SCIENTIFIC AMERICAN

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

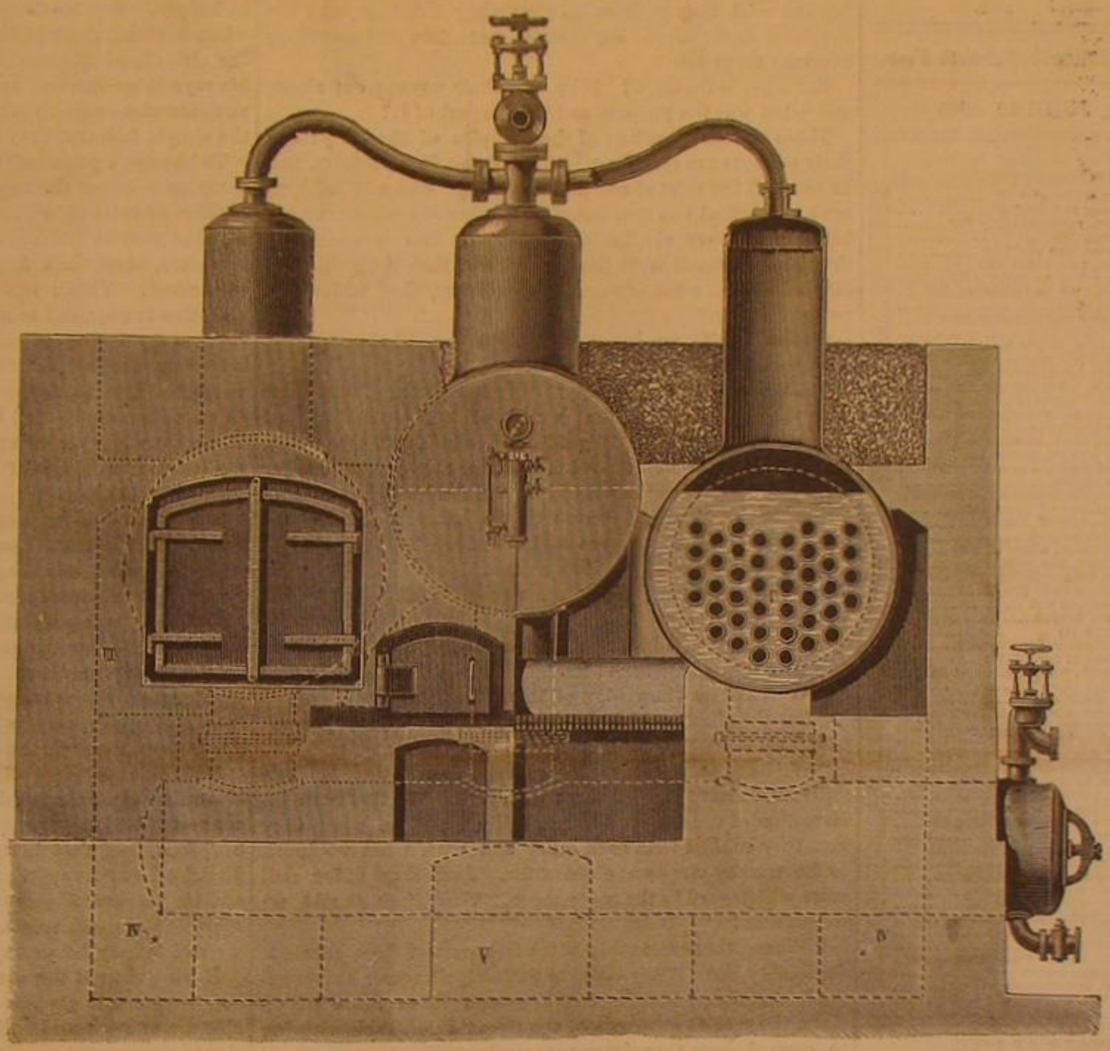
Vol. XXXII.—No. 24. (NEW SERIES.) | NEW YORK, JUNE 12, 1875. | $3.20 per Annum, Postage prepaid.

IMPROVED COMPOUND STEAM BOILER.

In spite of the economy in fuel and in the space occupied by multitubular boilers, the crowding the interior with tubes, and so diminishing the steam space, is by many engineers looked upon as a serious disadvantage; and a method of combining ample steam room and large heating surface has long been a desideratum, especially in cases where the boiler is liable to be suddenly called upon for a large supply of steam. In such cases, the multitubular boiler (which must, of necessity, carry a high water level) is very likely to commence priming; and damage to the engine is almost certain to ensue.

Mr. R. Wolff (of Buckau, Magdeburg, Germany) has succeeded in constructing a triple boiler, in which the two side boilers are multitubular; while the central one is plain, affording ample space for steam and water. Moreover, the tubes of the two outer boiler can be removed to allow them to be easily cleaned out. All three boilers are connected, by vertical tubes, with a feed water heater placed laterally below them; and communication between the three is maintained by compensating tubes, so arranged that live steam is taken from the central boiler only. The hot gases pass from the front to the rear of the boilers, then forward through the tubes, and back at the outside of the boilers, and lastly downward, around the feed water heater, and to the chimney, thus utilizing a large proportion of the heat, there being no conduction by walls of flues, etc.

The inventor states that experiments have substantiated his claims as to the efficacy of this heat generator, which deserves attention for its novelty and simplicity.



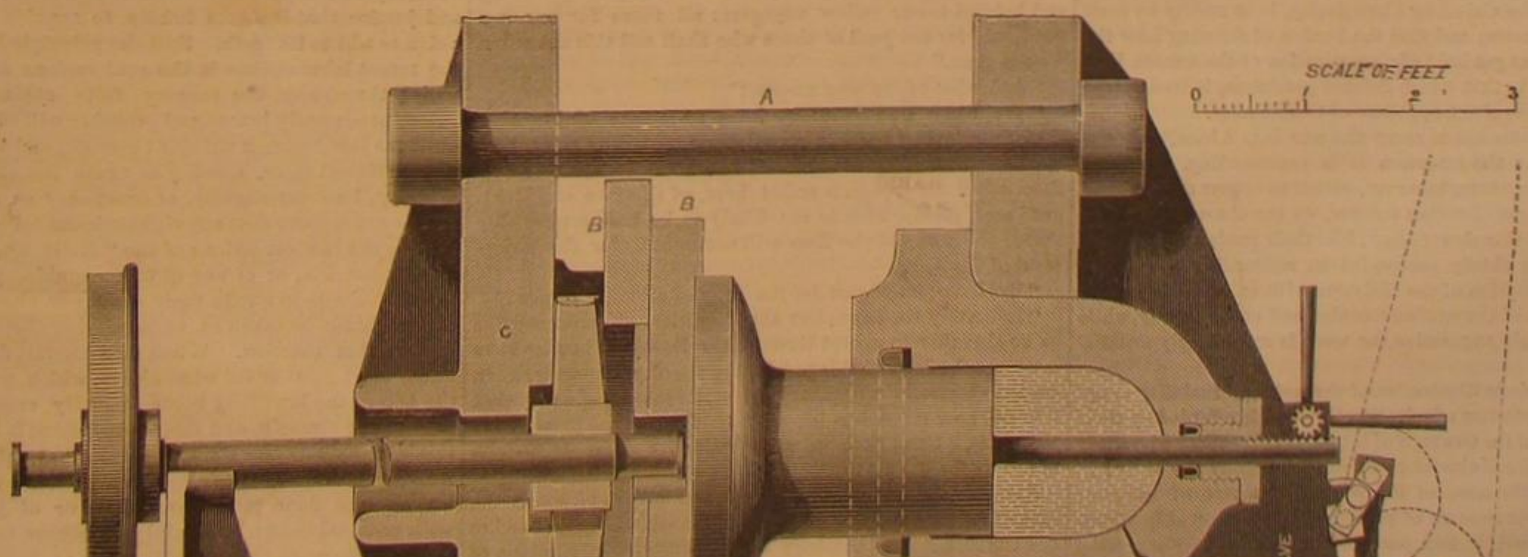
WOLFF'S TRIPLE STEAM BOILER.

DRIVING ON TYRES BY HYDRAULIC PRESSURE.

A correspondent of the *Engineer* has designed the hydraulic tyre press which we herewith illustrate. We cannot do better than permit him to speak for himself, only adding that the press appears to us to be well designed and likely to perform its work very satisfactorily. "Much," he writes, "has been said with reference to the breaking of tyres, and of the different modes of fastening them to the wheels. As no cure is so good as prevention, it will be the best policy to adopt a system for putting on the tyres, the safety of which is to depend on the strength of the tyre more than on any particular fastening. At present the plan most generally adopted is that of shrinking them on, but this seems rather an unsatisfactory way. If the tyre be much less than the diameter of the wheel, the strain in contraction would be very great. A tyre 10 feet in circumference and having a tensile strain of 11·5 tuns per square inch, equal to about one half its ultimate tensile strength, would extend 0·1164 of an inch; so that in shrinking on tyres the greatest care is necessary, or else they may be strained almost to the point of rupture. I think the most satisfactory way would be to turn or bore the tyres to a tight fit and force them on by hydraulic pressure. If the circumference of the wheel be 10 feet and the circumference of the tyre be 0·0437 of an inch less, and it be pressed on, it will have a strain of 4·5 tuns per square inch, which would be quite safe; the usual fastening could still be employed. The engraving shows an arrangement for putting on tyres; any slight modification could be made to suit local circumstances. The bars, A A, are fitted with slots or openings that they may be brought nearer or put further from the center, and the pieces, B B B B, can be changed for the larger wheels. There is an opening in the plate, C, to admit the axle, and by short temporary rails the wheels can be rolled into position."

The action of the press will be understood at a glance; and although the common use of solid cast iron wheels, as practised in this country, will prevent a very extensive demand for such machines, there are many uses, apart from rolling stock construction, to which they could be put. For driving wheels of locomotives, of course they could be employed and other uses will doubtless suggest themselves to our mechanical readers.

The New York Board of Trade has a special committee of merchants and publishers, who have placed themselves in communication with all the large cities with reference to the objectionable law on the postage of small parcels and publications. It is intended to introduce a bill into the next Congress for its immediate repeal



HYDRAULIC TYRE PRESS.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year, postage included	$3 20
One copy, six months, postage included	1 60

Club Rates:

Ten copies, one year, each $2 70, postage included	$27 00
Over ten copies, same rate each, postage included	2 70

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VOLUME XXXII., No. 24. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, JUNE 12, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

TWO VIEWS OF THE VOYAGE OF LIFE.

Taking the law of continuity as the basis of their argument, the authors of "The Unseen Universe, or Physical Speculations on a Future State"—the latest and one of the ablest of the many attempts to reconcile religion with Science—have endeavored to prove that the scientific view of the composition and government of the Universe is in the closest harmony with the view presented in the Christian records: that Science, legitimately developed, instead of appearing antagonistic to the claims of Christianity, is in reality its most efficient supporter; and that the burden of showing how the early Christians got hold of a constitution of the unseen Universe, similar to that which Science proclaims, is transferred to the shoulders of the opposers of Christianity.

It is a bold attempt to carry the war into Africa, and one well deserving the attention it is commanding. It lying without our province, however, either to oppose or to defend the claims of the Christian records, we can observe only that the authors of this clever essay, like their predecessors in the same field, are chiefly successful in reconciling a fanciful scientific conception of the Universe with an equally fanciful interpretation of the written records; and consequently, while it is exceedingly suggestive, the work is exceedingly unsatisfactory.

A characteristic illustration of the authors' inability to appreciate the position of scientific thinkers is afforded by their comparisons of the two sorts of investigators—those who study the How of the Universe and those who study the Why: in other words, the men of Science and the men of religious speculation—to two sets of passengers on a great ship plying between two well known ports. The one set, they say, keep on deck and try to make out, as well as they can, the mind of the steersman regarding the future of their voyage after they have reached that port to which they know they are all fast hastening, while the other set keep down below and examine the engines. Occasionally there is much wrangling at the top of the ladder where the two sets meet, some of those who have examined the engines and the ship asserting that the passengers will all be inevitably wrecked at the next port, it being morally impossible that the good ship can carry them further. To whom those on deck reply that they have perfect confidence in the steersman, who has informed some of those nearest him that the passengers will not be wrecked, but will be carried safely past the port. And so the altercation goes on: some who have been on deck being unwilling or unable to examine the engines, and some who have examined the engines preferring to remain below.

