suggestion every right-minded citizen who is acquainted with the subject, will say Amen!

Gen. Shaler regards the present law, regulating the sale of such oils, as defective, and urges the passage of such laws by the incoming Legislature, as shall render the use of inflammable fluids comparatively safe.

He mentions as another frequent cause of fires "gas burners, unprotected by globes or shades, in close proximity to window curtains. It is not uncommon to see a side burner in workshops, and even in large warehouses, where the surroundings are light woodwork, without a guard or protection of any kind."

With regard to means for extinguishing fires, he says, "The Commissioners are continually devising means by which fires may be reached at the earliest possible moment. The use of a portable fire extinguisher, carried by one man, for catching fires in their inception, was long since adopted; and it is now under contemplation to multiply them throughout the city, wherever convenient and desirable locations can be found. The introduction of a new and perfect fire alarm telegraph, with alarm boxes located not more than two or three blocks apart, and accessible to citizens as well as policemen and firemen on street patrol, thereby securing the earliest possible notice of a fire, is quite certain to contribute greatly to the successful working of the Department. The establishment of a complete system of street patrols by firemen, having for its object the discovery and extinguishment of fires, was one of the earliest means adopted to reduce the losses by fire.

"The heavy steam fire engines formerly used by the Department have been replaced by lighter ones. The horses have no difficulty in drawing these through the streets as fast as it is safe for them to travel. And as for the time consumed in hitching up, preparing to leave the houses, making connections to the hydrant after reaching the vicinity of the fire, stretching in and starting the water, under the present system of instruction, it is so incredibly short that the movements must be witnessed to be appreciated. Certain it is that no apparatus on wheels and worked by hand, however light and portable, such as are used by Captain Shaw, in the London Fire Brigade, can get an effective stream of water on a fire in less time."

The water is kept hot in the boilers and a run of a few blocks suffices to get up a working steam pressure. The facility and rapidity with which engines are started out is so great that Gen. Shaler avers he has witnessed the hitching up of a team, preparatory to leaving, inside of fifteen seconds, and it is not uncommon for a company to perform all preliminary work and issue from its quarters in thirty seconds from the first sounding of an alarm. He says even "at night, when all but the patrols are in bed asleep, a company, favorably situated, that occupies more than a minute after receiving the alarm in leaving quarters, would be ashamed to acknowledge it."

We feel sure that any one who has witnessed the prompt, rapid, and skillful evolutions of the members of the Metropolitan Fire Department in case of fire, will be willing to admit that a more efficient organization does not probably exist. The proof is, that except under rare and extraordinary circumstances, a fire is never permitted to reach beyond the building in which it originates, and in a large number of cases it is checked before extensive damage accrues. And this is done without noise and bluster, and in the best manner to obviate unnecessary damage by flooding.

THE ASSERTED SUPERIORITY OF THE RIGHT HAND.

Our article on the Education of the Hand, published on page 297, current volume, has called forth some criticism from those who seem to be ready to believe anything, provided it is printed in a book. We have been asked to remember a very absurd argument in Bell's Bridgewater Treatise, going to prove that there is a natural cause for the common preference of the right hand for ordinary purposes.

This argument is based upon the fact, that the left side of the body is generally weaker than the right, both in regard to muscular strength and in its vital or constitutional qualities.

We do not deny this fact, with reference to adults, and it is to adult opera dancers, and the measurement of adults by tailors and shoemakers that the author in question refers for his illustrations of the comparative weakness of the left side. We differ from him, however, in regarding this weakness as an *effect*, not a cause, of the greater use of the right limbs.

There are, however, some statements made in this connection by the same author, which we dissent from. We admit, that "in walking behind a person we seldom see an equalized motion of the body," but we deny, that if we look at the left foot, we shall find that the tread is less firm upon it than upon the right, in the majority of cases. We are confident that the right foot will be found by the careful observer to "toe in" as often as the left foot, and will shuffle quite as often. We deny that these defects are "more apparent in women than in men, because the elasticity of the female step depends more upon the ankle than the haunches." And we most emphatically deny, that "no boy hops on his left foot unless he be left handed." These assertions are not supported by facts, as we have observed them, and we do not believe any candid person will find himself convinced of their truth by observation.

The other argument used by this author to prove a natural superiority in the right side is scarcely less absurd than the one we have stated. What does the adaptation of implements to the use of the right hand prove, other than that because we have, by education and habit, acquired a preference for that hand, and increased power to use it deftly, we like to use it better, and, therefore, require our tools to be constructed in accordance with our *acquired preference?* We educate those who naturally prefer to use the left hand in spite of the tendency to unconsciously imitate those who surround them—we educate, we say, such children to use the right hand. Who believes that, if the attempt were made we could not educate all children to prefer the left hand? And how would the tools be made then? And which side would be the weaker then? Had it been the custom to educate children thus, so illogical a reasoner as Bell would have employed the same line of argument to prove the superiority of the left side. Think of a learned writer trying to prove that God has made man a lop-sided, unsymmetrical being, and this for a wise and obvious purpose.

Starting with the effort to prove an all-wise design in all things, as they exist, it is no wonder a man like Bell drew erroneous conclusions. He would, had he written upon the subject, have shown that the general want of power in the human race to move the muscles of the external ear was, also, the result of benevolent prevision, though "the obvious purpose" has proved a puzzle to anatomists.

The truth is that no reason for the peculiarity can be found in the anatomy of the human form, nor in the characteristics of the human mind, as will be amply demonstrated if physical educators ever turn their attention to the subject; but even were it found to be natural, it could be viewed in no other light than a defect, which it is expedient to remove, not a blessing bestowed upon man for a wise purpose, as Bell would have us believe.

THE SUEZ CANAL.

The accomplishment of this greatest engineering work of ancient or modern times, has taught important lessons to both hemispheres. It has shown that capital and skill together are all-powerful in subjugating natural obstacles to commerce. It has taught the Western hemisphere that a similar opening must be cut somewhere in the neck of land which connects North and South America, and the lesson must be heeded. It has given to the world important inventions, which will greatly aid in the performance of any similar work hereafter; and has more than all demonstrated the fact, that climate can be controlled by human agency, so that arid deserts may be literally made to "blossom like the rose." The whole work has been performed within ten years from its commencement, an instance of rapid work, unparalleled, except in the history of the Pacific Railroad. These works have helped to enforce the truth that the greatest rapidity in the excution of such enterprises, consistent with thorough ness, is the most economical way to prosecute them. But the Suez Canal has had obstacles to overcome that the Pacific Railroad did not encounter. It struggled with diplomatic troubles till 1864, had its laborers scattered by cholera in 1865, and in 1867 found itself at the bottom of its purse, and at its wit's end to obtain a loan of 100,000,000 francs, necessary to complete the work. The indomitable courage and perseverance of M. Lesseps, his skillful financial management, which at this juncture saved the enterprise, are they not written? The grand celebration which inaugurated the work has passed into history. It must not be long ere the completion of a similar work shall be celebrated on this continent.

THE SPANISH GUNBOATS.

The Spanish gunboats, thirty in number, recently seized by the United States Government, are perhaps an instance of the most rapid naval construction on record. As anything pertaining to these vessels is now a matter of current interest, and will be of historical importance in the future, we have visited the Delamater Iron Works, at the foot of Thirteenth street, North River, this city, where the fleet is at present lying, and have gained the following particulars.

The contract was entered into May 5th, and the first keel was not laid until the 19th of the month; yet on the 23d of June the first vessel was launched, and by the 3rd of September the last of the thirty was floated.

They are all built after one design, prepared by Capt. Ericsson, of monitor fame. They are twin screw steamers, 105 feet in length, 22 feet beam, and their depth of hold is 8 feet. Their maximum draft is, we are informed, to be 5 feet. The screws are 5 feet 10 inches in diameter, and are each driven by two steam cylinders, the length of stroke being 14 inches, and the diameter of the pistons 15 inches.

The arrangement of the steam machinery is the most compact we have ever seen, the whole, including pumps, surface condenser, fresh water generator, etc., resting on a surface of ten feet square and rising from this surface only six feet. The nominal horse-power of the engines in each boat is 140. They were set up in the works, and placed bodily on board the gunboats in the following manner: A model of the bed plate of the machinery was made of wood, this was taken into the vessel through the boiler hatch, and lined properly, when it was taken out, and the engines were in turn let down, hauled aft by steam, and fastened down. So expeditious was this process, that on a single afternoon, between one and six o'clock, the machinery was placed in three boats.

There are other peculiarities of the engines which it might be interesting to notice, but we must pass to other features of these in some respects unique war vessels.

The lines are made full at the bow, in order to support a heavy bow-gun. This gun is to be an improved 100-pound parrott rifle, mounted upon Capt. Ericsson's new gun carriage. This carriage and the arrangement of the engines above described, are novel and striking features of these boats.

The rigging is of wire, and the masts and smoke-pipe are given more rake than usual. A peculiarly light and graceful appearance is thus imparted.

A preliminary trial of the gunboat first finished was made in September, and the official trial took place Oct. 25th. The results of both these trials were very satisfactory. The ground selected for the official trial was from Fourteenth street to One Hundred and Twenty-Ninth street, on the Hudson River, a distance of 5·81 statute miles. The run up the river against the tide occupied 32 minutes and 35 seconds, and the return trip was made in 29 minutes and 35 seconds. Total distance, 11·62 miles. Total time, 62 minutes, 10 seconds. Considering the small size and full lines of these gunboats, the speed attained is considered remarkable. The vessel was loaded with pig iron during the trial, to her intended maximum draft.

The execution of so large a contract in so brief a time by a single establishment, is a marvel of rapid work, but when it is remembered that the inside finish is much more elaborate than that usually given to boats of this class, and that the contract included the entire outfit of the fleet, it must be considered as almost an unparalleled achievement in its way.

THE RIGHTS OF THE GOVERNMENT AND PATENTEES.

Charles W. S. Heaton and William H. Webb, recently brought suit, in the United States Circuit Court, against George W. Quintard, and others of this city, for an infringement of Heaton's patent, of April 14, 1863, for a system of defensive armor for marine and land batteries.