The work professes to regard the problems of the unseen Universe from the standpoint of Science, but the writers have been quite unable to divest themselves of their theological prepossessions: from first to last, as in the foregoing comparison, the theological bias is paramount. Science does not and cannot look upon the voyage of life, or the voyagers, in any such manner. Mankind are not all passengers in the same ship, though they may be regarded as sailors on the same sea. Each has a vessel to himself—the fragile craft he finds himself in possession of when his day of self-consciousness comes—and must guide it with such knowledge as he may gain by his own observation and the advice of those who have been longer afloat.

The sea is stormy, the winds conflicting, the currents baffling. Out of the mists on every hand, new crafts are constantly appearing; and on every side, at every stage of wind and weather, multitudes are disappearing: now in the calm noonday, now buffeted by midnight storms, now wrapped in fog and mist, they go down like so many Schillers, and the survivors drift on, knowing that the same fate will sometime overtake them also.

But what is that fate? Why was their voyage cut short, and what was the purpose and the purport of it?

These are the questions of the disciples of the Why: and their answers are confident. "The Great Pilot knows, and he has told the pilot of our fleet that those who sail with us are not wrecked but translated to another sea, where, with a better craft, they shall sail eternally in fair weather. If they have swerved from the right track, then their wreck is dire indeed: on a sea of storm and darkness, they suffer perpetual disaster."

"How shall we know the right way?" the anxious voyager asks.

"Sail with us," is the reply. "Long ago, the Great Pilot gave the captains of our fleet a chart of this sea and one of the seas to come. He still guides the winds and the waves for our good. If we follow his chart (or the leaders who remain in communication with him), we shall surely suffer no wreck, but shall be transferred to the halcyon sea, for the navigation of which we are now in training."

But the disciples of the How remain aloof.

"Whither are you going?" our voyager asks.

"We do not know."

"Do you not sail for the halcyon sea, or fear the sea of darkness and great storm?"

"We have no knowledge of them," is their reply.

"But the charts which the Great Pilot gave: have you not seen them?"

"We have seen many that claimed that title," is their reply: "we have studied them with care. We find little information of the sea we now are sailing, and in what they give they conflict with each other and with what we know to be true by our own observation. And they differ still more with regard to the seas unseen. Wherefore should we trust them?"

"Worse: the seamanship of the followers of these charts is deplorably bad. They come to untimely disaster: and sometimes sanguinary battles occur between these fleets which claim the special guidance of the Great Pilot, each striving to compel those they deem perversely sailing to tack about and go with them. We cannot trust them."

"What seek ye then?"

"These things," the disciples of the How reply: "to learn the sea that surrounds us—the ways of the winds and the currents, the places of the quicksands and the reefs: to learn the nature of our fragile crafts that we may make them staunch and keep them from all avoidable risks; to perfect our seamanship as best we may, that our voyage may be long and helpful to our fellow voyagers: all these for our own good, and for the good of those who shall sail this sea when we are gone."

"And what of the seas unseen?"

"We know them not: we have no means of knowing them: no time to waste in speculations regarding their possible existence and character. If such there be, and we go to them when our voyage is ended here, of this we confident: good seamanship here is not likely to be bad seamanship there: the study of the Now will not unfit us for the enjoyment of the Then.

"But have you no care for the Why of all these things?"

"Indirectly we have; but the faculties we possess give us no clue thereto except through the How. When we have mastered the laws of this perplexing sea of phenomena, when we have learned the nature of this environment of ours, what it is and how it came to be, we may be prepared to consider Why it is. Until then we must wait; for there is no one to tell us for the asking."

Such are the real relations of the two orders of men—the men of Science and the men of religion—to each other and to the Universe. And theology will have to change its plane of thought and ways of thinking more than the authors of "The Unseen Universe" have been able to do, before they can establish for themselves even a theoretical oneness with the purposes and conclusions of Science.

THE SECRET OF SPRING WEATHER.

Our late erratic spring has provoked the usual amount of comment and discussion, yet we have failed to notice any attempt to trace the causes of the persistent chilliness of the air in the face of the sun's manifest power, or to account for the sudden summer heat of May.

Not that there has been anything extraordinary in the conditions of the weather this year. Spring in our climate is always an uncertain blending of winter and summer, each retaining much of its native peculiarity; so that it is no uncommon thing for a morning mild as June to be followed by a snowstorm in the afternoon, or for an icy wind, piercing as an arctic blast, to sweep the open country, while in sheltered places the sun burns with midsummer intensity. Such contrasts are tiresomely common, yet they never cease to strike us as something abnormal. In spite of our yearly experience to the contrary, we persist in thinking that winter's severity ought to let up gradually; that the transition from winter to summer ought to be as gentle and uniform as the change from summer to winter. Why it is not and cannot be may be worth a moment's thought.

It is well known that one of the chief factors of climate is the sun's altitude. The more nearly vertical its rays, the greater its power. The sun's position, however, is not the only factor. If it were, February would be as mild as October, April as hot as August. When under favorable conditions we experience the sweltering heat of the sun's untempered rays in spring time, we are apt to say that it must be through contrast with the winter's cold that we feel the heat so keenly. But we deceive ourselves. During the months when winter lingers in the lap of spring, the days are as long, the altitude of the sun is as great, and the heating power of his rays is as intense as in midsummer. Their failure to mitigate more rapidly the severity of the season is due to the simple fact that they have other work to do.

To change a pound of ice at 32° to water of the same temperature requires the expenditure of 143 units of heat, each capable of raising, when converted into mechanical motion, a pound weight 772 feet high. In melting a pound of ice, therefore, more than fifty-five foot tuns of solar energy is exhausted. Think what an incalculable amount of solar radiation is required to melt the millions of tuns of ice and snow every spring between this and Greenland!

During the fall months, immense amounts of water are converted into ice in the northern hemisphere, setting free an enormous amount of heat to reinforce the rays of the declining sun, giving us an Indian summer at a season when the weather would be coldest did the temperature depend upon the sun alone.

This year winter lingered unusually late, and summer came with a burst. The ice in the lakes and rivers was uncommonly thick, and the ground was covered deep with snow. To convert this snow and ice into water taxed the sun's power, so that it was not until after it had reached the northern tropic and was southward bound again that it began to gain on the wintry weather. It will be remembered also that the greater part of the snow was not merely melted, but evaporated. It disappeared while we were anticipating disastrous floods—not through the rivers, but into the air.

Had the snow gone off in the form of water, each pound of it would have exhausted 55 foot tuns of solar energy. To convert it into vapor required about seven times as much, or 372½ foot tuns, that being the mechanical equivalent of one pound of water vapor. In view of the vast amount of snow and ice evaporated this spring, it is not surprising that the approach of warm weather was so dilatory. It was the price we had to pay for exemption from floods and freshets.

Having cleared the ground of snow and snow water, the sun was free to give its full force to the earth, which, in the absence of the usual spring rains, was speedily put in condition to convert the sun's rays into heat for the warming of the air. Consequently the interval was brief between reports of ice floes in the harbor and sunstrokes in the streets.

THE RIGHT TO INTERFERE.

The right of every man to dispose of his labor as he sees fit, or to conduct his business affairs according to his own ideas, so long as the rights of the community in general are not trespassed upon, is so well founded in common sense and justice that it seems hardly to require a judicial decision to add to its truth. Still the principle is one which, as the recent labor strikes in the coal regions and in various trades throughout the country fully evidence, the trade unions persistently ignore, and probably will continue so to do until the law becomes stringent enough, and is administered with sufficient vigor, steadily to crush out any proceedings savoring, however slightly, of conspiracy or undue coercion. We do not believe that any right-minded laboring man will indorse the lawless actions of the "Molly Maguires" of the mining districts, or of any of the misguided people who resort to violence to obtain their ends; nor should the course of such bands be taken as exemplifying the usual mode of trade union coercion. When men commit deeds, no matter under what guise or for what object, which put them under the ban of the law, they become equally criminal with the thief or the assassin, and their punishment is identical. We think, or at least we want to think, that ruffianism is fast reaching a low ebb in our trade societies, and that misguided actions are done more through error of judgment than with criminal intent. Certainly we adhere to the belief that good intentions on the part of the men predominate over bad; but on the other hand it is not to be lost sight of that the very best of motives may underlie practice which in itself is highly prejudicial to the rights of other people. And here we reach the boundary, on one side of which lie those appeals to a man's cupidity, or sense, or honor, or any other sentiment he may possess, which are perfectly justifiable from his friends or from others interested with him in a common pursuit if made in one way, and on the other those same appeals made in another manner, which, from its very nature, includes an apparent conspiracy against a third person. Thus, there is certainly no harm in A endeavoring to show to B that B is losing money or injuring his interest by working for C, and that he could improve both the affairs of himself and also of his brothers in trade by seeking labor elsewhere. But if A and his friends should post themselves in front of C's door, and tell B, D, and E, and every other employee of C's whom they met, that C would not accede to prices fixed by A and company, and that the shop was black-listed, and then should endeavor to make B and his comrades leave their work, not directly for B's benefit, but first to injure C, and thus coerce him into benefiting A: such is clearly wrong, since it is an invasion of the rights of C.

A recent case decided in England exemplifies this point very clearly, and at the same time adds another to the precedents which stand to mark how far trade unions can lawfully interfere with trade. Messrs. Jackson & Graham, a large upholstering firm in London, altered their system of paying per hour to that of piece work throughout their entire establishment. The operatives at once, with a few exceptions, struck, whereupon the firm promptly supplied their places with non-society men, and continued business. The strikers then through their association, stationed pickets in the vicinity of the shops, waylaid the workmen going and coming, and for the space of three months persistently labored, though with little success, to induce the new hands to join them. No physical intimidation was employed, and nothing but verbal persuasion used to discourage the men from their labor. Finally the proprietors caused five of the ringleaders of the pickets to be arrested on the criminal charge of conspiracy. The trial involved the services of very eminent counsel, and lasted two days. Baron Cleasby, the presiding judge, in his charge laid down the law clearly and emphatically, that it was an offense to offer any molestation or obstruction to a working man, to coerce him to quit his employment, or to a master, to alter his mode of carrying on his own business. Picketing, he said, might not be unlawful under certain circumstances; but it is when carried on in such a manner, and to such a degree, that it might be expected to influence other persons to the extent of annoyance, apprehension, or loss. The case went to the jury on a mere question of fact; the defendants were found guilty, and sentenced to brief imprisonment.

THE IRON HORSE.

On page 340 of our current volume, we published a letter from Mr. Flower, President of the West End Railroad Company, of Philadelphia, Pa., in which he offers a premium of $5,000 to the inventor of a substitute for horses, to draw street cars, on condition that he gives the company the control of the invention. It appears to us that, considering the difficulties of the problem and the immense value of a successful solution thereof to those having the control of it, the compensation is rather trifling. This practical problem has been occupying many minds for several years, and many others are working at it now; but the difficulties are scarcely realized unless we consider the great advantages possessed by the living horse, in case only the power of one, two, or three horses is required. When we need the power of ten, twenty, or more horses, no doubt the locomotive is preferable; but we doubt if locomotives of one or two horse power will ever be found to give satisfaction even when well constructed, as they can never compete with a living horse, the trouble of raising which is less than the labor of building a locomotive in a shop. And the horse takes its own water and fuel when needed, and needs no stoker; it also continually repairs itself, until it is entirely worn out. Even then, at its dissolution, there is no danger of bursting a boiler. It is always ready, and needs no firing up; and finally, having a sense of self-preservation, it will not blindly go ahead, and run in the river off an open drawbridge, as locomotives have often done. If it is objected that occasionally the control of horses has been lost by the driver, and that they ran off, it must be remembered that runaway locomotives are by no means uncommon. Taking all things into consideration, we believe that the ordinary horse is a good institution, which it will be very hard to surpass by labor in a machine shop.

GRASSHOPPER INVENTIONS WANTED.

The grasshoppers have appeared in the Western States in such countless throngs that the terrible devastation worked by them among the crops of last year bids fair to be repeated. In the neighborhood of St. Joseph, Mo., it is said the gardens are literally black with the insects, and that the land extending from that city southwest, across the Territories to the Rocky Mountains, is covered for miles in breadth. The size of the locust is from that of a flea to that of a house fly; but, in spite of its lack of growth, its inroads on vegetation are none the less severe. The Colorado journals think that the crops, not merely of that State, but of five or six States to the eastward, will be entirely ruined. This is certainly a very gloomy prospect, and the wholesale destruction of the wheat will make itself felt over the entire country.

It is getting high time that the extermination of this nuisance should engage more widely the attention of inventors. A machine, for example, which can be dragged over the fields before the crops are put in, and which will destroy the eggs deposited in the ground, is needed; or a device might be produced for killing the grown insects without injury to the crops. The Greeley *Tribune*, located in the midst of the ravaged district, says: "We want the same acuteness, the same nice observation applied to the grasshopper question, that is applied to abbreviating labor by mechanical contrivances and in constructing works of beauty and skill. Enough ingenuity is displayed in the sewing machine to catch every grasshopper in our valley and skin him into the bargain." There have been already several attempts made to invent the grasshopper out of existence. The apparatus last brought out is a fire machine, which is simply a grate on runners. The inventor says that "pitch pine is used for fuel, and our Colorado zephyrs fan it into a miniature hell." The fire is made on the grate, and a sheet iron cover directs the blaze downward. This machine is dragged by a team around in circles of large diameter, burning the hoppers which get under it and driving others before it, "corralling" them, in fact, in the scorched circumference. It keeps on its circuitous route in gradually decreasing circles until every insect within an extended radius is burned.

Ditching entirely around the fields, and filling the cut with water, is said to keep the grasshoppers out. This is probably of little use, however, after the insects are able to fly. Another plan is to keep the entire land wet (a rather difficult operation, we should imagine), it being found that the hopper prefers dry localities to damp ones. A farmer who has adopted this mode of protecting his fields combines it with the ditch system, keeping the ditches filled with running water, which is made rough by passing over a number of small dams. He cuts the ditch first around the plot, and then wets the enclosed area. The grasshoppers try to crawl off, and then tumble into the ditches where they are quickly drowned and washed away. If he finds an army marching in from a new quarter, he directs a stream of water on the threatened point and thus heads off the column. Another individual has saved a ten acre patch by putting a little kerosene oil just above the head gate which admits water to the enclosing ditch. The oil floats on the surface and is held in place by a board, the edge of which touches the water. Under this board it gradually leaks out, forming a film over the entire ditch, rendering the latter a river of death to the insects. We notice also another fire invention somewhat similar to that already described. It has wings on which fires are kindled, and a fan which blows the insects into the flame.

It seems to us that a good road engine, rigged with an extra boiler to make steam which could be directed in jets downward—something after the fashion of the numerous snow-melting inventions—might be usefully employed. It could go over the ground quickly, and one machine would serve to protect a large area. Or there is that apparatus we described a short time ago, which makes a fearful heat underneath it by a current of superheated steam entering ignited naphtha gas. This melts thick ice by merely passing over it at the rate of some four miles per hour. Judging from this effect, the machine would readily destroy grasshoppers.

The Governor of Missouri has appointed a day of prayer for relief from the scourge. If these supplications are as earnestly supplemented by products of our inventors, we have not the slightest doubt but that they will be answered. Meanwhile, we commend to the people of Missouri the old maxim: "Help yourself and God will help you;" in other words, invent first and pray afterwards.

CLIMATE OF THE ICE AGE.

The science of meteorology has, of late years, been growing more and more in popular favor. The revelations of the United States Signal Service, and the valuable practical deductions that have been made from them, have created an interest in the subject which will not soon die. And while the climatology of our own day has commanded the careful study of our best scientists, that of earlier times in the earth's history has received equal, if not more profound, consideration. The study of the plants and animals which previously existed on the globe—including the vexed questions relating to the development of organic forms—has largely to do with the climate and state of the atmosphere that prevailed in those earlier periods.

It has long been supposed, and taught by text book and teacher, that during the carboniferous age, when the sun's heat was stored up for us in the form of coal, petroleum, etc., the atmosphere was supercharged with carbonic acid gas; but recent investigations have rendered this extremely improbable, and some late experiments have demonstrated that plants are killed by a greater amount of this poison gas than is ordinarily found in the air. But doubtless the greatest intellectual capital has been invested in a consideration of the meteorological conditions of the glacial period; and the conclusions which have been reached on the subject are as widely apart as the antipodes. While all agree that the northern part of our continent, down to 40° of north latitude, was almost completely covered with a sheet of ice from one to three miles thick, during this period, some make it a season of intense cold, and others claim that it must have been a time of moderately high temperature. Many theories have been advanced to account for the climatic changes which brought the alternations of heat and cold to our earth during the past ages. One of these is the supposition that the solar system, in its translation through space, may have passed alternately through regions of extreme cold and great heat. Another is that the earth may have changed the position of its axis of rotation, because of some great mountain upheaval between the equator and the poles. Still another is the wild supposition that the earth's crust has gradually slipped on its nucleus, so as to bring the equatorial belt nearer to the pole than usual, and then away from it again. Lyell has attributed these changes to a supposed change of place between the land and the sea. *He argues that, if the land were* accumulated most in the tropics, the vast amount of solar heat which it would "soak up" would be carried by currents to the polar regions, and afford nearly or quite a summer climate to any islands that might be situated there. And if the land were accumulated about the poles, it would result in a great diminution of terrestrial heat, because the water, which is exposed, in this case, to the direct rays of the sun, has far less heating power than the land. Professor Shaler has advanced the idea that these changes may be explained on the supposition that our sun, like many other suns in the universe, is a variable star, and makes our earth warm or cold according as its brightness varies. Whether any one of these is the real cause of past cosmical climatic changes, we cannot say; but we can reasonably conceive that the first and the last two may each be considered a true cause.

Among those who believe the ice age to be one of extreme cold, stands prominently Mr. James Croll. His theory for explaining the cause of this cold is based upon the eccentricity of the earth's orbit, the precession of the equinoxes, and the obliquity of the ecliptic. The orbit of the earth is an ellipse, varying in eccentricity as the planets are variously situated in their orbits, being most elliptical when the planets draw it farthest from the sun. Its rate of variation is very variable. If a plane pass through the sun's center, parallel to the plane of the earth's equator, it will cut the earth's orbit in two opposite points, namely, at the vernal and autumnal equinoxes. The line between these points does not divide the earth's orbit into equal parts, on account of its eccentricity. The earth passes through the perihelion part of its orbit in seven or eight days' less time than through its aphelion part. Hence, now our winter is shorter than our summer, and *vice versâ* in the southern hemisphere. The action of sun and moon on the protuberant equatorial mass of the earth is constantly changing the plane of the earth's orbit, and hence, also, the position of the line joining its equinoctial points. These make a complete revolution in about 21,000 years. Now, when the earth had its winter in the northern hemisphere, while it was in aphelion, its winter was longer than the summer, hence extremely cold. In this case, the ice and snow of winter will not be entirely melted during the summer, because much of the sun's heat is taken up in melting ice, and therefore does not ameliorate the temperature. The result is that, during this long period, ice and snow are accumulating in the northern regions. The vapor from melting ice would obscure the sun with cloudy atmosphere in the summer, and thus make the air raw and cold. It is said by antarctic explorers that the summer there is even colder than summer in northern regions of the same latitude, though the latter are millions of miles farther from the sun.

Another consideration, Mr. Croll thinks, would make great difference with the cold at the north pole, when its winter occurred in aphelion. All permanent oceanic currents originate in the Antarctic Ocean. The chief one divides into two parts: one goes north to the East Indies; the other goes west through the Indian ocean, is deflected round the Cape of Good Hope, follows up the west coast of Africa for some distance, then crosses the Atlantic and forms two currents: the Brazilian, going south, and the Gulf Stream, going north. Now the sun causes the air at or near the equator to give place to cold currents from the poles, which rush in to produce equilibrium. During the long cold of the northern hemisphere, the north currents would be stronger than those from the south, where the climate is, at the time, warmer. He thinks this stronger current from the north might be able, by its friction on the water, to entirely stop the Gulf Stream, and leave the northern hemisphere to unmitigated cold. Croll's theory supposes that the time of the ice sheet in the northern and southern hemispheres was not synchronous, but distant by at least 10,000 years. He supposes that glacial time began some 240,000 years ago, and terminated about 160,000 years ago, that the most intense cold was about thirty or forty thousand years after the period commenced, and that there were several great changes of climate during its continuance.

Mr. Murphy claims that, if the climate at any given elevation is cold enough to form glaciers, no decrease of winter temperature will increase their magnitude, while, on the other hand, a low summer temperature is shown, by the facts of physical geography, to be eminently favorable to glaciation. He therefore concludes that the glacial age occurred when the earth's greatest distance from the sun was in summer rather than in winter.

Another theory, still more at variance with Mr. Croll's, is that held by Mr. Thomas Belt and many others. Savants of this school believe glaciation was not due to extreme cold, but to excessive precipitation. They hold that the ice was thickest over the American continent, because the great evaporating area of the Pacific lay to the southwest of it, and counter trade winds swept across it, and precipitated the moisture with which it was laden. While Mr. Croll makes the ice six miles at least in thickness at Greenland, it was probably thicker south of the poles than near the poles, because the water from warmer regions would be precipitated before reaching the poles. The glacial age probably existed on both continents at the same time, as traces of glaciation north and south of the equator nearly inosculate, and the character and appearance of the morains is the same in both. This *supposition only* could make correct Mr. Darwin's explanation of the fact that forty flowering plants of North America and Europe are also found at Terra del Fuego. He says that plants were driven to the equator during the ice age, and then followed the retreating ice sheet, both ways from the equator.

Agassiz considered the glacial period a cold time followed by a *much warmer one*. He thinks it not long and slow, else boulders would have been carried as far south as the ice sheet extended, but sudden and short, as is proven by Siberian elephants caught in the snow and frozen so that their flesh is preserved for recent dogs and wolves to eat.

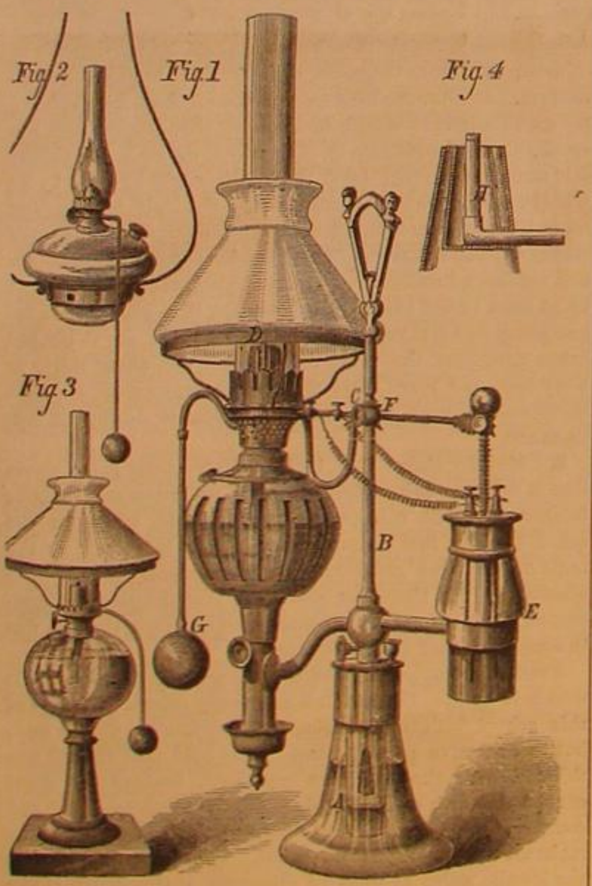
To harden a wooden pulley, boil it for about eight minutes in olive oil.

ZIMMERMAN'S HYDRO-ELECTRIC LAMP AND EXTINGUISHER.

We illustrate in the annexed engraving, Fig. 1, a curiously ingenious lamp, which has been recently invented by Professor Wm. H. Zimmerman, Vice President of Washington College, Chestertown, Md. The lamp is self-lighting, and this, although any form of burner, or wick, or any kind of illuminating fluid be used. To effect this, the inventor has arranged a combination of Professor Döbereiner's well known hydrogen lamp with a small galvanic battery, in a neat and even graceful design, so that the whole apparatus takes up no more room than the ordinary German student's lamp, which in fact, in exterior aspect, it somewhat resembles.