Such system is described in the specification of the patent as consisting of iron armor plates, laid in the usual way against the longitudinal or outer timbers of a vessel, such timbers being such as to form a sufficient backing to rigidly support the armor plates, and of an outer layer of timber covering the armor plates, and only bolted on sufficiently to hold it to its place, and of a plate or thin sheath on the outer surface of the timber.

The Government ordered the contractors, Quintard & Co., to apply substantially this arrangement of armor to the *Onondaga*, whereupon the owners of the patent brought suit to recover damages.

Judge Blatchford dismissed the bill on the ground that the defendants were acting under the order of the Government in what they did, and were but agents of the Government.

In the course of the proceedings before Judge Blatchford, it appeared that the defendants subsequently bought back the vessel from the Government, and it remains now to be determined how far such after purchase protected them in the use of the Heaton armor plate. If the Government has a reserved right to make and use a patented invention, then it is clear that the defendants had such right also. That question was not, however, involved in this suit, which was commenced before the later purchase took place.

The Judge cites an English case, decided in 1865 (which, by the way, also arose out of a patent for armoring vessels), in which it was held that the Crown had the right to use any article, notwithstanding its being patented. It is quite clear, that if the Government is not called upon to deal with a patentee, as having a sole right to his invention, such patents as this will be, in connection with Government work, of no advantage to the inventor.

The idea of such an assumption on the part of our Government as against the rights of a patentee, is simple monstrous. In time of war the Government possesses the right to seize any man's property, on the plea of public safety, by paying for it; but in times of peace no such right exists, and we do not believe that our federal courts will sanction any such outrage of the rights of a patentee.

MEN OF PROGRESS:—CELEBRATED AMERICAN INVENTORS.

A sketch of the lives of the celebrated men whose portraits, engraved in Sartain's best style, after the original painting by Schussele, are offered this year among our subscription prizes, will be read with interest by all our readers.

Their inventions, and the wonderful energy with which they prosecuted their labors against discouragements and trials of no ordinary character, stamp them as men of superior genius; and we defy the world to produce the same number of men whose countenances give more unmistakable marks of intellectual strength than these.

The artist has chosen to represent the group as surrounding a table on which rests a Morse telegraph instrument, which is a subject of animated discussion among those immediately surrounding the stand, to which those standing a short distance away are listening with absorbed attention. At the extreme left stands Mr.

JAMES BOGARDUS.

This prolific inventor was born in Catskill, New York, March 14, 1800. He was a descendant of Dominee Bogardus, one of the early settlers, and engaged in farming. At the age of fourteen, James was apprenticed to a watchmaker, and subsequently became a skillful workman. By close application he became a good die sinker and engraver. Desiring to see something of the world, in 1820 he went to Savannah, Ga., and there worked at engraving. He afterward returned to New York, engaged in watchmaking, and invented a three-wheeled chronometer clock, for which he received the highest premium at the first Fair held by the American Institute. One of these clocks has been in good running order for more than thirty years without needing cleaning. In 1828 he invented the ring flyer for cotton spinning, now in general use. In 1829 he invented the eccentric mills, which differ from all other mills; the grinding-stones or plates running the same way with nearly equal speed, but eccentric to each other. In 1832 he invented and patented a dry gas meter; this received the gold medal from the American Institute. He also invented a machine for transferring bank note plates for Messrs. Rawdon, Wright, and Co., which invention is in universal use for that purpose. In 1836 he invented an improved dry gas meter, overcoming difficulties which had appeared in the meter patented in 1832, and this meter has been extensively used. In September, 1836, he visited England, and, in competition with English and French engravers, made a machine that excelled all others in engraving the head of Ariadne in relief, and which would also from the same medal twist the face in a variety of comic shapes. This same machine engraved a portrait of the Queen, Sir Robert Peel, and others. While in England he contracted with a company in London to build a machine for transferring bank note plates and other work, and also a machine for engine-turning, which machine was to copy engine-engraving. A reward being offered in England for the best plan of carrying out the penny post system, Mr. Bogardus' plan was adopted over 2,600 applicants, and is now universally used. Returning to New York in 1840, he invented machines for pressing glass tumblers, etc., now in common use, and also a machine for cutting india-rubber into fine threads. He also made improvements in drilling machines, and important improvements in the eccentric mills, adapting them to almost every purpose. In 1847 he put into execution his long cherished ideas of iron buildings; constructing a large factory in New York city entirely of iron, five stories high, ninety feet long, and the first cast-iron building in the world. Since then iron buildings have been erected in nearly all the principal cities of the United States and elsewhere. This invention formed a new branch of business for mechanics, benefited nearly every foundery in the country, and gave an immense impetus to the manufacture of iron.

The likeness of Mr. Bogardus given in our prize engraving admirably portrays the peculiar reflective cast of countenance characteristic of great inventors.

In the middle background, listening to the discourse of Professor Morse, but as though he was familiar with its details, not looking directly at the apparatus, stands

JOSEPH SAXTON,

who was born in Huntingdon, Pennsylvania, in the year 1799. His early educational advantages were slight. At thirteen years of age he was apprenticed to a watch and clock maker, John McKennon, who died in about a year after. Mr. Saxton continued the business till 1818; when he went to Philadelphia and worked at his business for a short time. He next worked for M. W. Baldwin and Co., at machinery. In 1823 he worked again at watchmaking, and invented the machine for giving the epicycloidal form to the teeth of wheels. In 1825 he made an astronomical clock for Mr. J. Gamery, of Burlington; in which was an improved escapement and tubular compensation pendulum rod. For adjusting the compensation rod he invented the reflecting pyrometer and comparater. This was applied to the State House clock in Philadelphia. In 1829 he went to London, remaining there until 1837, and inventing the magneto-electric machine, and was there associated with Wheatstone in experiments for measuring the velocity of electricity. On his return to Philadelphia he was employed at the United States Mint, where he improved the medal ruling machine, and with it engraved the plates for a book on coins published by the assayers. He afterward went to Washington, and took charge of the making of standards for adjusting the weights, measures, balances, etc., used in the United States Custom Houses. He also invented a self-registry tide-gage, a deep sea thermometer, a break circuit, and clock register used in astronomical observations, a dividing machine for dividing the scale on standard yards, and an hydraulic printing press with flexible platen. He also made other useful inventions, in connection with the Coast Survey Office at Washington.

Bending over the table, and pointing to a portion of the instrument stands the form of

PETER COOPER,

whose fine, benevolent countenance reflects his character. He was born in the city of New York, Feb. 12, 1791. His father was a lieutenant in the war of the Revolution, after the close of which he established a hat manufactory, in which his youthful son Peter aided to the extent of his strength. During his youth, his father's undertakings being attended with little success, Peter had to work very hard. He attended school only half of each day for more than a year, and beyond the humble knowledge thus gained, his acquisitions are all his own. At the age of seventeen he was placed with John Woodward, to learn coachmaking, and served out his apprenticeship so much to the satisfaction of his master, that he offered to set him up in business, which Mr. Cooper declined. He successfully followed his trade; and subsequently the manufacture of patent machines for shearing cloth, which were in great demand during the war of 1812; the manufacture of cabinet ware, the grocery business in the city of New York, and finally engaged in the manufacture of glue and isinglass, which he has carried on for more than thirty years. Mr. Cooper's attention was early called to the great resources of this country for the manufacture of iron, and in 1830 he erected extensive works at Canton, near Baltimore. He erected subsequently a rolling and wire mill in the city of New York, in which he first successfully applied anthracite to the puddling of iron. In 1845, he removed the machinery to Trenton, N. J., and erected the largest rolling mill then in the United States, for the purpose of manufacturing railroad iron, and at which, subsequently, he was the first to roll wrought iron beams for fire-proof buildings. While in Baltimore, Mr. Cooper built after his own designs the first locomotive engine that was turned out on this continent, and it was operated successfully on the Baltimore and Ohio Railroad, thus identifying his name with the early history of railroads. Having taken great interest also in the extension of the electric telegraph, he was chosen President of the New York, Newfoundland, and London Telegraph Company. Mr. Cooper was one of the earliest and most persistent advocates of the present free school system, but finding that no common school system could supply a technological education, he determined to establish in his native city an institution in which the working classes could secure that instruction for which he, when young and ambitious, sought in vain. Accordingly, the "Union for the Advancement of Science and Art," commonly called the Cooper Institute, was erected in New York city; which building covers an entire block, and cost over $500,000. This celebrated institution and its objects are familiar to our readers.

As an inventor, Mr. Cooper is not generally known to the American public. Nevertheless, he possesses inventive talent of a high order. A recent summary of his inventions, published in the New York *Herald*, states that among his very earliest inventions was a self-rocking cradle. After he was married, and a cradle became one of the necessities of his household appointments, they were too poor to keep a servant, and the result was that he was called upon to rock the cradle with inconvenient frequency. He therefore invented a self-rocking cradle, and not only that but a fan attachment to fan the infant and keep off the flies, and last, and not least, important of all, a diminutive calliopean arrangement to soothe with its sweet harmonies the infant to repose. He took out a patent for this and sold it to a Yankee.

One of his inventions was to demonstrate the loss of power by use of a crank in rotary motion. Ten years ago, through the medium of an endless chain three miles in length, and on the same principle now in extended use in England and France, he conveyed iron ore to one of his furnaces over rough and impassable gorges. When a boy at home he ripped up an old shoe and, discovering how it was made, soon made lasts and shoes for the family. He made a machine for grinding plate glass of any size to a perfect plane. During his apprenticeship he made a machine for making hubs of carriages similar to those now in use. Another of his inventions is a cylindrical machine for puddling iron and for reducing ore and pig metal to wrought iron, an invention somebody else has just brought out in England, and is making a fortune from. Twenty-two years ago he filed a caveat and specifications for this invention. There is, in fact, scarcely any end to his inventions. He also—as long ago as when an apprentice—invented a process of utilizing condensed air as a propelling power. At one of these experiments at Fulton ferry—that is, where Fulton ferry is now—the great Fulton who made the first steamboat was present, and expressed himself highly pleased with the result. Fifty-seven years ago he made a model of a mowing machine, embracing the principle of mowing machines now in use.