The Döbereiner lamp serves as the pedestal. A is the receptacle for the acid and water, and within is seen the inverted bell glass, in which the zinc is suspended. When the acidulated water attacks the zinc, hydrogen gas is evolved, which fills the interior bell glass, and forces out the water, until the latter, falling below the zinc, no longer acts upon it, and the evolution is arrested until, the gas being allowed to escape, the water again reaches its former level. This is the regular action of the hydrogen lamp, with which every student of chemistry is familiar, and regarding which nothing further need here be said. In the present instance the gas ascends the vertical tube, B, passes through the valve at C, when the same is opened, traverses a flexible tube, and finally escapes from a side orifice in the small vertical pipe, D, placed just beside the burner. Before leaving the hydrogen generator, it may be noted that the vertical tube is free to revolve in the metal cap which covers the glass pedestal, and may be secured, as desired, by the thumbscrew provided, also that said cap has a filling cup through which a fresh supply of acid and water may be poured into the pedestal. E is a small galvanic battery (bichromate of potash or otherwise), the zinc in which is attached to a verticsl rod, a spiral spring on which keeps it raised, thus holding the metal out of the exciting fluid, and normally keeping the battery out of action. To the upper end of said rod is pivoted an arrow-shaped lever, F, which connects with the valve, C, in the hydrogen pipe, so that, when horizontal, or rather when its rod-supporting end is held up by the spiral spring above referred to, the valve, C, is shut. The conducting wires from the battery lead to binding screws on the chimney frame, and thence connect with two electrodes which stand vertically beside the hydrogen outlet, D. Between these electrodes is extended a fragment of fine platinum wire.

The automatic illumination of the lamp will now be readily understood. The operator simply pushes down the knob on the end of the battery rod. By so doing, he lowers the zincs, establishing a current which heats the platinum wire,



between the electrodes, red hot. As the rod descends the lever, F, tilts, and so opens the valve, C. A stream of hydrogen then escapes at D, strikes just above the incandescent wire, becomes inflamed, and so ignites the lamp wick toward which it is directed.

The inventor states that he has had the device in operation since last November, and that during this period he has renewed the solutions but once. The ignition, he states, is now instantaneous on touching the lever.

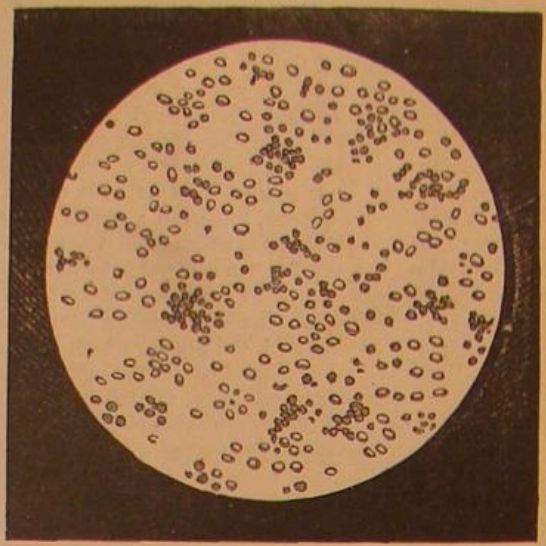
In connection with the apparatus described and applied to lamps of other patterns, in Figs. 2 and 3 we represent a novel device by the same inventor for extinguishing the light, the object being to avoid the danger resulting from the common habit of blowing down the chimney. A hollow rubber bulb, G, is connected by flexible piping to a metal tube, H, which passes up inside the burner, as shown in section in Fig. 4. Around the upper extremity of said tube are a number of small apertures, through which, when the bulb, G, is compressed, a number of radial jets of air are directed upon the burner, blowing the flame away from the wick and quickly causing its extinction. The lamps are provided with apertures for filling without necessitating the removal of the wick and chimney. As represented in Fig. 2, the device will prove particularly useful in lamps hung high and out of reach, as the flexible conducting tube may be of any length to render the bulb convenient to the hand.

These inventions were patented through the Scientific American Patent Agency, respectively March 9 and 16, 1875. For further particulars address the inventor as above.

THE DISEASES OF THE SILK WORM.

M. Pasteur, the distinguished French chemist, has recently published an exhaustive treatise on the above subject, the same being the results of his investigations conducted in the

Fig. 1.

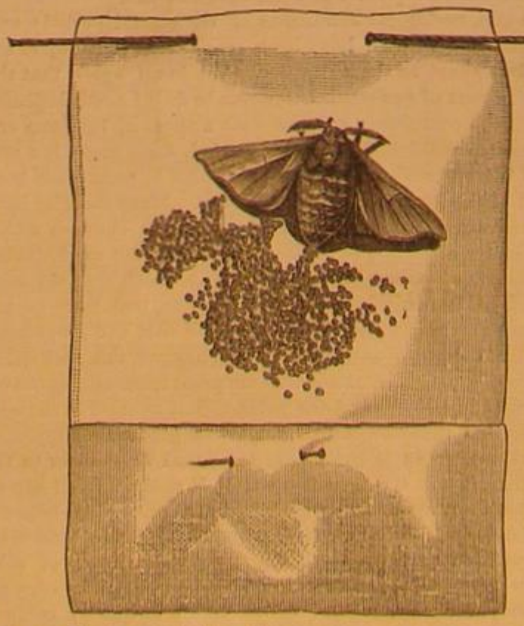


heart of the French silk-manufacturing district and under the auspices of the French Government. The enormous mortality which, during certain years, has happened among the silkworms, M. Pasteur ascribes to two diseases, each perfectly distinct. The first he terms *pébrine*, and it is characterized by the presence, in all the organs of the worm or but-

Fig. 2.

terfly, of small ovoid corpuscles, invisible except when magnified four or five hundred times, and then appearing under the microscope as represented in Fig. 1. The other disease, called *flachérie*, is an enfeeblement of the vital force of the

Fig. 3.



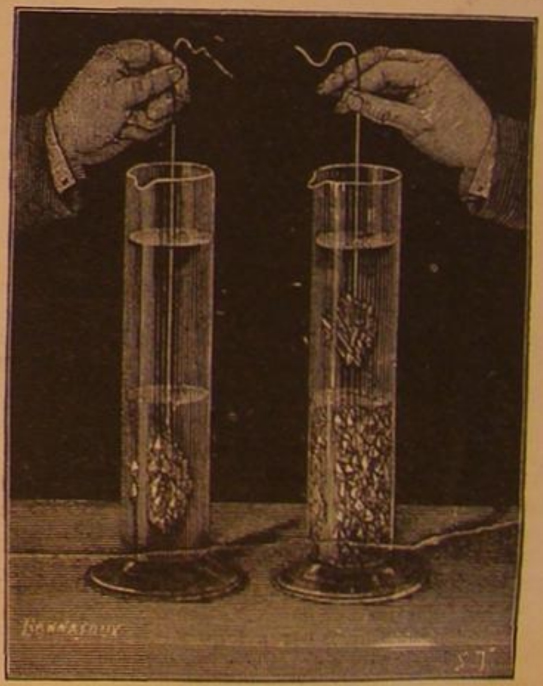
worm, and is recognized by the presence of a particular ferment in the digestive tube or stomach. The malady first mentioned attacks the worm at all ages, and is eminently hereditary and contagious. Its progress is very slow. The worm, born healthy but subsequently contracting the germ, generally has time to make its cocoon before falling a victim. The disease is, however, transmitted to the offspring, which perish prematurely. The way to avoid the trouble is to raise only such worms as come from eggs deposited by healthy butterflies. The cultivator, although by no means sure that the worms will not become diseased during their lives, is, however, secure in ultimately having cocoons which will remunerate his labor.

Flachérie is a disease more alarming than *pébrine*, because it attacks at the end of the fourth age, after the rearing is accomplished, and the cultivator expects soon to realize the fruits of his outlay of time and money. Within a few days every worm dies, leaving at the foot of the shrubs, which it had been hoped would be covered with cocoons, nothing but a mass of infected bodies. The effect of the disease is shown in Fig. 2. The malady is either accidental or hereditary, and may be caused by careless sanitary measures, in the conservation of the eggs, during the rearing, or more frequently by feeding on a leaf of bad quality. The hereditary transmission is only to be guarded against by careful selection of the butterflies which are to furnish the eggs for the crop of the following year; and those attainted, after a little experience can easily be recognized by their lack of vigor and the slowness of their movements.

M. Pasteur gives the following instruction for obtaining eggs which are almost sure to yield a remunerative harvest In selecting the cocoons, preference should be given to those from a healthy stock, which are appear to be the finest. After the butterflies emerge, those which seem at all diseased should be carefully eliminated, and the others coupled and deposited on little squares of linen or calico suspended so that the insects cannot crawl from one to the other. As soon as the fecundation is terminated, the male is imprisoned by closing with a pin either one corner of the cloth or a little tuck previously made at the lower edge. (See Fig. 3.) After the deposition of the eggs, the female should be shut up in like manner, and the whole should be kept in a dry, well ventilated place, submitted to all the variations of the exterior temperature. Nothing remains further than to examine the butterflies for corpuscles, a proceeding to which the entire winter may be devoted, as it can be done just as well when the butterflies are dried. The examination is accomplished by grinding one or both of the insects on a cloth, in a mortar, with the quantity of water necessary to obtain a thick paste. A minute drop of this is placed beneath the microscope and examined rigidly. If any corpuscles characteristic of *pébrine* are recognized, the whole batch of eggs on that cloth are at once destroyed, and so on through all, keeping only such eggs as are entirely free from infection.

CURIOUS EXPERIMENT IN INSTANTANEOUS CRYSTALLIZATION.

It is well known that various salts dissolve in water in different proportions, and that the solution usually takes place more readily when the water is warm. After cooling, crystallization of the fluid takes place, but this may be prevented by leaving the solution in absolute quiet and protecting it



from contact with the air. It is then said to be supersaturated, and the least shock, or the addition of a minute crystal of the salt, is sufficient to cause instantaneous crystallization of the whole. A curious experiment, based on the above, has recently been devised by M. Peligot: 150 parts, by weight, of hyposulphite of soda are dissolved in 15 parts of water, and the solution is turned into a large test tube, previously warmed, so as to half fill the same. Another solution of 100 parts, by weight, of acetate of soda in 15 parts of boiling water is made, and this is carefully poured in on top of the first solution, so as to float on and not mingle with the latter. To the above two solutions is then added a little boiling water, and the whole is left in quiet to cool.

After the cooling is accomplished, a little crystal of hypo sulphite of soda may be let down into the liquid. The fragment will traverse the acetate solution without effect thereon; but on its reaching the solution below, instant crystallization of the same will take place, as shown in the figure on the left of the illustration. As soon as the reaction in the hyposulphite is finished, a crystal of acetate of soda may be caused to produce a similar result in the acetate solution

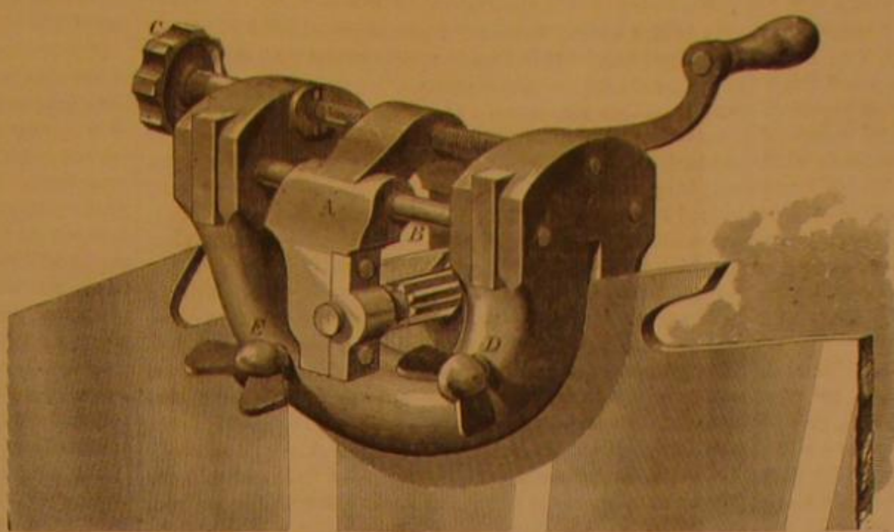
IMPROVED SAW GUMMER.

The inventor of the device illustrated in the annexed engraving states that, after an experience of eighteen years in using various kinds of saw gummers, as the result of such experience, he has produced the present machine, which he believes to be the best yet invented. It is a very strong apparatus, as will be seen from the heavy semicircular iron frame with which it is provided, the ends of which are cast solid. The cutter is journaled in the carriage, A, which slides on guides, B, and is fed to its work by the hand wheel, C. The cutter is rotated by the crank shown. The thumbscrews, D and E, hold the gummer upon the saw.

It is stated that any gullet can be started without filing or without danger of breaking the cutter by slacking the thumbscrew, E, on the lower part of the frame, until the circle of the cutter is formed.

The same is done to direct the cutter toward the center of the saw and to make a large gullet, the feed screw being operated during the turning of the crank. The screw, D, then holds the gummer upon the blade, and at the same time serves as a center about which the instrument works. There are no boxes liable to get out of order, and the bearings can be easily Babbitted. Finally, the inventor claims that the saving in cutters alone will soon cause the device to pay for itself.

For further particulars address Mr. Walter B. Noyes, Three Rivers, P. Q., Canada.



NOYES' IMPROVED SAW GUMMER.

SPAR TORPEDO WARFARE.

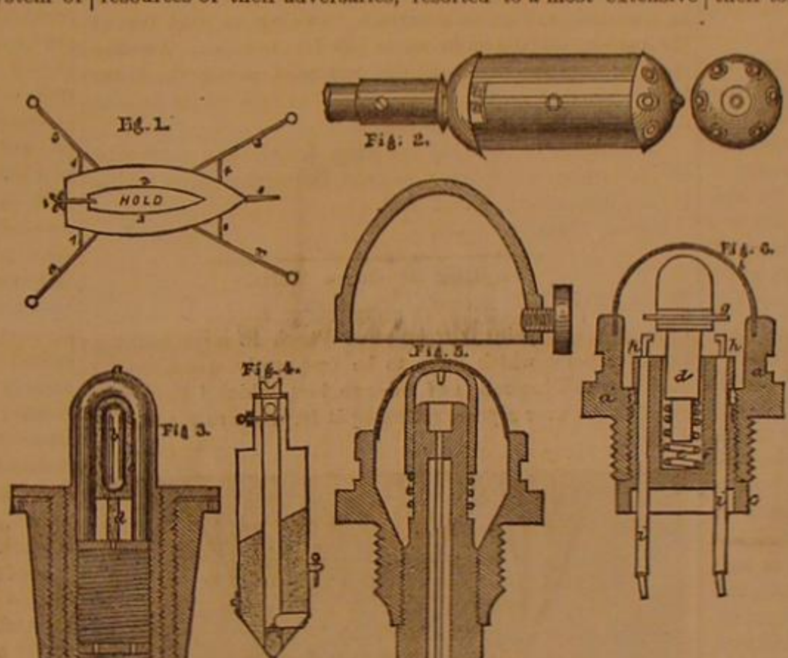
Mr. A. Sedgwick Woolley, Associate and Secretary of the Institution of Naval Architects, England, recently read before that society an able *resumé* of the torpedo system of attacking the enemy's vessels, by means of boats specially constructed for this submarine warfare, which carry their deadly bombs on the ends of spars, extending usually from the bows of the boat. We give a condensed abstract of the paper, illustrated by a series of engravings selected from the pages of *Engineering*:

Spar torpedo launches are being so generally adopted at present into the service of all foreign nations that a short sketch of the origin and history of this form of submarine warfare may be interesting, before discussing the merits and demerits of the plans now in vogue.

The first idea of an offensive attack by means of a boat, specially constructed to carry a torpedo, seems to have originated with Captain David Bushnell, of Connecticut, about the year 1775, but it had little in common with the boats now used for the same purpose. This boat, an account of which was read by the inventor before the American Philosophical Society, in 1798, was only intended to accommodate one person, who sat in a watertight chamber capable of containing sufficient air to support him for thirty minutes, and who could cause the vessel to descend and ascend at will, by letting the water into a chamber below him, or expelling it therefrom by means of two brass force pumps, at the same time letting fall about 200 lbs. of the lead, by which the vessel was ballasted, at the bottom. An attempt was made with this boat to blow up the English 64-gun ship Eagle, during the campaign of 1776; but the operator, from some reason or other, was unable to fix in the screw, and had to desist from the attempt.

The next step in the same direction was made by the celebrated Fulton, who proposed a similar diving boat to the French Government about the year 1801, and made several successful experiments in the harbor of Brest, blowing up a small vessel by means of a torpedo, which he placed under her bottom. In this boat Fulton seems to have employed a screw, operated by a crank, as a means of propulsion. The French Government, however, would not adopt his invention, and Fulton forthwith withdrew to England, in 1804, where, under the assumed name of Francis, he obtained the support of Mr. Pitt. A commission was appointed to examine into and report upon his invention, which they at once pronounced to be impracticable. Fulton then returned to America, where he also gained the ear of the minister, and had a commission appointed; but he met with great opposition, and was so unfortunate in his experiments that he gave up the attempt to introduce a system of torpedo warfare in order to turn his attention to steam navigation, which he may be said to have introduced into that country. It may be remarked, however, that, during the course of his torpedo experiments, he developed the first notion of the torpedo steam launches of to day. This idea, which never got beyond the state of a model, consisted of a vessel of 300 tuns, shown in Fig. 1, with sides 6 feet thick, designed to be cannon-proof, and musket-proof decks six inches thick. She was to be propelled by a scull wheel, and was intended to carry two torpedoes on each side, fixed on the end of spars 96 feet long, supported by guys from the masthead.

It was not, however, until, during the civil war of America, the Southern States, being overpowered by the force and resources of their adversaries, resorted to a most extensive employment of torpedoes, that the power of this species of attack was developed.

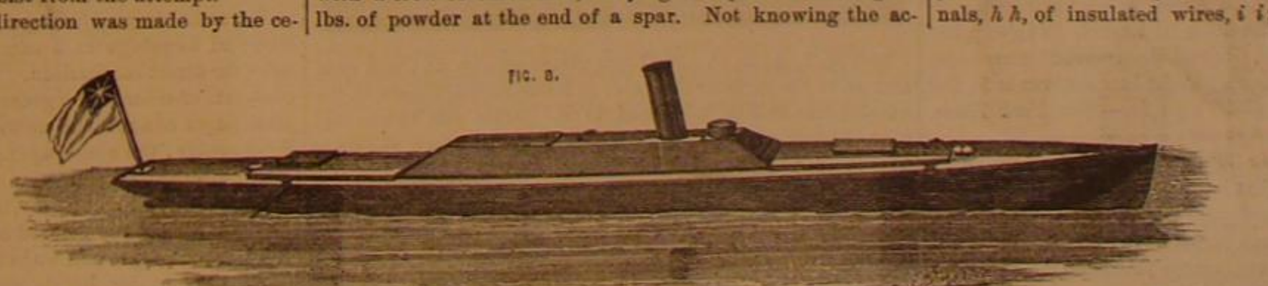


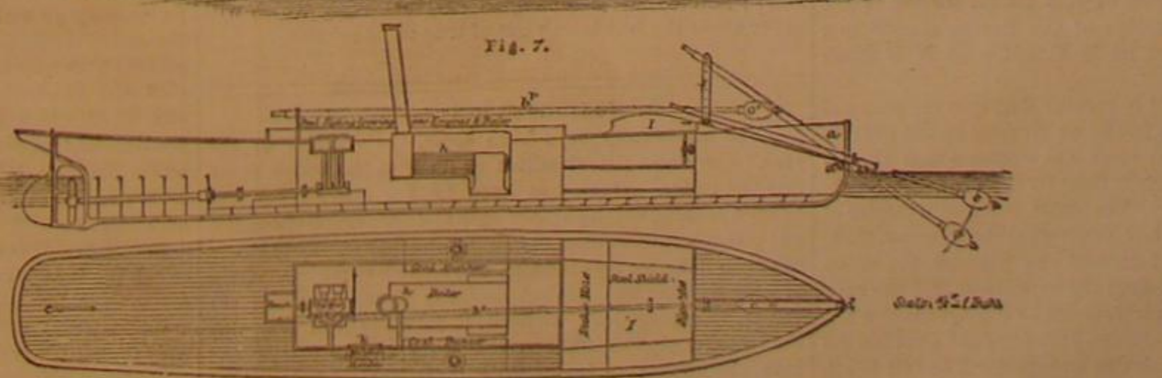
VARIOUS TORPEDOES.

The first of these attacks was made off Charlestown, against the United States war vessel Ironsides, by a cigar-shaped boat under the command of Lieutenant Cassell, with a crew of three men, carrying a torpedo containing 60 lbs. of powder at the end of a spar. Not knowing the action of the explosion, and thinking that their boat would probably be sunk by it, her crew jumped overboard before ramming. The explosion, though severe, failed to effect any hole in the bottom of the Ironsides; the boat was also uninjured, and was found drifting, half full of water, by her engineer, who climbed into her, made up his fires, and steamed back safely to Charlestown. The next attempt was also made off Charlestown, with a plunging boat, against the United States steamer Housatonic, which was sunk by the explosion, the torpedo boat, however, going down as well. This boat had already drowned sixteen men during the trials made with her in Charlestown harbor, the last time going down with a crew of nine persons, and not again appearing till she was fished up and put in order; and a fifth crew of six persons, under a Captain Dixon, undertook the attack on the Housatonic. She was propelled by means of a screw worked by a crank, which required the six men, sitting three and three opposite each other, to turn it.

The confederate ship Albemarle was sunk by a torpedo launch, commanded by Lieutenant Cushing. The launch, however, was also sunk by the explosion; and out of a crew of fourteen persons, only two saved themselves by swimming. Both sides were employed in preparing special spar torpedo boats when the war terminated. Just before the close of it, however, a remarkable attack was made, in the James River, on the merchant vessels which had brought supplies to Grant's army, by the confederate fleet of three ironclad rams and seven gunboats, all armed with torpedoes, fixed on the end of spars, 30 feet or 40 feet long, which projected from their bows, and could be raised or lowered by a tackle. This fleet was stopped by a boom, and two of the ironclads got aground, where they remained all night, under fire from the banks; but although their torpedoes were completely riddled with rifle shot, not one was exploded, as it so happened that the fuses were in no case struck. The Southern States had throughout employed percussion fuses, which were exploded on contact, the shape of their torpedoes being cylindrical with hemispherical ends, into which seven fuses were inserted, as shown in Fig. 2; these fuses (shown in Fig. 3) consisted of a cap of lead, *a*, containing a glass tube, *b*, filled with sulphuric acid, and surrounded with a mixture of chlorate of potash and white sugar, *c*, communicating with a primer, *d*, of mealed powder; on contact, the lead cap being crushed, the glass bottle was broken, and the sulphuric acid ignited the chlorate of potash and sugar, and fired the torpedo. The danger of a torpedo, furnished with these fuses, being exploded by contact with any floating log of wood or boom, before reaching the enemy's ship, and the extreme caution required in handling it, led the Federals to adopt a torpedo made as shown in Fig. 4, which could be detached from the spar, and having an air chamber provided to keep it nearly vertical when so detached, a tube being placed in its center, at the upper end of which an iron ball was kept in position by a pin; this pin was released by means of a rope, leading into the boat, and dropped on to a cone of fulminate.

Captain McEvoy, of the London Ordnance Works, invented the mechanical fuse, A, shown in Fig. 5, provided with the safety cap, B; but being afterwards impressed with the advantage arising from the use of electric communication, he invented, in 1871, the plan shown in Fig. 6. This consists of a metal bushing, *a a*, having its upper end closed by a thin metal dome, *b*, and a metal plug, *c*, screwed into its lower end. A metal spindle, *d*, is supported on a spiral spring, *e*, inserted in a recess, *f*, in the plug, *c*; a thin insulated bridge, *g*, is attached to the spindle, *d*, under which are two terminals, *h h*, of insulated wires, *i i*; one of these wires is connected with the battery, and the other, to which is attached the electric fuse, has either an earth or other connection with the battery. When the torpedo, with this closer attached, is projected against a vessel or other body, and receives a shock sufficient to crush in the thin metal dome, *b*, the spindle, *d*, is forced down until the metal bridge, *g*, is brought into contact with the two terminals, *h h*, thus completing the circuit of the electric fluid, and firing the fuse. The wires would, of course, only be connected to the battery just before the action of ramming. It is, however, evident that the thin metal dome might be crushed in through some accident beforehand, and that then, as soon as the wires were connected, the torpedo would be fired at once. To overcome this difficulty, there has been substituted for the metal dome, *b*, one made of India rubber, fixed in a peculiar manner, which would always retain its form and allow the spring, *e*, to keep the circuit uncompleted. The torpedo is shaped as shown in Fig. 7, in order to





SPAR TORPEDO LAUNCH.

insure the contact of the fuse with the vessel. The system of firing shown in Fig. 6 is that generally adopted with the torpedoes to be used with the launches which are being at present built for foreign countries. The launches may be divided into two classes, namely, those intended for river service, and those meant for ocean purposes. Fig. 7 represents a river launch similar to those constructed by Messrs. Yarrow and Hedley, of Poplar. The one shown is 45 feet long and 7 feet 6 inches beam, calculated to have a speed of 14 knots, built either of iron or steel, the plating being 1/8 inch at the keel, and 3/32 inch at the gunwale.