It was largely owing to his perseverance, and readiness to risk his fortune that oceanic telegraphy was successfully introduced. His is, as it deserves to be, one of the most prominent figures in this group of noble men.

JORDAN L. MOTT

was born in New York in 1798. His ancestors came to America in 1636, and filled very important positions in the government of the colony. Mr. Mott in his youth was in too delicate health to permit of close application to business, and as, fortunately, his means were too ample to necessitate his selecting any avocation, he was brought up without any profession. The revulsion of 1818, however, left him dependent on his own energies, and stimulated the exercise of his talents. Already, at the age of fifteen, he had invented a machine for weaving tape, and now a new field for his ingenuity was open to him. The anthracite coal in Pennsylvania was, about this time, exciting much interest. It was partially introduced for domestic use, but only the larger lumps were considered available in grates, the smaller coal being cast aside as refuse. Mr. Mott determined to apply his mind to invent a means of rendering this seemingly worthless fuel serviceable to the poor, and succeeded in producing a more perfect combustion than had ever before been attained. The iron founders not casting his stoves to suit him, with the assistance of a friend he started in business and manufactured them for himself. These difficulties surmounted, he had still another to overcome, the prejudice in favor of the long-cherished firewood, and opposition to the new fuel, which at first, but only for a short time, interfered with his success. A very large quantity of refuse coal had accumulated on the banks of the Schuylkill, at Philadelphia. This was bought by Mr. Mott, and the purchase first established the fixed value of small coal. Mr. Mott has had many testimonies to the merit of his inventions. A Patent Office report says: "Mott's stoves for burning refuse coal produced a distinct era in fuel saving." Gen. Harvey, in 1847, testified that "Mott's admirable arrangement for burning small coal caused its speedy introduction for domestic, mechanical, and manufacturing purposes." Mr. Mott took out more than forty patents connected with apparatus for burning coal, and the adaptation of iron to many useful purposes. His portable caldron furnace has become indispensable to the farmer, while extensively used by the manufacturer. The public are indebted to Mr. Mott for the change from blast furnaces to the cupola, in making stoves and other light castings. His factory and shop were destroyed by fire in 1846; only the engine house and cupola stack being saved, but, nothing daunted, in six days he was melting iron again in a new building erected around the stack. He was the pioneer in starting the villages of Morrisiana and Mott Haven; the J. L. Mott Iron Works, an incorporated company, being located at the latter place. Mr. Mott died at his residence in this city about two years ago.

The portrait of the American physicist,

PROFESSOR JOSEPH HENRY,

occupies the middle background. He was born in Albany, N. Y., Dec. 17, 1797. He received a common school education, and for some years pursued the occupation of watchmaker in his native city. In 1826 he was appointed Professor of Mathematics in the Albany Academy. A strong taste for scientific pursuits led him in 1827 to begin a series of experiments in electricity. In 1828 he published an account of various modifications of electro-magnetic apparatus. Previous to his investigations the means of developing magnetism in soft iron were imperfectly understood; he was the first to prove, by actual experiment, that in order to develop magnetic power at a distance, a galvanic battery of intensity must be employed to project the current through the long conductor, and that a magnet surrounded by many turns of one long wire must be used to receive this current. He was also the first to actually magnetize a piece of iron at a distance, and he invented the first machine moved by the agency of electro-magnetism. In March, 1829, he exhibited to the Albany Institute electro-magnets which possessed magnetic power superior to that of any before known, and subsequently he constructed others on the same plan, one of which, now in the cabinet of the college at Princeton, N. J., will sustain 3,600 pounds, with a battery occupying about a cubic foot of space. In 1831, in some experiments at the Albany Academy, he transmitted signals by means of the electro-magnet through a wire more than a mile in length, causing a bell to sound at the further end of the wire. In 1832 he was called to the chair of Natural Philosophy, in the College of New Jersey, at Princeton, where he continued his experiments and researches. In his first lecture in that institution in 1833, he mentioned the project of the electro-magnetic telegraph, and explained how the electro-magnet might be used to produce mechanical effects at a distance adequate to making signals of various kinds. He did not, however, attempt to reduce these principles to practice. In February, 1837, he went to Europe, and in April of that year, he visited Prof. Wheatstone, of King's College, London, to whom he explained his discoveries and his method of producing great mechanical effects at a distance, such as the ringing of church bells 100 miles off by means of the electro-magnet. In 1846, on the organization of the Smithsonian Institution, at Washington, Prof. Henry was appointed its Secretary, a post which he still holds, and which gives him the principal direction of the institution. Prof. Henry has published "Contributions to Electricity and Magnetism," and is the author of many scientific papers in the "American Philosophical Transactions," in Silliman's *Journal*, and in the *Journal of the Franklin Institute*. He is an assiduous student, and ranks among the first of American scientists.

In the right of the picture sits

ISAIAH JENNINGS,

who was born in Frankford, Connecticut, 1782, and who began work at an early age as a blacksmith, in making by hand, thimbles for sailors, used in sails and rigging, which led him to invent a machine for making thimbles and eyelet holes, the perfection of which cost him much time and labor. He went to Liverpool in 1808 and started the business; but war breaking out, his plans were frustrated, and he returned to the United States. Having made some money in England, he commenced business in Southport, Connecticut, taking a partner, but the partner took his money and broke him up. He next invented his cigar boat, consisting of two hollow air-tight tubes, with a space of six feet between, the work framed on sleepers and worked by hand. It ran in opposition to the Brooklyn horse ferry, crossing in less than half the time. In 1810, he invented a thrashing machine, the first that did not destroy the straw, and the first one put in operation in Duchess County, New York. In 1812 he invented a steam boiler to stand the pressure of 500 pounds, which was approved by Oliver Evans. During the war he worked at Leggert's foundery on cannon. He subsequently invented a new pump and sent it to Washington. A Mr. Perkins, of London, copied it and took out a patent. Mr. Jennings was too poor to prosecute him and the Government refused to protect him. In 1822, he made a repeating gun with twelve charges, one barrel, sliding stock. In 1823, he invented a steam engine on the same principle as locomotive boilers now in use. He built this engine before Stevenson started his manufactory; and it has been claimed both Stevenson and Perkins took their ideas from Mr. Jennings' invention. In 1323 and 1824, he invented instantaneous matches, called afterwards "Loco Foco." He sold out three fourths of his right to Mr. Bernan, of New York, and the receipt to Mr. Jones, of London, for $1,000, realizing in all some $11,000. He next obtained a patent for fluid for lamps. The Mechanics' Institute, in 1837, awarded Mr. Jennings a medal for the best carbureted alcohol and burner for producing light, and in 1848, Mr. J. received two medals for portable liquid gas lamps. He died in 1862.

At Mr. Jennings' left hand sits

THOMAS BLANCHARD,

who was born in Sutton, Worcester county, Mass., June 24, 1788. From a strong bias for mechanical employments, he joined his brother, who was engaged in the manufacture of tacks by hand, a very slow and tedious process, and at the age of eighteen commenced his invention of a tack machine. It was six years before he could bring it to the desired perfection. Finally, so effective was the machine, that by placing in the hopper the iron to be worked, and applying motive power, 500 tacks were made per minute, with better finished heads and points than had ever been made by hand. For this machine, Blanchard secured the patent, and sold the right to a company for $5,000. About this time various attempts were made in several of the United States armories to turn musket barrels with a uniform external finish. Mr. Blanchard undertook the construction of a lathe to turn the whole of the barrel from end to end by the combination of one single self-directing operation. He succeeded perfectly in his invention, and this remarkable machine with modifications and improvements, is in use in the national armories as well as in England; and in various forms is applied to many operations in making musket stocks, such as cutting in the cavity for the lock, barrel, ramrod, butt plates, and mountings, comprising, together with the turning of the stock and barrel, no less than thirteen different machines. Mr. Blanchard was also interested at an early day in the construction of railroads and locomotives, and in boats so contrived as to ascend the rapids of the Connecticut, and rivers in the Western States. He has took no less than twenty-four patents for different inventions. He died at Boston, April 17, 1864.

REPORT OF THE JUDGES OF DEPARTMENT OF STEAM ENGINEERING AT THE AMERICAN INSTITUTE FAIR.

The following is a Report of the Judges, in department 5, group 1, of the Thirty-eighth Annual Fair of the American Institute, held in the city of New York, October, 1869:

No. 51. HARRIS' STEAM ENGINE (CORLISS).—For best results on net effective power shown at the trial, being from one to two per cent better than any other on competition, and for superiority of workmanship and general arrangement of valves and valve gearing. (1st medal and diploma).

No. 848. BABCOCK AND WILCOX STEAM ENGINE.—For the most perfect and automatic expansion valve gearing on exhibition. The judges are of the opinion that, had the principles upon which the engine was based been properly carried out in its construction, it would have performed much better. Also, it was evident that during the trial of the Harris engine the steam was dryer than in the trials of the other engine. (1st medal and diploma).

I hereby certify that the above is a true copy of the Report on file, as far as the same relates to Nos. 51 and 848.

JOHN W. CHAMBERS, Secretary.

Truly the mountain has labored and brought forth a mouse. It has taken this committee some four weeks to come to the conclusion, that of two engines out of all exhibited at the recent fair, each is better than the other. The Corliss engine having better valve gear than the Babcock & Wilcox engine, the valve gear on the latter is the best; or it is the other way. How is it? Will somebody help us out of our confusion. We do not comprehend this mystery.

What can the public gather from such a meager and inconsistent report as this? It was not to be expected that out of all the engines exhibited more than two could gain the *first* prize, of which we suppose each triumphant exhibitor may claim the equal undivided half; but it is to be supposed that other engines had merit enough to receive some mention, honorable or otherwise; and a more minute statement of the work performed by each would have enabled the public to determine whether the action of the judges was based upon good grounds. We put it as an intricate problem for our mathematical readers to solve, that if it has taken the judges four weeks to make the above *elaborate* report on engines, when may we expect the one on boilers?

ANNOUNCEMENT FOR 1870.---A SPLENDID WORK OF ART AND CASH PREMIUMS TO BE GIVEN.

The SCIENTIFIC AMERICAN enters its twenty-fifth year on the first of January next, and to mark this period of a quarter of a century in which it has maintained its position as the leading journal of popular science in the world, we have purchased from the executors of the estate of the late John Skirving, Esq., and propose to issue on New Year's day, the fine steel engraving executed by John Sartain, of Philadelphia, entitled

"MEN OF PROGRESS—AMERICAN INVENTORS."

The plate is 22x36 inches, and contains the following group of illustrious inventors, namely, Prof. Morse, Prof. Henry, Thomas Blanchard, Dr. Nott, Isaiah Jennings, Charles Goodyear, J. Saxton, Dr. W. T. Morton, Erastus Bigelow, Henry Burden, Capt. John Ericsson, Elias Howe, Jr., Col Samuel Colt, Col. R. M. Hoe, Peter Cooper, Jordan L. Mott, C. H. McCormick, James Bogardus, Frederick E. Sickles.

The likenesses are all excellent, and Mr. Sartain, who stands at the head of our American engravers on steel, in a letter addressed to us says "that it would cost $4,000 to engrave the plate now," which is a sufficient guarantee of the very high character of the engraving as a work of art.

The picture was engraved in 1868, but owing to the death of Mr. Skirving, a few copies only were printed for subscribers at $10 each. A work embracing so much merit and permanent interest to American inventors, and lovers of art, deserves to be much more widely known. We propose, therefore, to issue, on heavy paper, a limited number of copies at the original price of $10 each, to be delivered free of expense. No single picture will be sold for less than that price, but to any one desiring to subscribe for the SCIENTIFIC AMERICAN, the paper will be sent for one year, together with a copy of the engraving, upon receipt of $10. The picture will also be offered as a premium for clubs of subscribers as follows to those who do not compete for cash prizes:

For 10	names	one	year	$30	one picture.
" 20	"	"	"	50	" "
" 30	"	"	"	75	two pictures.
" 40	"	"	"	100	three "
" 50	"	"	"	125	four "

In addition to the above premiums we also offer the following cash prizes:

$300	for	the	largest	list of	subscribers
250	"	"	second	do	do
200	"	"	third	do	do
150	"	"	fourth	do	do
100	"	"	fifth	do	do
90	"	"	sixth	do	do
80	"	"	seventh	do	do
70	"	"	eighth	do	do
60	"	"	ninth	do	do
50	"	"	tenth	do	do
40	"	"	eleventh	do	do
35	"	"	twelfth	do	do
30	"	"	thirteenth	do	do
25	"	"	fourteenth	do	do
20	"	"	fifteenth	do	do

Subscriptions sent in competition for the cash premiums must be received at our office on or before the 10th of February next. Names can be sent from any post office, and subscriptions will be entered from time to time until the above date. Persons competing for the prizes should be particular to mark their letters "Prize List" to enable us easily to distinguish them from others.

Printed prospectuses and blanks for names furnished on application.

NEW PUBLICATIONS.

WORK AND PLAY.

Messrs. Milton, Bradley & Co., Springfield, Mass., contemplate issuing an illustrated monthly magazine for the young, containing sixteen pages, at a subscription price of one dollar per annum. This firm is an enterprising one, and has abundant facilities for producing an instructive and amusing journal. Send for a prospectus, which gives full particulars.

THE RAILROAD TRAVELER'S JOURNAL is the title of a new, handsomely printed, and well-edited weekly paper printed at Philadelphia, Pa. We wish it success. Babcock, Trowbridge & Co., publishers. $3·50 per annum.

PATENT DECISION.

UNITED STATES DISTRICT COURT, SOUTHERN DISTRICT. BEFORE JUDGE BLATCHFORD.—PATENT LOCKS—COMPLETED INVENTION.

Paul C. Coffin vs. *James B. Ogden and Lucius Woodruff*.—This was a suit for infringement of letters patent reissued to Charles A. Miller, assignee of Wm. S. Kirkham, the inventor, January 27, 1863, for an improvement in locks and latches, and assigned to the plaintiff. The object of the invention is stated in the specification to be, to render a door latch readily applicable to either right or left-hand doors. The defenses set up were that the invention was previously made by one Barthol Erbe, at Birmingham, in Pennsylvania; that the claims of the reissued patent are not for any patentable invention, nor for any mechanism arranged for a particular purpose, or to produce a particular effect, but are for an effect or function, irrespective of any particular mechanism, and that the patent is therefore void; that if the patent is valid the defendants have not infringed it.

Held by the Court.—That the lock made and sold by the defendants is, in its mechanical construction, substantially the same as the lock described in the plaintiff's patent, with only such variations as the skill of a mechanic would suggest, the invention of Kirkham being taken in its mechanical construction and arrangement. This being so, and the invention of Kirkham, as described, being infringed, the rules of law require that the plaintiff's patent shall, if possible, be so construed as to make it valid with reference to the defendant's lock—*ut magis valeat quam pereat*. Upon this principle there is no difficulty in so construing the claims of the patent as to relieve them from the objection made that they claim results or effects; for the claims must be construed in connection with the descriptive parts of the specification, and with reference to what is seen to be the real invention. (Case *vs.* Brown, 2 Wallace, 320). As to the question of novelty, the reversible latch claimed to have been invented and made by Erbe, prior to Kirkham's invention, undoubtedly embodied the inventions claimed in the plaintiff's patent as above construed. The question then arises whether the Erbe lock antedates as a completed invention the Kirkham lock. The weight of evidence shows that Kirkham did not make his invention at an earlier date than March 1, 1861. Erbe made his invention in the latter part of the year 1860, and soon after exhibited it to three persons experienced in making locks. He did not make a second lock of the kind till he made one which was deposited in the Patent Office in 1864, in connection with an application for a patent. Nor did he put any such lock into use on a door until after he had so applied for a patent. On these facts it is claimed by the plaintiff that the lock made by Erbe in 1860 was a mere experiment, rested only in experiment, and was not a completed invention. This position cannot be maintained. The lock made by Erbe in 1860 was put in a practical form, and was ready for use. It was, therefore, a completed invention, and the imparting a knowledge of its construction by Erbe to the three persons connection with the business of lock making, who saw it and understood its arrangement was the giving to the public such a knowledge of it as a completed invention as to deprive Kirkham of the right to be considered in law as the first inventor of such invention, though he was an original and independent inventor of it. An invention may be completed and ready for practical use without being actually in use, in the usual acceptation of the word. Use is not necessary to show completion, though it is generally strong evidence of it. These views are confirmed by the most carefully considered cases on the subject. (Reed *vs.* Cutter, 1 Story, 590; Bedford *vs.* Hunt, 1 Mason, 302; Curtis on Patents, sec. 87, Whitely *vs.* Swayne, 7 Wallace, 685). Kirkham's invention was, therefore, fully anticipated by that of Erbe.

Bill dismissed with costs.

For the plaintiff, G. Gifford; for the defendants, B. F. Thurston, and S. D. Law.

Recent American and Foreign Patents.

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

EGG BEATER, ETC.—H. G. Fougen and A. C. Fougen, Cape Girardeau, Mo. —This invention has for its object to furnish an improved machine for beating eggs, churning, mixing liquids, and other similar uses, which shall be simple in construction and effective in operation.

SAD IRON.—M. W. Montgomery and E. H. Votaw, Springfield, Mass.—This invention has for his object to furnish an improved sad iron, which shall be so constructed and arranged that the handle may be readily attached and detached for convenience in heating and using the sad irons.

EXPANDING PLOW.—A. W. Wilkins and S. T. Eskridge, Rome, Ga.—This invention has for its object to improve the construction of expanding plows in such a way that the standards may be moved toward and from each other squarely, and in such a way that the pitch of the plows may be adjusted as required.

ICE PITCHERS, ETC.—Kingston Goddard, Richmond, N.Y.—This invention has for its object to furnish a simple, neat, durable, light, and inexpensive ice pitcher, which shall have all the beauty and durability of a solid silver pitcher, and may be manufactured at trifling cost.

SINCH OR BELLY-BAND FASTENER FOR RIDING AND PACK SADDLES.—C. H. Horne, Astoria, Oregon.—This invention has for its object to furnish an improved fastener for sinching up riding and pack saddles, which shall be simple in construction and convenient and effective in use.

SEED PLANTER.—John M. Shaw, Water Valley, Miss.—This invention has for its object to furnish an improved seed planter, designed more particularly for planting cotton and corn, which will open the furrow, drop the seed, and cover it, leaving the top of the ridge rounded and smoothed off, and which may be easily adjusted for planting either kind of seed.

DITCHING MACHINE.—J. W. Weston and M. H. Weston, Windsor, Ill.—This invention has for its object to furnish a simple, convenient, and effective machine for digging ditches, grading roads, raising hedge rows, and similar uses.

BED FASTENING.—Nickolas Zins, Evansville, Ind.—This invention has for its object to furnish a simple, strong, durable, and convenient fastening for connecting the rails to the posts of a bedstead, and one which shall be so constructed as to be held securely in place without screws or other fastenings.

COMBINED RAKE, WEEDER, AND SMOOTHER.—A. F. Duckwitz, New York city.—This invention has for its object to furnish an improved instrument, which shall be so constructed as to adapt it for use as a rake, as a weeder for cutting off the weeds in walks and other places, and as a smoother for smoothing off the surface after it has been properly raked.

UMBRELLA AND DRESS SUSPENDER.—Messrs. McDougall and Eden, Manchester, Eng.—This invention relates to a new umbrella and suspender. It is made in the following manner: A piece of elastic cord, rather longer than would be required for a dress suspender merely is employed; the ends are connected in any suitable manner, when it is placed round the waist. A metal plate is then provided in which eight holes are pierced in a line, and which is placed in front of the dress and between the ends of each other. The elastic cord is then passed backward and forward through these holes alternately, leaving a loop of the same between the two center holes. This loop forms the umbrella suspender, and may be lengthened or shortened by drawing the elastic cord through the holes. A button or tassel is attached to the loop, for facility for drawing out or expanding the loop when the umbrella is removed from it.