The draft is 3 feet 6 inches, and the freeboard 2 feet. There is a steel turtle-back shield, *g*, forward, 1/8 inch full thick, to afford protection to the men and steering wheel, and throw off the water which might come on board from the explosion of the torpedo. The engines and boilers are also provided with steel sliding covers. The boilers are locomotive, with a total heating surface of 140 feet, the barrel plates being of 1/4 inch. Lowmoor iron throughout, with 5/8 inches butt straps inside and out, double riveted; and the engines are non-condensing direct-acting, of 55 horse power, working up to 140 pounds pressure. The diameter of cylinders is 6½ inches and length of stroke 7½ inches. The frames are made of 1 inch angle irons with 3/4 inch reverse irons.

The spar, *c*, for the torpedo is shipped amidships, and can be run out over a roller. A pocket, *a*, suggested by Captain Davidson, is provided to allow the spar to have a greater depression than in the old plan of running it out over a roller on the top of the stem. Two stanchions, *f*, provided with pinholes, allow of the spar being depressed through an angle of 35°, a noiseless exhaust chamber, *k*, preventing the approach of the boat being heard. In this chamber the condensing is effected against a portion of the skin of the boat, the plates there being increased in thickness. It is surprising what a small effective surface is required to condense the steam in cases where the object is simply to condense it in order to avoid the noise, or to get the fresh water back into the boiler, and not with the object of obtaining a vacuum.

Fireless Locomotives.

It will be interesting to know that fireless locomotives are in constant and successful operation on a city and suburban railway in New Orleans, namely, the New Orleans and Carrollton Railway, under the able management of General G. T. Beauregard, who is a skillful engineer, and yet who is is alive to, and keeps pace with the improvements of the age. This success has been achieved, too, under the most adverse and unpromising circumstances. The road under other running arrangements had become nearly valueless, its stock having gone down to 7 cents; but it is now a paying and valuable road. The road is about six miles in length. From the center to the outskirts of the city it is operated by mule power; there the mule is taken from the car, and the little fireless locomotive is attached, which is accomplished in less time than would be occupied in attaching another mule. The train is then off like a rocket, the driver still on the platform of the car working the engine, managing the brakes, and making change, as usual; there is no other person on the train to attend these duties. The car is started and stopped quicker than when drawn by the mule. The railway (double track) is in the middle of a very wide street, and is a little raised, so that it cannot be crossed by carriages except at the street crossings; thus, being somewhat isolated, high speed is admissible. The locomotive is simply a cylinder of boiler iron, perhaps 3 feet in diameter and 10 feet long, mounted on four wheels, and partly filled with water. The engine—a double vertical—is attached to the end of the cylinder next the car, being within reach of the driver. The cylinder is then filled with steam at a proper pressure, from a stationary boiler at Carrollton, when the locomotive is ready, and it will run to the city and back without care or expense. There is no fire, no ashes, no pump, no danger, and less noise than from the hoofs of horses. The expense of this means of propulsion, General Beauregard assured me, is less than by mules. The cost of the locomotives is $1,250 each, which includes the builder's profit.—*New York Times.*

Responsibility for Employees' Injuries.

It has been established that failing to make reasonable provision for the safety of employees is a negligence employers are liable for; but judges and juries have failed to uniformly determine just what is a "reasonable provision." The nearest approach to the settlement of this matter we find in the court news of a recent number of the Boston *Herald*, in a case in the Supreme Court, of M. F. Avilla *vs.* N. C. Nash *et al.*

"The action was brought to recover damages for personal injuries resulting from the fall of an elevator in the defendants' refinery. At the trial there was evidence that the defendants had given directions to their foreman to forbid workmen riding on the elevator. The court ruled as a matter of law that, if the defendants had so directed the foreman, then, even in case he had not informed the plaintiff, the action could not be maintained against the defendants, for the accident was the result of the carelessness or negligence of a fellow workman, the foreman. The jury returned a verdict for the defendants, and the plaintiffs excepted. The full bench have now sent down a rescript sustaining the exceptions, and have ordered a new trial."

The point turns upon the fact as to whether Messrs. Nash had cautioned their foreman and directed him to forbid the workmen using the elevator.

It is hardly proper to surmise what the results of a new trial will be, but the decision already secured by Messrs. Nash will have an important bearing to all manufacturers, and the case as above cited should be placed in the hands of all superintendents and foremen, that they may be fully apprised of the responsibility they assume in not enforcing a strict compliance with orders for the security of life and limb.

Correspondence.

Hard Rubber Thermometers.

To the Editor of the Scientific American :

In 1852, I noticed the electric properties of hard rubber or vulcanite, and in 1853, I made arrangements with the owners of the patent for the manufacture of insulators for telegraph wire from this substance. The first orders for them were received from California; and as transportation was very expensive on the Isthmus route, they were made very light, weighing but half an ounce each. On arrival they were heated to about 300° Fah., by which they were expanded; and while in this condition, they were placed upon iron pins, to which they were held firmly by contraction.

My attention having been thus called to the dilatability of hard rubber, several thermometers were made from it. One was made by riveting it to a thin strip of steel, about a foot in length, and one fourth of an inch in width. The bottom of this was held fast, while the top was free to move, and so to indicate the temperature on a graduated arc. This one, now in use, has a range from zero to 90° Fah., and is as sensitive as the common mercurial thermometer. It is well adapted for the ordinary range of the atmosphere, but is not suitable for indicating high degrees of heat, as the rubber softens at about 200° Fah. One of them was made by perforating a thin strip of steel, at intervals of an inch, and placing upon it a strip of rubber compound when in a plastic state. This was coiled, with an intermediate strip of metal, which forced the rubber through the holes. It was then vulcanized in the usual manner; and when cold, the intermediate strip was withdrawn, leaving an open space between the coils. This saved the trouble of riveting, and gave to the rubber an unbroken and smooth surface. The coil is held fast at the center, and the outer end is left free to move. Another thermometer was made of glass and hard rubber, the latter in the form of an arc, being riveted at both of its ends to a glass plate, which formed the chord.

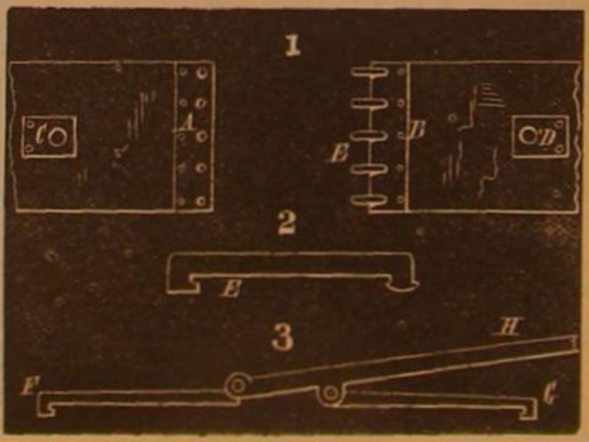
Instruments of this kind are much better than mercurial thermometers for making electric connection with alarm bells to indicate excess of heat.

Boston, Mass. J. M. B.

Coupling Machine Belts.

To the Editor of the Scientific American:

Seeing a query in your issue of March 13 about putting together belts which have to be frequently uncoupled, I send you an illustration of a 6-inch belt, which I have been running for over a year, reversing it from one to four times a week.



In Fig. 1, A, B, C, and D are pieces of No. 16 sheet iron, riveted to the ends of the belt; E E are hooks, shown in the natural size in Fig. 2, riveted to B. After the belt is laid over the pulleys, the hooks, F and G, of the lever, shown in Fig. 3, are placed in the holes at C and D. Now the two ends of the belt are drawn together by the lever, H; and the hooks, E, are put in their places at A. Then the lever is taken out, leaving the joint finished.

By this method, two men can set and couple a belt in the least possible time, obtaining an effectual joint, which will never allow the belt to run out of true or to reverse.

W. KAPP.

HOUSEHOLD HINTS.—I.

"The melancholy days have come, the saddest of the year," ejaculates paterfamilias as he lugs the stove down into the cellar. There has been for the last twenty-four hours a reeking atmosphere of soap and soda and step ladders and moist scrub women pervading the house. Rest, there has been none for him indoors, and so he has made a virtue of necessity and has worked manfully at taking down the stoves, wrapping them, we hope, in old carpet, and fastening the legs and pipe together so that they cannot escape and hide themselves in ingeniously inaccessible places, as he vehemently affirmed they did, when he found them in the garret and under the coal and in the chicken house last fall. Materfamilias, we trust, has fully perused the recipes we have been publishing for the last six months, and the knowledge thus gained has been practically applied in cleaning the paint and the windows, destroying vermin, and putting the house in "apple pie" order generally. At last it is all over, the rooms are "painfully clean," and the bright sunlight pouring into the open windows is revealing the threadbare spots in the carpets, and the cracks and knocks on the furniture only too plainly. A high court of inquiry has been held, and the superannuated veterans which have done long and faithful service on the floors, or have survived many a year's hard usage about the rooms, are at last condemned. Then the heads of the family, who, like sensible people, have waited for the high prices peculiar to Mayday to subside, prepare to sally forth on visits to carpet and furniture stores, and paterfamilias figures up his check book or draws his winter's savings from the savings' bank ready to withstand the coming financial strain.

("I don't see nuthin' about Science in all that. What's it got to do with masheens?" interrupted the practical man who happened into our sanctum just in time to hear us read over the foregoing paragraph to ourselves. "Nothing, excellent and anti-theoretical friend," we reply, "nothing about 'masheens' is therein contained; but as to Science, it relates to the science of home, the science of making one's life something more than one "demnition grind" for existence, by—as you will perceive if you continue looking over our shoulder as we proceed with our writing—rendering that home more attractive, more cheerful, and so making for yourself and yours a sanctuary, at the doors of which the cares of labor may be laid aside." He said that it must have cost "an awful lot to polish that 'ere model with the file," from which we inferred that our previous remark was lost upon him, so we resumed our pen, oblivious to his further presence.)

We were about to observe that, before buying furniture and carpets—if we may venture to intrude upon the family discussion which is taking place previous to the exodus to the shops above mentioned—there are several facts well worth remembering, which may assist one in selecting goods, and besides tend to save money; and at the same time there are a few more hints which we have to offer which mainly relate to simple decoration, and which, we think, may result in making the rooms which are to be renovated look perhaps a little more tasteful and pretty. Let us suppose that a sitting room which also does duty for a parlor is to be newly furnished. The walls are now either plain white or else the old paper has been scraped off and new hangings are required. The first question is of a carpet. Some people believe that the English article is the best; so it is we think, as a general rule, so far as colors are concerned, but if durability is considered a first requisite, then the American goods, if of first quality, are fully equal to those of foreign make. A good carpet is thick, pliable, and well woven, and it is better economy to buy a good article like a real Brussels at the outset. Ingrains are now made to go with Venetian borders, but these do not wear equal to Brussels, and besides with the border costs nearly as much. In this city the best body Brussels costs from $1.75 to $2.50 per yard, and the lining (which consists of layers of stout brown paper with cotton batting between, and which saves carpets wonderfully, particularly if the floor be at all uneven), is easily made, or costs when bought 10 cents a yard. For those who can afford a little extra expense, it may be well either to mat the floor or else plane it very smooth, putty up all the cracks, and stain brown, finishing with a coat or two of shellac dissolved in alcohol. Then cover the middle with a large rug, leaving a yard of uncovered space around the walls. Handsome druggets can be bought very reasonably for this purpose; or two Turkish rugs (each about 4x6 feet, such as are sold for $15 to $18 a piece), placed side by side, would be large enough for a good-sized apartment, though costing more than the drugget. These can be easily taken up and shaken, or in summer can be removed altogether, leaving the cool matted or painted floor. Turkish rugs, besides, are like camel's hair shawls; they will accord with any color of furniture or wall, and are almost indestructible by wear.