ADJUSTABLE BENCH CLAMP.—O. L. Fenner, Rochester, N. Y.—The inventor has constructed a new adjustable bench clamp, to be used by carpenters and other mechanics.

VELOCIPEDE.—Charles A. Maynard, St. Louis, Mo.—This invention relates to a new three-wheeled velocipede, which is propelled by the weight of the rider placed alternately upon one of two oscillating frames, so that the rider may, by alternately sitting down and standing up, impart the requisite motion to the vehicle.

VELOCIPEDE.—S. M. Bailey, Cottage Grove, Minn.—This invention relates to a new velocipede, which is to be lighter, easier made, cheaper, and more substantial than those heretofore in use.

COMBINED SEEDER, ROLLER, AND DRAG.—John V. B. France, Boscobel, Wis.—This invention relates to a new agricultural implement, which is so constructed that it will serve to scatter the seed on the ground and to work the same into the soil, all by one operation.

PHOTOGRAPHIC PRINTING APPARATUS.—L. J. Marcy, Newport, R. I.—This invention relates to a new instrument for printing photographic pictures, on, more particularly, transparencies by the aid of artificial light. Such plates are used as slides for magic lanterns and other purposes. The invention consists of a lamp of novel construction, placed into a frame, or case, so that the light will be projected towards the negative through a narrow aperture of the case. The invention consists, also, in the general arrangement and construction of the aforesaid case or frame.

OPERATING GRINDSTONE.—Hamilton Pray, Sharon, Conn.—This invention relates to a new and improved mode of operating revolving grindstones, whereby one person is enabled to turn or revolve the stone and to hold the article to be ground.

DUPLEX DOUBLE SIPHON FORCE PUMP.—Samuel B. B. Nowlan, C.E., New York city.—This invention relates to new and important improvements in force pumps for raising and forcing water.

TELEGRAPH WIRE INSULATOR.—W. D. Guseman and E. C. Bright, Morgantown, Va.—This invention relates to a new and useful improvement in insulators for telegraph wires.

CONDENSING VALVE.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba. —This invention relates to a new and useful improvement in valves for spreading and spraying the water in jet and surface condensers.

COMBINED JET AND SURFACE CONDENSER.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.—This invention relates to a new and useful improvement in condensing vessels, whereby they may be used for either jet or surface condensation, so as to use the water for the boiler supply, or as injection water, or for other purposes.

MACHINE FOR TURNING WOODEN WARE.—John C. Bryant and A. W. Turner, Gardner, Mass.—This invention relates to a new and useful machine for turning and squaring the ends of wooden pails, tubs, kegs, and other wooden ware.

PRESERVING EGGS AND OTHER ARTICLES.—Mrs. S. Bruner, Marshall, Mo. —This invention relates to a new and useful invention and discovery, whereby eggs may be kept perfectly good and sound for an indefinite period of time.

AUTOMATIC BOILER FEEDER.—Silas Cook, Magnolia, Iowa.—This invention relates to a new and important improvement in the method of supplying steam boilers with water, whereby a uniform hight of water in the boiler is automatically maintained.

HINGE.—Louis Frühinsfeld, Newark, N. J.—This invention relates to a new and useful improvement in hinges for hanging the covers of trunks and chests, and for all purposes, to which the ordinary butt hinge is adapted, but which is more especially designed for trunks and similar articles.

STEM-WINDING WATCH.—Edward Bourquin, New York city.—This invention relates to various improvements in the setting, winding, and entire working apparatus of watches, and consists in the construction of the various devices pertaining thereto, with an object of obtaining greater power with less friction than could heretofore be produced, and also to provide far greater facility of controlling the whole movement.

SCHOOL DESK AND SEAT.—B. W. Arnold, Des Moines, Iowa.—This invention relates to improvements in combined desks and seats for use in schools, such as have the desks arranged upon the backs of the frames for the seats, and are arranged for folding the seats up and desks down. The invention consists in certain improvements in the hinge joints for both the seat and the desk.

HAY ELEVATING FORK.—Samuel G. Simpson, Mill Creek, Pa.—This invention consists in the attachment to the suspending yoke, which is pivoted to the outside tines, about one third of the distance from the head towards the points of a curved bar and spring tripping catch, which work through a slot in the handle, the spring catch engaging with the handle to hold the fork in the position for elevating a load; also, of a curved suspending bar, projecting in the opposite direction towards the point of these teeth, and which, when the suspending yoke is set for elevating, is thrust forward into the hay on the tines in a manner to hold the same from slipping off.

MACHINERY FOR PROPELLING CARS AND BOATS.—G. T. Beauregard, New Orleans, La.—This invention relates to new and useful improvements in machinery and apparatus for propelling cars, and other vehicles, on land, and boats on canals or rivers, by means of overhead wire, or other rope deriving motion from stationary engines, or other power, at intervals along the route.

PLOW.—P. Burns, Indiana, Pa.—This invention relates to improvements in cast iron or steel plows, and consists in forming the mold board, landside, and point or spreader in separate parts, and joining them together by bolts; also, in dovetailing the point or spreader to the moldboard in a manner to sustain the shocks caused by the points striking large stones, and other obstructions, in a way to relieve the bolts by which the point is connected to the moldboard, of the strain of such shocks. The object of forming the plows in the several parts, as stated, is to make the work of molding more simple and easy than when cast together.

APPARATUS FOR COOKING.—This invention consists of a vessel, having a jacket or inner lining of tin, or other proper metal. The jacket has a nozzle or lip, and being filled with water, is placed on the fire; by this means the inner space or compartment of the jacketed vessel is heated with dry heat, and so adapted as to receive a partially roasted joint of meat, or any other substance requiring to be completely cooked. The whole of this apparatus is inclosed in a vessel which is covered with some substance which is a bad conductor of heat, and is termed by the inventor a heat retainer. By this combination a great saving of heating material is effected, and the meat is never rendered hard, as is often the case in the ordinary methods of cooking.

HYDRAULIC CEMENT, OR ARTIFICIAL STONE.—This invention consists in the production of an hydraulic cement, which may be white or tinted, and which perfectly resists the action of water, and is suitable for ornamental purposes for the decoration of buildings. The principal components of this compound are lime, silica, and alumina, the two latter being extracted from refractory clays. In order to bring about the formation of the double silicate of lime and alumina, sulphuric and boracic acid are added in small quantities. The proportions of the constituents are varied, as the cement is required to set slowly or more quickly. For producing the cements the substances in an anhydrous state are employed in the following proportions:

Fat lime of first quality	67·956	to	74·6555	per cent	by weight
Refractory clay	27·182	to	42·889	"	"
Sulphate of lime	4·757	to	9·055	"	"
Boracic acid	0·105	to	0·401	"	"
	100·				

The cements formed between these limits varying in the rapidity with which they set, but are of equal quality, and attain in the course of time the same degree of hardness. The substances are mixed after being ground to a fine powder, they are then made into bricks with water, and are baked at a white heat; after this they are reduced to an impalpable powder. This powder, mixed with water, is then used as the cement, either plain or colored, and can be molded as required. The inventor is M. Jules Antoine Dubus, of Paris.

CLOTHES LINES.—P. C. Johnson, Central City, Col.—This invention has for its object to do away with the props or sticks commonly used to support clothes lines at or near the middle, to prevent them from hanging too low.

DOUBLE SUPPLY ATTACHMENT TO PUMPS.—D. F. Dodge, Lowville, N. Y. —The object of this invention is to provide a device by means of which water or other liquids can from either one of two reservoirs be guided to one pump. The invention will be particularly useful in households, where the same pump can be used to obtain water from a well and from a cistern, as may be desired. The invention consists in the application of a plug within a chamber, which communicates with the suction pipe of the pump, and with the two supply pipes leading to the two reservoirs. The plug has two apertures through it; either one of which can be brought in communication with the suction pipe. One aperture will connect one supply pipe and the other aperture the other supply pipe with the pump. A slight turn of the plug will therefore serve to bring either the cistern or well into connection with the pump.

BEDSTEAD FRAME.—J. N. Farnham, Hartford, Conn.—This invention relates to a new frame for single and double bedsteads, which are provided with elastic or flexible sheets for the support of the bedding. The invention consists in the use of slotted or double inclined end pieces in which the ends of the fabric are clamped, and in the employment of longitudinally adjustable standards to which the said end pieces are secured. By this arrangement the fabric is securely held and can be stretched or slackened at will.

BOOK AND MUSIC STAND.—Edward Conley, Cincinnati, Ohio.—This invention relates to a new book or music stand which is adjustable in every respect, so that it can be set at any suitable hight, and in any desired position to suit the position of the reader, and which can also be used as a nursery table, and for other purposes.

SUBMARINE TELEGRAPH CABLES.—M. G. Farmer, Boston, Mass.—This invention consists in combining a strengthening wire or wires with the central electrical conductor or conductors; thus dispensing with the use of strengthening wires upon the exterior of the insulating substance.

MILLSTONE DRESS.—John Fairclough, St. Joseph, Mo.—The object of this invention is to provide an arrangement of the furrows, or "dress" of millstones, whereby the draft will be greatest at the eyes, where the grinding movement of the surfaces is less, gradually diminishing towards the periphery as the movement of the said surfaces increases.

STEAM PUMPS.—W. W. Gilbert, New York city.—This invention relates to improvements in steam pumps, and has for its object to provide certain improvements in the arrangement of the steam piston, for cheapening the construction and simplifying the adaptation of the same for use, in opening and closing the parts of a steam actuated piston valve; also to provide certain improvements in the construction of the pump valves.

CLOVER AND FLAX THRASHING MACHINE.—S. H. Lintan, Burrows, Ind.—This invention relates to improvements in machines for thrashing and separating clover and flax, and has for its object to provide a more simple and cheap machine than those now in use. It consists of an improved construction of the teeth or beaters and its case; and also of an improved arrangement of the separating devices.

STAYS AND CORSET.—H. A. Lyman, London, England.—The object of this invention is to provide a well-fitting and convenient corset.

SEWING MACHINE FAN.—D. W. Glassie.—This invention relates to a device which may be attached to the balance wheel of a sewing machine, or in any suitable manner to an actuating wheel driven by any convenient power, and is provided with fans which may be caused simply to rotate, or to have a compound motion, reciprocating and rotary; and it consists in a certain combination of mechanical means for operating the fans, whereby a lady can operate the sewing machine and fan herself simultaneously, without being sensible of the greater exertion of power she is required to make.

BED SPRING.—F. J. Gardner, Washington, N. C.—This invention has for its object to furnish a simple, convenient, and very elastic bed spring.

PLOW.—C. C. Ansley, Americus, Ga.—This invention has for its object to furnish a light, simple, convenient, and effective plow, and one which may be easily made, and will be of light draft.

DOUBLE TAPERED PLATE FOR THE MATERIAL OF BLANKS FOR CULTIVATOR TEETH, ETC.—W. H. Singer, Pittsburgh, Pa.—This invention consists in a plate of the proper metal, run between rolls of such shape as to give it the required double transverse taper, such plate being of any desired or practicable length, and serving as the material out of which blanks may be cut for immediate formation into shovels, plows, or cultivator teeth.

ROLLING MACHINE AND PRODUCT.—W. H. Singer, Pittsburgh, Pa.—This invention consists in placing tapering rolls upon shafts for the purpose of producing beveled edges upon agricultural and other tools, such edges having heretofore been produced by hammering or grinding, and in combining with such tapering heads a sliding rest for supporting the blanks while going through the beveling operation.

SPRING BED BOTTOM.—Peter W. Kniskern, Ft. Smith, Ark.—This invention relates to improvements in spring-bed bottoms, the object of which is to produced an improved spring bed bottom, and to construct the same wholly, or mostly, of wood, and in a simple and inexpensive manner.

FEED-WATER HEATER.—John Fairclough, St. Joseph, Mo.—The object of this invention is to provide feed-water heaters for steam boilers, having greater heating capacity, and adapted, also, for filtering the water, and to have great condensing capacity for returning the steam, as feed water, for use where the feed water is not always abundant, and particularly adapted for portable traction engines.

BRIDGE.—Samuel Ensign, New Franklin, Ohio.—The essential feature of this invention consists in the construction and arrangement of the chords, which are made up of bars or slabs of either rolled or cast metal, bolted together, and so shaped as to permit them to be cheaply formed and joined together. Another part of the invention consists in the arrangement of the braces, suspension rods, and posts, and the supporting blocks for the same.

FLUE CLEANER.—John Fairclough, St. Joseph, Mo.—This invention relates to an improved arrangement of pointed metallic tubes for taking steam from the steam dome, or other part of the boiler, and discharging it in jets into the flues of the boiler for forcing out the collections of soot and other matters in them, and scouring the surfaces of the flues, the arrangement being such that the nozzle may be directed against all parts of the said surfaces.

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.

M. E., of Conn.—The grand discovery of atmospheric pressure was made only a little more than two hundred years ago—in 1643—by Torricelli, a pupil of Galileo. Torricelli's announcement that the air had weight, that its pressure sustained the mercurial column, and that every body went about, bearing upon their persons an air burden of fifteen tuns, was received with scorn and ridicule by many of the scientific men of his day. But Pascal, a French *savant*, acknowledged its correctness "If," said he, "it be really the weight of the atmosphere under which we live that supports the column of mercury in Torricelli's tube, we shall find, by transporting this tube to a loftier point in the atmosphere, that in proportion as we leave below more and more of the air, there will be a less column of mercury sustained in the tube." He carried the tube to the peak of Puy-de-Dome, a lofty mountain in Central France, and found that the mercury gradually fell in the tube in proportion as he ascended. In 1646, at Rouen, Pascal showed that a column of water, 34 feet high, was sustained by atmospheric pressure. 30 inches of mercury, and 34 feet of water have nearly the same weight.

T. H. J., of Texas.—The best lubricant for iron spur gearing, is undoubtedly good sperm oil. The following proportions for teeth may be considered good practice: Depth of pitch line = three tenths of the pitch. Working depth of tooth sixth tenths of the pitch. Bottom clearance one tenth. Whole depth to the root of the tooth seven tenths. Thickness of tooth five elevenths of the pitch width of space six elevenths. Other proportions are however used.

B. W. S. C., of Ind.—You can run a steam saw mill successfully from a counter shaft under your saw mill, said counter shaft to be driven from a pulley 7 feet in diameter on a main shaft thirty feet distant but your belts will need to be well proportioned. In short you will need a man of experience and skill to adjust everything so as to insure success.

J. N., of Ohio.—You will find in our advertising columns, advertisements of safety valves and other steam apparatus. It will be evident to you upon a moment's reflection. that it is not our place, even were we disposed, to recommend any of these to the exclusion of others If you need counsel, able engineers, who also advertise with us, will give it to you.

W. N. G., of N. Y.—Both the plumber and yourself are partly wrong. No water can be forced into a range boiler, or any other boiler so long as the pressure of steam in the boiler is greater than the pressure of the water. The pressure of water poured in through a funnel put into either the hot or the cold water pipe, near the top of your boiler would not be enough to force it in against a slight pressure of steam. The funnel used for filling the boiler during the low water, should have been placed in the cold water pipe, and the faucet of the hot water pipe should have been opened while the filling was going on, to relieve the boiler from steam pressure.

W. H. C., of Ill.—The rule you refer to for computing the horse power of steam engines is correct. Your engine would, according to your statement, have 19·04 horse power. We recommend you to get "Bacon's Revision of Porter's Work on the Steam Indicator," noticed in another column, and "Auchincloss' Link and Valve Motions." Both works are published by D. Van Nostrand, 23 Murray and 27 Warren streets, New York.

C. M. T., of Mass.—The suggestions you make are valuable but as we have recently published an illustrated description of a safety heating apparatus for railroad cars (see page 40 current volume) together with similar suggestions, we respectfully decline your communication.

W. H. E., of Pa.—The soap test for water referred to is a tincture of soap, made by dissolving fine soap in 75 parts of water by weight and then adding an equal volume of rectified alcohol. The amount of the tincture which makes a permanent lather when added to water is an indication of the hardness or softness of the water.

J. S. E., of Mass.—The furrow in the tough sod after the severe storm of which you write us, is evidently the work of lightning. Such occurrences are not unfrequent, and the peculiar hissing sound of lightning you mention has also been often observed.

T. E. T., of Ga.—A compass needle is deflected by beds of iron ore but such a needle would not assist you in the search for gold or silver The divining rods of which you speak are in our opinion humbugs.

J. M. D., of Ill.—To specify all the uses of peroxide of manganese would occupy much space. Both it and phosphate of iron are used in medicine.

P. H. D.—It is a well known property of loaf sugar that it becomes luminous when rubbed with a hard substance in the dark. The subject has been frequently referred to in this column.

C. H. C., of Ill.—There is no doubt in the minds of scientific men of the existence of atmospheric tides, caused by the attraction of the moon in the same way that ocean tides are produced.

S. M. A., of Conn.—You will find an account of ancient tools in "Appleton's American Cyclopedia," with references to authors upon the subject in article "Copper."

J. C., of Ill.—Your communication does not suit us. It is offensively personal.

J. A. L., of Ohio.—You may learn to translate the French language into English by the aid of books, but to speak it you will need the aid of a living teacher.

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.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,132.—STEAM GENERATOR.—Silas C. Salisbury, New York city. October 28, 1869.

3,139.—STEAM GENERATORS AND SURFACE CONDENSORS.—J. A. Miller, Boston, Mass. Oct. 29, 1869.

3,144.—CIGAR MACHINERY.—J. Wettstein and J. T. Henneman, Baltimore Md. Oct. 29, 1869.

3,218.—GENERATING STEAM, ETC.—Noah Shaw, Eau Claire Wis. Nov. 8, 1869.

3,226.—MACHINE FOR HECKLING HEMP.—George Webber, Boston, Mass November 9, 1869.

3,077.—MACHINE FOR MANUFACTURING BRUSHES.—W. A. Foskett and H. Tyler, New Haven, Conn. October 22, 1869.

3,208.—SEWING MACHINE NEEDLES.—P. H. Newbill, Los Angeles, Cal. Nov. 5, 1869.

3,220.—MEANS OF SECURING CORKS IN BOTTLES.—H. Scholfield, Guatemala, Central America. Nov. 6, 1869.

3,248.—PROCESS OF BREWING.—James McCormick, Boston, Mass. Nov. 11, 1869.

3,254.—TREATMENT OF CAOUTCHOUC, GUTTA-PERCHA, AND ANALOGOUS GUMS FOR THE PRODUCTION THEREFROM OF ARTICLES OF UTILITY AND ORNAMENT.—J. B. Newbrough and Edward Fagan, New York city. Nov. 11, 1869.

3,250.—LOCK.—A. B. Vandemark, Southington, Conn. Nov. 11, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING NOV. 30, 1869.

Reported Officially for the Scientific American.

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Full information, as to price of drawings, in each case, may be had by addressing

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Patent Solicitors, No. 37 Park Row, New York.