To return to the carpet: supposing such to be the choice: we should advise the selection of that and the wall paper at the same time. It is a good plan to procure a roll of the intended hangings as a sample, and carry it to the carpet store for direct comparison. This will save many awkward contrasts of color. If a green carpet be decided upon, then a plain paper of a rose tint, or with that shade prevailing, accords handsomely; the same paper goes well with the unobtrusive gray-patterned carpets now very much in fashion. If the walls be tinted French gray, in kalsomine or paint, this shade will suit almost any colored carpet, especially red or crimson. Big-figured papers and huge medallion carpets are abominations only fit for hotels and steamboats. Bright tinted papers may go with a rich-toned carpet, or with one in which the colors are mingled; but we never should select hangings printed with impossible birds and animals, or a carpet covered with gaudy flowers, hideous designs in red and yellow which look like a petrified firework explosion, or incomprehensible and huge scroll work. A neat, small, quiet figure is by far the most genteel and appropriate, while it is much more economical, as none of the stuff is ever wasted in matching.

Before laying the carpet, if moths are suspected, it is well to rub the boards over with turpentine; sprinkling with very dilute carbolic acid, about a tablespoonful to a gallon of water, is also a good precaution. This last should be rubbed over the walls before the paper is put on.

Now comes the matter of furniture. Do not buy the so-called "cottage" stuff. It has no merit save that of cheapness, and our own experience in its use has left us with the firm conviction that glue was too expensive and it was stuck together with gum arabic. A hearty sneeze from a stout person is ordinarily sufficient to completely disorganize the chair he may be sitting on. Besides, it is usually of pine wood, for which bedbugs havean extraordinary predilection. Do not buy veneered furniture, especially if there be furnace heat, for the veneering, generally after short wear, manifests a strong desire to part company with the wood. Buy good substantial solid work, not machine-made, as it is termed in contradiction to hand-made. Machine furniture is sold by the cheaper dealers, and it is put together with wooden dowels. It is, besides, turned out in large quantities of the same pattern at a time, and too often hastily glued together. It looks well enough at the start, but its lasting qualities are poor. Hand-made furniture, though its integral parts are of course machine work, is produced with greater care. The wood used is thicker and more carefully selected, and iron dowels are used as fastenings. It is well to look carefully to this difference, as it much more than compensates for the disparity in price.

In our next issue we shall have something further to say about furniture, before passing to the other subjects to which, in these papers, we propose to allude.

ARCTIC NOTES.

Captain Nares, who is in command of the new British arctic expedition, recently made an address at Winchester, before the college boys, in which he gave a variety of interesting particulars connected with his previous experience in the frozen regions.

ICE WATER AS A HEATER.

Speaking of sledge expeditions, he said they always made it a point to encamp on the level snow, over the water, the heat given off by the water underneath warming them considerably, and the tent was warmer when spread over the ice than over the snow.

BOOTS AND OTHER CLOTHING.

He next described the interior of the tent, the clothing, etc., and stated that their footgear was the only thing they took off. When they took their boots off, they were necessarily damp, and unless they put them under their beds they would freeze; so they lay on them all night to keep them warm for the morning.

While on board the ship, taking short walks and retiring to a dry cabin, sealskin clothes, he said, were very good; but as soon as they started on a traveling expedition, having only a common light tent to which to retire, they could wear nothing but flannel and cloth clothes, covered with a light, outer duck suit, which caught the snow. They started wearing their skin dresses, but though they were limp enough the first evening, in the morning they found them frozen as hard as boards. It was impossible to put them on, and they were left on the ice for the bears.

FREEZING OF WATER BOTTLES.

Captain Nares next referred to the water bottle, which was worn inside the dress next the skin. Though the inner side of the bottle was warm, the outer skin froze. A layer of ice collected on the outer side of the bottle, and day by day gradually became thicker, and in a week they were all thrown away. For the present expedition they were trying to cover the bottles with flannel, but these would be just the same.

He called attention to the fact that they gradually became reconciled to the want of water, and they merely had half a tumblerful in the middle of the day when they stopped for lunch. This was exactly the experience of all arctic travellers. He mentioned that when the men in his party, on leaving the tent, were offered an extra quantity of either tea or grog, they all chose the tea.

ARCTIC TEMPERATURE.

On the 4th of November, Captain Nares's party saw the sun for the last time until the 5th of February, after an absence of 93 days. He stated that the coldest temperature of all was 62° below zero, which was equal to 92° of cold, or the same amount of cold as would balance a hot temperature of 126°, and this agreed with the highest heat ever registered. As long as they were on board the ship in calm, they could walk about, but immediately there was the slightest wind they were frostbitten.

AIMS OF THE NEW EXPEDITION.

Captain Nares said, in conclusion, that in the present expedition it would all depend on the favorable or unfavorable state of the ice how far they got north, and where they should leave the depot ships. Should they be fortunate enough to reach latitude 82°, as Hall did easily (to which they knew the land extended), they would have every prospect of being able to journey the 500 miles still cutting them off from the pole. Of course, if there were land there, they could only skirt round the shores. If there were water, one of the ships would be taken up as far as possible. The previous expeditions in this direction had never been sufficiently equipped for traveling. In the last voyage, by the Polaris, no traveling, to speak of, was attempted, and they merely knew that the land extended to some 50 or 60 miles further on without any appearance of its coming to an end. Of course, in the present expedition, they would push as near the pole as possible; but after the first week in September one ran the risk of the ship never being actually stationary in a harbor, and unable, therefore, to be made the base of departures for sledge journeys. She might even be drifted by the current ignominiously and helplessly to the southward, perhaps passing the consort, who would necessarily be snugly posted in a protected harbor. However, with God's help, they would do their best, and the meeting might depend on it they would not fail through want of perseverance.

ARCTIC AMUSEMENTS.

A sick man in the arctic circle would not only be a burden to himself, but so handicap his messmates as probably to put in jeopardy the success of the undertaking. Absolute health has, therefore, been made a *sine quâ non*; and it may be assumed that all truly healthy men are of a cheerful disposition.

But the expedition is provided with artificial aids to good fellowship. The Admiralty have not made it a condition that the officers should be able to sing a good song or dance a hornpipe, but such like accomplishments are of great importance under the circumstances, and measures will be taken to encourage the histrionic powers of the ships' companies.

Mr. Clements Markham remarks that the "most valuable" qualifications for arctic service are aptitude for taking part in those "winter amusements which give life to the expedition during the months of forced inaction," and in his arctic navy list he has recorded the part which each officer took in the polar theatricals. Captain Nares, while mate under Kellett, sustained the character of Lady Clara in the historical drama of *Charles II.*; and he will probably see that the stage of the Alert does not lack novelties. Admiral Sherard Osborn was manager of "the Arctic Philharmonic Entertainments," on board the Pioneer; Admiral Ommanney was manager of the "Royal Arctic Theater," on board the Assistance, and acted the part of Mrs. Crank in the farce of *Did you ever Send your Wife to Camberwell?* Admiral Nias performed Sir Simon in *Miss in her Teens*, Perriwinkle in *A Bold Stroke for a Wife*, and other parts; General Sir Edward Sabine was also a member of the now historic "Arctic Theater," and acted Lord Minnikin in *Bon Ton*.

In fact, the majority of our most noted arctic navigators were, from the exigencies of their position, admirable amateur performers; and in furnishing a theatrical wardrobe and appurtenances, the government are contributing in no mean degree, and, perhaps, to a much greater extent than they suppose, to the success of the arctic expedition of 1875.

Patent Rights.

Among the many improvements in commercial law recently advocated in England, one of the most remarkable is the demand for the abolition of patent right. Not only, it is said, is the advancement of the nation in material prosperity hindered by the protection hitherto accorded to inventors, but those unfortunate persons are themselves injured by the laws intended to preserve to them the fruit of their time and labor. It is urged that the inventor cannot be restrained from inventing; and that there should be a system of national rewards for conspicuous improvements, and that purely honorary distinctions should be liberally bestowed. Interference with the freedom of trade is, moreover, declared to be only one of the evils arising from the protection of the inventor, and a whole catalogue of difficulties is assigned to the same source. English manufacturers are said to be put at a disadvantage compared with those of other countries where there is no patent law. A patent once granted bars the way for further improvements in the same direction; patents are granted for useless things, and for already old contrivances. In addition to these disadvantages, the existence of patents gives rise to expensive and tedious litigation; and to sum up, patentees are themselves, in the gross, great losers.

In a paper "On the Expediency of Protection for Inventions," recently read before the London Society of Arts, these objections, not to the present patent law prevailing in England, but to all patent laws whatever, were very ably combated, and the rights of the poet, even, if his creative faculty take a mechanical turn, were vigorously maintained. Those who peruse the history of inventions can hardly lay aside the sad narrative without a feeling of pity for the melancholy destiny of the men whose patient thought has enriched the world. Palissy burned the bed from under him to feed his furnace; Dud Dudley was ruined by the sheer brute strength opposed to him; and Crompton, the inventor of the spinning mule, who, to protect his unpatented invention, commenced a secret manufacture at his house, called the "Hall in the Woods," found it besieged, and ultimately broken into and rifled by those who were destined to profit by his labors. Over and over again occurs the same dreary story of hope deferred, resources exhausted, and health broken. For it must be remembered that the contriver of a great improvement in the machinery of an important industry, although a benefactor of his species, by no means appears in this enviable light to those whose work he designs to improve. The wealthy manufacturer doing a profitable business dislikes to stop his costly and extensive works to test a new invention, and his work people resent any attempt to teach them new ways. Hence the poor inventor is often regarded rather as a nuisance than a benefactor, and finds himself opposed instead of encouraged.

The charge that the growing strength of foreign competition in departments of industry over which England has been accustomed to reign supreme is due to patent rights can hardly be sustained. The practical answer lies in the fact that Great Britain, the United States, and France all have efficient patent laws, and yet in no other countries are manufactures so vigorous and improvement so rife. Few countries claiming to be civilized are without patent law. Switzerland has none, but the only manufactures for which that country is famous are alpen stocks and long hotel bills.—*Inter-Ocean.*

WHEN it is not convenient to take a lock apart to fit a new key, the key blank should be smoked over a candle, inserted in the keyhole, and pressed firmly against the opposing wards of the lock. The indentations in the smoked portion made by the wards will show where to file.

An Old Prophecy.

One of our New England exchanges has come across an old almanac, dated 1755, edited by Dr. Nathaniel Ames, who lived in Dedham, Mass., published in Boston, and in one of its articles Dr. Ames made use of these prophetic words:

"There lie buried in all this vast region materials for the art and ingenuity of man to work upon—treasures of immense worth, concealed from the poor, ignorant, aboriginal natives. The curious have observed that the progress of human literature, like the sun, is from the east to the west; thus it has traveled through Asia and Europe, and now has arrived at the eastern shore of America. As the celestial light of the Gospel was directed here by the finger of God, it will doubtless finally drive the long, long night of heathenish darkness from America. So arts and science will change the face of nature in their tour from hence over the Appalachian Mountains to the western ocean; and as they march through the vast desert, the residence of wild beasts will be broken up and their obscene howl cease forever, instead of which the stones and trees will dance together at the music of Orpheus, the rocks will disclose their hidden gems, and the inestimable treasures of gold and silver be broken. Huge mountains of ore will be discovered, and vast stores reserved for future generations. This metal, more useful than gold and silver, will employ millions of hands, not only to form the martial sword and peaceful share alternately, but an infinity of utensils, improved in the exercise of art and handicraft among men. Nature through all her works has stamped authority on this law, namely, 'that all fit matter shall be improved to its best purposes.' Shall not, then, those vast quarries that teem with mechanic stones—those for structure be piled into great cities, and those for sculpture into statues to perpetuate the honor of renowned heroes, even those who shall now save their country? Oh! ye unborn inhabitants of America, should this page escape its destined conflagration at the year's end, and those alphabetical letters remain legible, when your eyes behold the sun after he has rolled the seasons round for a century to come, you will know that in Anno Domini, 1755, we dreamed of your times!"

The Electric Light.