97,263.—SASH BALANCE.—J. C. Anderson, Webster, Pa.
97,264.—REFRIGERATOR FOR CONDENSING VAPORS FROM FERMENTING VATS IN BREWERIES.—Lawrence Angster, Newark, N. J.
97,265.—COMPRESS.—C. W. Armstrong (assignor to himself and T. H. Armstrong), Detroit, Mich.
97,266.—VULCANIZING PRESS.—Joseph Banigan, Smithfield, assignor to Woonsocket Rubber Co., Woonsocket, R. I.
97,267.—LOGGING SLED.—Albert R. Baxter, Peck Post Office, Mich.
97,268.—MODE OF CURING BACON, HAMS, AND SHOULDERS.—W. G. Bell, Charlestown, Mass.
97,269.—VENTILATING WINDOW BLIND.—Harrison Berdan and John Bantly, Wayne, Mich.
97,270.—FASTENING FOR BEDSTEADS.—Charles Bradway, Maquoketa, Iowa.
97,271.—LAMP EXTINGUISHER.—Geo. V. Bunker, Yankton, Dakota Territory.
97,272.—DEVICE FOR CLEARING LAND OF STUMPS.—Chas. Canfield and H. Willard, Grand Rapids, Mich. Antedated November 18, 1869.
97,273.—COMBINED ROLLER AND CULTIVATOR.—J. B. Catey, Williamsburgh, Ind.
97,274.—PUMP.—E. S. Cavnah and David Yeagley, Bourbon, Ind.
97,275.—FRUIT PICKER.—L. D. Cogswell, Lowell, Mass.
97,276.—DUST PAN.—F. L. Daniels, Boston, Mass.
97,277.—COMBINED REVOLVING HOE AND COTTON CULTIVATOR.—Major E. Davis, Rome, Ga.
97,278.—WOOD PAVEMENT.—David L. De Golyer, Chicago, Ill.
97,279.—MACHINE FOR THE MANUFACTURE OF ARTIFICIAL FUEL, AND FOR COMPRESSING CONGLOMERATE SUBSTANCES INTO COMPACT MASSES.—A. Dietz, New York city, assignor to F. N. Hopkins, Baltimore, Md.
97,280.—BORING MACHINE.—E. C. Dodge, Edgecomb, Me. Antedated Nov. 13, 1869.
97,281.—PITCH BOARD.—John R. Drew, San Francisco, Cal.
97,282.—HAY ELEVATOR.—F. R. Dufour, Vevay, Ind.
97,283.—APPARATUS FOR CARBURETING AIR.—C. F. Dunderdale, New York city.
97,284.—APPARATUS FOR PRODUCING ILLUMINATING GAS.—C. F. Dunderdale, New York city.
97,285.—GAS MACHINE FOR CARBURETING AIR.—H. F. Eberts and John Fanning, Detroit, Mich.; said Eberts assigns his right to said Fanning.
97,286.—BOOT CRIMPER SCREW.—Jacob Edson, Boston, Mass.
97,287.—PLATE PRINTING FOR COLORS.—Joseph Enthoffer, Washington, D. C.
97,288.—GATE.—Samuel Freet, Upper Strasburg, Pa.
97,289.—BRACKET FOR CONDUCTORS.—Peter Gantz (assignor to himself and Martin Fryer), Albany, N. Y.
97,290.—FAUCET ATTACHMENT TO CANS.—John H. Garrigan, Sacramento, Cal., and F. L. Hall, Reno, Nevada.
97,291.—COOKING RANGE.—R. D. Granger, Providence, R. I.
97,292.—MACHINE FOR FORMING CIGARS AND PLUG TOBACCO.—Wm. Hall and E. J. Bennett, Boston, Mass.
97,293.—FRUIT JAR.—L. B. Harberger, Philadelphia, Pa.
97,294.—LAMP SHADE.—E. K. Haynes, Boston, Mass.
97,295.—PAD OR HOUSING FOR HARNESS SADDLES.—C. B. Hogg, Boston, Mass.
97,296.—BOILER OR OTHER FURNACE.—M. L. Horton, Windsor, Vt.
97,297.—BRICK MOLD.—Stephen Inman, Rockford, Ill.
97,298.—LAMP BURNER.—Melvin Jincks, Wallace, N. Y.
97,299.—STEAM PLOW.—J. G. Knapp, Madison, Wis.
97,300.—APPLYING STEAM POWER TO STREET RAILWAY CARS.—L. W. Langdon, Northampton, Mass.
97,301.—REST FOR CARRIAGE TOPS.—C. C. Lawrence and Jas. Lewis, Marengo, Mich.
97,302.—HEAD BLOCK FOR SAW MILLS.—C. Leffingwell (assignor to himself, H. Blandy, and F. Blandy), Zanesville, Ohio.
97,303.—RAILWAY CAR COUPLING.—H. L. Lockwood, Denmark, Iowa.
97,304.—CURTAIN FIXTURE.—Moses Loeb, Chicago, Ill.
97,305.—STEAM GENERATOR.—W. B. Mack, Detroit, Mich. Antedated Nov. 11, 1869.
97,306.—FOUNDATION FOR SPRING BED BOTTOMS.—David Manuel, Dedham, Mass.
97,307.—FIRE PLACE.—Stephen Martin, Detroit, Mich.
97,308.—TOOL FOR MOLDING DOVETAILS.—Bernard McEnally and Edward Farrell, Detroit, Mich. Antedated Nov. 13, 1869.
97,309.—PRESS FOR COMPACTING THE WASTE PARTICLES OF COAL INTO BLOCKS FOR FUEL.—T. M. Mitchell, Philadelphia, Pa.
97,310.—STAVE MACHINE.—Samuel Newman, Cleveland, Ohio, assignor to himself and John Newman.
97,311.—VAPOR BURNER.—J. H. Pattee, Monmouth, Ill. Antedated Nov. 20, 1869.
97,312.—METAL BELTING.—W. P. Powers, North La Crosse, Wis. Antedated Nov. 24, 1869.
97,313.—GRAPE CRUSHER AND STEM SEPARATOR.—T. C. Purington Lincoln, Cal.
97,314.—CHAIR SPRING.—T. C. Purington, Lincoln, assignor to himself and A. Mayoux, Marysville, Cal.
97,315.—BABY WALKER.—P. H. Randolph, Leavenworth City, Kansas. Antedated Nov. 13, 1869.
97,316.—SNOW GUARD FOR ROOFS.—A. Rogers, Worcester, Mass.
97,317.—SEEDER.—J. S. Rowell, Beaver Dam, Wis.
97,318.—TELEGRAPH INSULATOR.—A. G. Safford, St. Albans Vt. Antedated Nov. 17, 1869.
97,319.—CULTIVATOR.—Alexander Shaw, Monmouth, Ill. Antedated Nov. 22, 1869.
97,320.—MACHINE FOR DRESSING MILLSTONES.—Franklin Simmons (assignor to H. D. Coleman), New Orleans, La.
97,321.—STOVE-STAND.—D. N. Smith, Boston, Mass. Antedated Nov. 27, 1869.
97,322.—HAY RACK FOR WAGONS.—S. J. Smith, Farmington N. Y.
97,323.—WATER-CLOSET PAN.—W. Smith, San Francisco, Cal
97,324.—GOVERNOR.—Robert Spear, New Haven, Conn.
97,325.—MACHINE FOR PUTTYING SEAMS OF VESSELS.—Alfred Stevens, Georgetown, assignor to Josiah Starling, Manheigan, Me.
97,326.—CAN HANDLE.—L. A. Sunderland, Madison, Ohio.
97,327.—HORSESHOE BLANK.—E. B. Turner, Providence, R. I. Antedated Nov. 13, 1869.
97,328.—CARPENTERS' PLOW.—Harmon Vanbuskirk, Vienna Mich. Antedated Nov. 24, 1869.
97,329.—RAILWAY CAR WHEEL.—Zadock Washburn, Hopedale, assignor to Hopedale Furnace Company, Milford, Mass.
97,330.—CHANNEL OPENER FOR BOOT AND SHOE SEWING MACHINES.—Orin Weeman, Lynn, Mass.
97,331.—FASTENING FOR NECKTIES.—P. S. White, Providence, R. I. Antedated Nov. 24, 1869.
97,332.—LATCH.—M. J. Woodruff (assignor to Russell and Erwin Manufacturing Company), New Britain, Conn.
97,333.—TILE OR SLAB FOR FLOORING AND WAINSCOTING, AND FOR THE MANUFACTURE OF FURNITURE.—E. H. Woodward, New York city.
97,334.—RAILWAY SWITCH.—W. L. Yantis, Brownsville, Mo.
97,335.—LUBRICATING COMPOUND.—W. N. Abbott, Boston, Mass., assignor to himself, G. W. Boyle, and F. N. Terrent, Baltimore, Md.
97,336.—PRINTING PHOTOGRAPHS.—Joseph Albert, Munich, Bavaria.
97,337.—PLOW.—C. C. Ansley, Americus, Ga.
97,338.—SCHOOL DESK AND SEAT.—B. W. Arnold, Des Moines, Iowa.
97,339.—MACHINE FOR PLANTING POTATOES.—L. A. Aspinwall, Albany, N. Y.
97,340.—VELOCIPEDE.—S. M. Bailey, Cottage Grove, Minn.
97,341.—MIDDLINGS SEPARATOR.—Joseph Barker (assignor to himself, A. L. Brown, and T. H. Brown), Chicago, Ill. Antedated Nov 17, 1869.
97,342.—ANCHOR.—E. T. Barlow, San Francisco, Cal.
97,343.—MACHINERY FOR PROPELLING CARS.—G. T. Beauregard, New Orleans, La.
97,344.—CANCELING PUNCH.—M. E. Berolzheimer, New York city.
97,345.—LINIMENT FOR THE TREATMENT OF NEURALGIA, RHEUMATISM, ETC.—Benjamin Bissell, New London, N. Y.
97,346.—STEM WINDING WATCH.—Edouard Bourquin, New York city.
97,347.—HOT AIR FURNACE.—Robert Boyd and J. C. Hart, Rochester, N. Y.
97,348.—WINDOW BUTTON.—E. K. Breckenridge, West Meriden, Conn.
97,349.—PRESERVING EGGS AND OTHER ARTICLES.—Catherine Bruner, Marshall, Mo.
97,350.—MACHINE FOR TURNING WOODEN WARE.—J. C. Bryant and A. W. Turner, Gardner, Mass.
97,351.—BOLT HEADING MACHINE.—O. C. Burdict, Providence, R. I.
97,352.—PLOW.—P. Burns, Indiana, Pa.
97,353.—SECTIONAL STEAM GENERATOR.—A. S. Cameron, New York city.
97,354.—LUBRICATOR.—A. S. Cameron, New York city.
97,355.—WATER WHEEL.—J. T. Case, Barkhamsted, Conn.
97,356.—CUT-OFF FOR BRICK MACHINES.—Cyrus Chambers Jr., Philadelphia, Pa. Antedated Nov. 20, 1869.
97,357.—SAW-MILL.—T. E. Chandler, Indianapolis, Ind.
97,358.—LAMP CHIMNEY.—E. S. Chase, Eau Claire, Wis.
97,359.—NECK YOKE.—G. P. Cole, Hudson, Mich.
97,360.—MUSIC STAND.—Edward Conley, Cincinnati, Ohio.
97,361.—AUTOMATIC BOILER FEEDER.—Silas Cook, Magnolia, assignor to himself and Henry Ford, Sioux City, Iowa.
97,362.—WEATHER STRIP.—G. W. Cretors and Enos Hoover, Clinton county, Ind.
97,363.—BUTTON.—A. P. Critchlow, Northampton, Mass.
97,364.—PEANUT PICKER.—W. A. Crocker, Norfolk, Va.
97,365.—MODE OF PRODUCING WHITE LEAD.—J. G. Dale and Edward Milner, Warrington, England.
97,366.—TWO-WAY COCKS.—D. F. Dodge, Lowville, N. Y.
97,367.—ARBOR OR FENCE POST.—J. P. Dorman, Galesburg, Ill. Antedated Nov. 25, 1869.
97,368.—COMBINED RAKE, WEEDER, AND SMOOTHER.—A. F. Duckwitz, New York city.
97,369.—CLOTHES SPRINKLER.—S. G. Dugdale, Richmond, Ind.
97,370.—SUPPORT FOR ELLIPTIC SPRINGS.—Ellis Eves, Millville, Pa.
97,371.—FEED WATER HEATER.—John Fairclough, St. Joseph, Mo.
97,372.—BOILER FLUE CLEANER.—John Fairclough, St. Joseph, Mo.
97,373.—MILLSTONE DRESS.—John Fairclough, St. Joseph, Mo.
97,374.—SUBMARINE TELEGRAPH CABLE.—M. G. Farmer, Salem, Mass, assignor to the American Compound Telegraph-Wire Company, New York city.
97,375.—BEDSTEAD FRAME.—J. N. Farnham (assignor to Woven-Wire Mattress Company), Hartford, Conn.
97,376.—BENCH CLAMP.—O. L. Fenner, Rochester, N. Y.
97,377.—CULTIVATOR.—James Ferguson, Huntley Grove, Ill.
97,378.—ROAD GRADER.—E. L. Foreman (assignor to Edward Foreman), Rantoul, Ill.
97,379.—EGG BEATER.—H. G. Fougen and A. C. Fougen, Cape Girardeau, Mo.
97,380.—COMBINED SEEDER, ROLLER, AND DRAG.—John V. B. France, Boscobel, Wis.
97,381.—HINGE.—Louis Fruhinsfeld, Newark, N. J.
97,382.—PUMP.—Aaron Fuller, Marietta, Ohio.
97,383.—ROTARY BELL HEAD.—Samuel M. Fulton and Wm. M. Fulton, Pittsburgh, Pa.
97,384.—FEED CUTTER.—Warren Gale, Peekskill, N. Y.
97,385.—PACKER FOR RAILWAY CAR SPRINGS.—Perry G. Gardiner, New York city.
97,386.—BED SPRING.—F. J. Gardner, Washington, N. C.
97,387.—FIREBOX.—Redman Gay, Richmond, Va.
97,388.—PLOW.—James R. Gilbert, Wootens, Ga.
97,389.—STEAM PUMP.—Walter W. Gilbert, New York city. Antedated November 24, 1869.
97,390.—MODE OF CONSTRUCTING WATER PITCHERS AND OTHER VESSELS.—Kingston Goddard, Richmond, N. Y.
97,391.—COMBINED WATCH KEY AND TOOTHPICK.—Henry E. Graham and Richard D. Child, Boston, Mass. Antedated November 24, 1869.
97,392.—INSULATOR FOR TELEGRAPH WIRES.—W. D. Guseman and E. C. Bright, Morgantown, West Va.
97,393.—SAWING MACHINE.—E. R. Hall and Wm. H. Town, Syracuse, N. Y.
97,394.—GRAIN DRILL.—W. N. Hamilton, Odessa, Del.
97,395.—COMBINED HAY RAKE, THRASHER, LOADER, AND STACKER.—James R. Hammond, Sedalia, Mo.
97,396.—LANTERN.—H. W. Harkness (assignor to himself and Andrew Turnbull), New Britain, Conn.
97,397.—PAPER FILE.—B. F. Herr, Livingston, Ala.
97,398.—AUGER HANDLE.—George W. Herring, Bangor, Me. Antedated November 27, 1869.
97,399.—INSTRUMENT FOR PULLING WEEDS.—Daniel M Holmes, Watkins, N. Y.
97,400.—SASH BALANCE.—John Douglas Hopkins, London England. Patented in England, November 20, 1868.
97,401.—BELLY-BAND FASTENER.—Charles H. Horne, Astoria, Oregon.
97,402.—COMBINED STOVE AND WATER HEATER.—Henry Howard, Springfield, Mass. Antedated November 20, 1869.
97,403.—EXTENSION CRIB AND BEDSTEAD.—Charles H. Hudson, New York city.

97,404.—Paddle Wheel.—Wm. Huffman, Oshkosh, Wis.
97,405.—Steam Condenser.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.
97,406.—Condenser Valve.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.
97,407.—Railroad Car Wheel.—Lewis B. Hunt, Leverett, Mass.
97,408.—Wagon Skein.—John C. Johnson, Golconda, Ill.
97,409.—Clothes Line.—P. C. Johnson (assignor to Mary Johnson), Central City, Colorado Ter.
97,410.—Railway Car Coupling.—Wm. C. Johnson (assignor to himself and Aaron Johnson), Fort Madison, Iowa.
97,411.—Velocipede.—Willis H. Johnson, Springfield, Ill. Antedated November 27, 1869.
97,412.—Weather Strip.—Joseph Johnson, Chicago, Ill.
97,413.—Churn.—Jacob Klingensmith, Warren, Ohio.
97,414.—Stove Damper.—L. W. Langdon, Northampton, Mass., assignor to himself and Edwin R. Locke, Keene, N. H.
97,415.—Device for Grinding Saw Gummer Burrs.—Chas. E. Lewis, Northfield, Vt.
97,416.—Harrow.—Samuel H. Lintan, Burrows, Ind.
97,417.—Metallic Solution for Coating Iron and Steel.—Alson A. Lothrop, Neponset, Mass.
47,418.—Corset.—Henry Alexander Lyman, Cheapside, London, England, assignor to Thompson, Langdon & Co., New York city.
97,419.—Photographic Printing Apparatus.—L. J. Marcy, Newport, R. I.
97,420.—Oyster Dredge.—Thomas F. Mayhew, Port Norris, N. J.
97,421.—Velocipede.—Charles A. Maynard, St. Louis, Mo.
97,422.—Street Sprinkler.—R. Y. McConnell and George Pringle, Rochester, N. Y.
97,423.—Safe.—Wm. McFarland, Williamsburg, N. Y.
97,424.—Cotton Seed Planter.—Matthew McMillian Caney, Arkansas.
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89,144.—Gang Plow.—Dated April 20, 1869; reissue 3,750.—T. J. Hall, Bryan, Texas.
58,268.—Gate Latch.—Dated Sept. 25, 1866; reissue 3,751.—R. A. Leeds, Stamford, Conn.
94,805.—Composition of Liquids for Tanning.—Dated Sept. 14, 1869; reissue 3,752.—Ira Wood, Woodstock, Vt.
90,246.—Plow.—Dated May 18, 1869; reissue 3,753.—H. B. Durfee, Decatur, Ill.
61,070.—Manufacture of Whipstocks.—Dated January 8, 1867; reissue 3,754.—Liverus Hull, Charlestown, Mass.
34,178.—Clothes Wringer.—Dated January 14, 1862; reissue 3,755.—Metropolitan Washing Machine Company, Middlefield, Conn, assignee of A. M. Bailey and J. O. Couch.

DESIGNS.

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3,768.—Frame of a Carding Machine.—E. C. Cleveland, Worcester, Mass.
3,769.—Trade Mark.—H. Fenn, Plymouth, Conn.
3,770.—Printers' Type.—Julius Herriet (assignor to D. W. Bruce), New York city.
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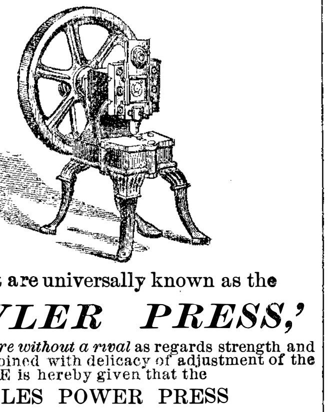

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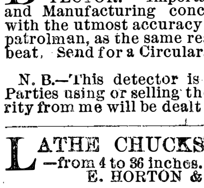

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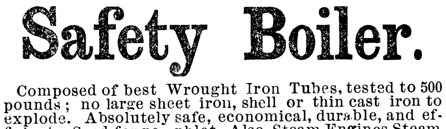

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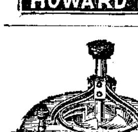

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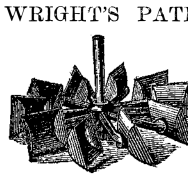

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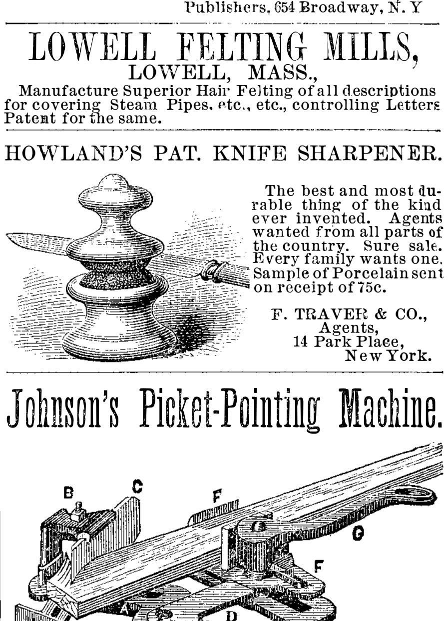

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