Dr. Wilde, of the Academy of Sciences of St. Petersburgh, and Director of the Central Physical Observatory, has recently made a report to the Academy upon the new mode of producing the electric light proposed by M. Ladiguin, of that city, and mentioned on page 227 of the SCIENTIFIC AMERICAN, present volume. Since the discovery of the voltaic arc in 1821 by Davy, many attempts have been made to utilize it practically for illumination. But in spite of the regulators devised for the purpose, it still remains variable and inconstant; being too intense, used at a single point, it is yet incapable of division. Since the improved magneto-electric machines have reduced the cost of the electric light to only one third that of coal gas, these efforts to utilize it have been redoubled. And, as a result, M. Ladiguin has made an invention which, in a very simple way, resolves both problems, rendering the light steady, and at the same time capable of division. It has long been known that the electric light proper comes from the intensely heated carbons which the current traverses, the resistance of the air between them developing this heat. So the resistance of a platinum wire placed in circuit causes it to be highly heated; but the light thus obtained, though constant and entirely controllable, is too feeble for practical use. M. Ladiguin has conceived the idea of replacing the platinum wire in this experiment with a thin rod of gas carbon, and with complete success. Carbon possesses, even at the same temperature, a much greater light-radiating power than platinum; its calorific capacity is less than one half that of platinum; it is, moreover, a sufficiently good conductor of heat; so that the same quantity of heat elevates the temperature of a small rod of carbon to nearly double that of a wire of platinum of the same size. Again, the resistance of the carbon employed is 250 times greater than that of platinum; hence it follows that a rod of carbon may be fifteen times as thick as a wire of platinum the same length, and yet be heated by the same current to the same degree. Finally, the carbon may be heated to the most intense whiteness without the danger of fusion, to which platinum is liable. These are some of the advantages of carbon; its only disadvantage is that heated in air it burns, and so gradually wastes. But M. Ladiguin has happily obviated this difficulty by enclosing the rod of carbon in a glass cylinder containing no oxygen and hermetically sealed. Dr. Wilde asks, in conclusion, that the Academy recognize the fact that M. Ladiguin has resolved the grand problem of dividing and rendering steady the electric light, in the simplest possible manner, and that they award him, in consequence, the Lomonossow prize.

White Ants at St. Helena.

White ants were introduced into the island in 1840 in some timber from a slave ship. Mr. M'Lachlan has identified the species *termes tenuis*, Hagen, peculiar to South America. The mischief which it has done is almost incredible, and it appears to have simply gradually destroyed the whole of Jamestown. A considerable portion of the books in the public library, especially theological literature, was devoured by them, and the whole of the interior would be destroyed without the exterior of the volumes seeming otherwise than intact.

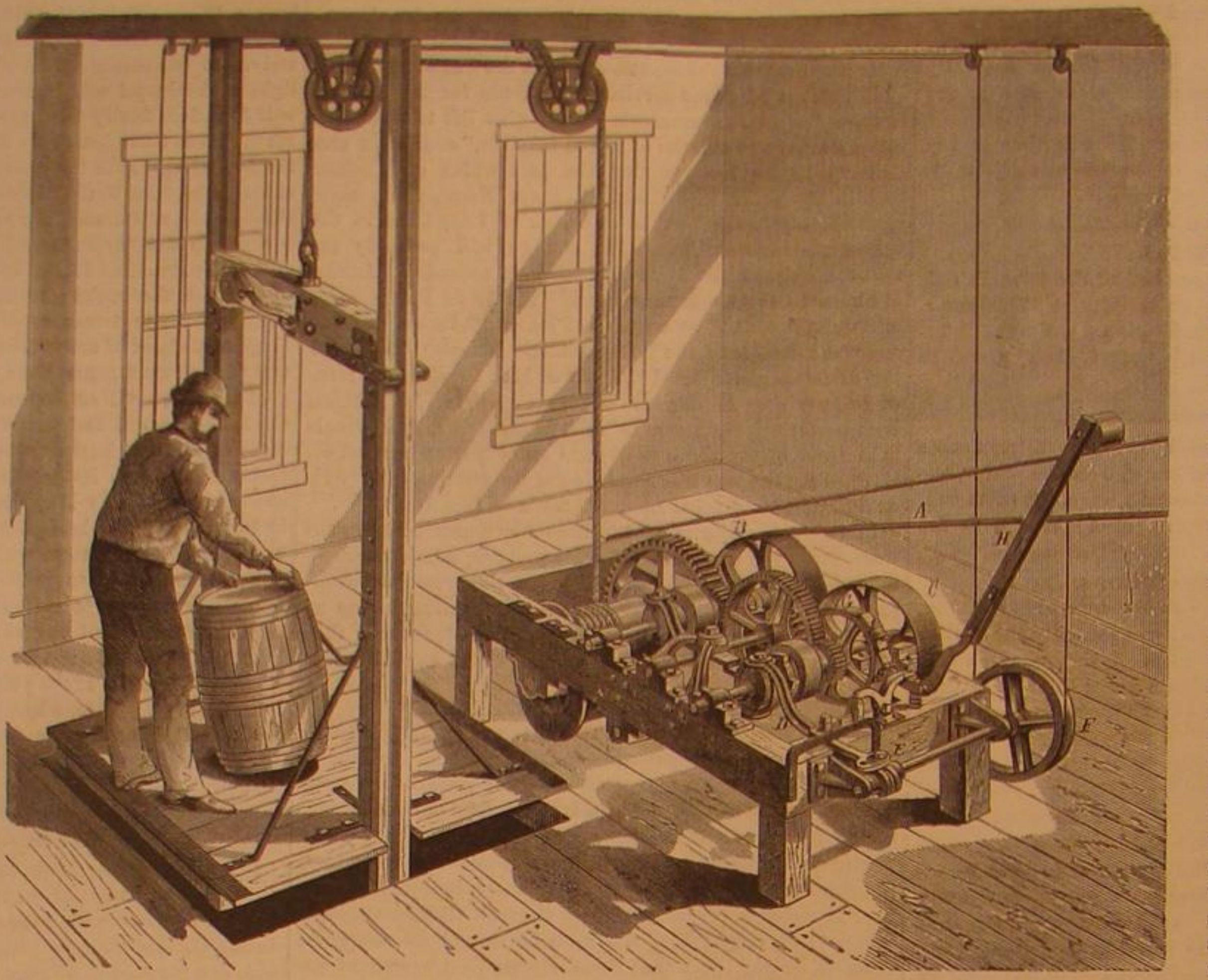
A GOOD cement for chemical and electrical apparatus may be prepared by mixing 5 lbs. resin, 1 lb. wax, 1 lb. red ocher, and 2 ozs. plaster of Paris, melting the whole with moderate heat.

IMPROVED ELEVATOR.

We illustrate herewith improved mechanism for elevators, in which will be found combined several novel devices, tending to simplify the apparatus as well as to render the same strong and safe. Among the new features are the means for holding the platform should the hoisting rope break, the use of a single belt running in one direction to actuate the hoisting gear, an improved clutch, and a simple arrangement of an idler on the belt, in connection with a brake lever, which last, on the breaking of the belt, at once throws the brake into action, and so stops the machinery.

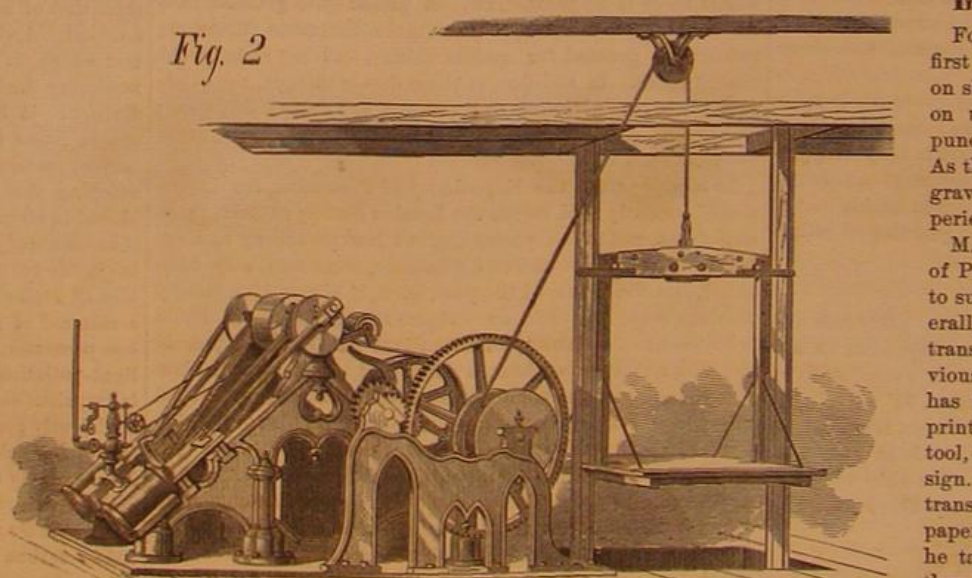
We also illustrate, in Fig. 2, the direct application of a steam engine to the hoisting gear, in cases, for example, where power cannot be obtained from some main source in the building. The engine is built by the same manufacturers, and is of neat and compact pattern, well adapted to this special purpose.

Referring to Fig. 1, it will be seen that the driving belt, A, is caused to lap over both pulleys, B and C, thereby rotating the same in contrary directions, and, through its application to a large pulley surface, communicating an increased amount of power without slipping. D is a bar pivoted to the center and provided at each side of its pivot with clutches which engage with pulleys on the shafts of wheels, B and C. It is obvious that but one clutch can be thrown into action at a time, and this is done by the end of the bar, D, at E, being provided with a projection which enters a worm on a shaft, at the extremity of which is a pulley, F. Cords from this pulley are led down alongside the elevator carriage. By means of said cords the pulley, F, may be turned in one or the other direction, so moving correspondingly the end of bar, D, and thus throwing into action one or the other of the clutches. The latter are of novel construction, and consist essentially of cones which, on entering the pulleys, expand movable pieces which enter V-shaped grooves and tightly bind. The effect of operating the clutches is, as will be obvious from the gearing represented, to transmit motion to the hoisting drum in one or the other direction, and so to hoist or lower the carriage. In order to hold the mechanism during the instant when, in shifting the clutches, both are thrown out of gear, a bell crank lever, connected with the end of the bar, D, is provided. This, when the bar is moved either way, pulls down the brake on the brake wheel, G. The same, of course, serves as the means for stopping the carriage at any desired point. Connected also with the brake is a long lever, I, which terminates in an idler which rests on the belt. Should the latter become ruptured, the lever falls, and its weight, applying the brake at once, prevents accident by arresting the motion of the mechanism. This arrangement obviates the necessity of the governor usually provided.



HOLSKE'S ELEVATOR.

Fig. 2



An inspection of the standards in which the platform travels will show that the rack, ordinarily placed on the inner sides, with which pawls engage, and so prevent the fall of the platform in event of the breakage of the hoisting, is here done away with. The safety mechanism substituted is much simpler and, at the same time, cheaper. It is shown in the broken away portion of the upper crossbar of the platform, and consists of a reversed T-shaped piece of iron, the vertical portion of which passes through the bar and serves as a point of attachment of the hoisting rope. The horizontal part of the T underneath connects with a leaf spring, and this with a toothed pivoted eccentric. When a strain is on the T piece, the spring is held out of action; but on the breakage of the rope the T piece falls, the spring is thrown outward, and the cam turned so that its widest portion becomes jammed, and the teeth bite in the wood of the standard, thus holding the carriage securely. The same arrangement is on each side of the crossbar, which is also steadied and held in place by the guide rollers shown at I.

The mechanism generally is of excellent construction, and, judging from practical trials which we have witnessed, appears to show that the claims of its manufacturers are fully substantiated.

For further particulars address the Holske Manufacturing Company, 279 Cherry street, New York city.

IT is said that a few drops of oil of anise or oil of rhodium, placed upon bait, will entice animals into a trap.

Vulcanizing of Caoutchouc.

Professor Böttger states that Gaulthier de Caulbry has established by experiment that, upon mixing flowers of sulphur and dry chloride of lime in a porcelain mortar very intimately, a decided odor of chloride of sulphur soon becomes noticeable, accompanied by an elevation of the temperature of the mixture, while the sulphur softens, and a plastic mass is formed. If the sulphur is largely in excess of the chloride of lime, and they are mixed without hard grinding, the product, with or without the addition of chalk, zinc white, etc., when added to caoutchouc softened in bisulphide of carbon or oil of turpentine, causes so-called vulcanization at the ordinary temperature, or upon slightly warming. With chloride of lime in excess, the mass remains pulverulent, instead of becoming pasty.

IMPROVED BILL FILE.

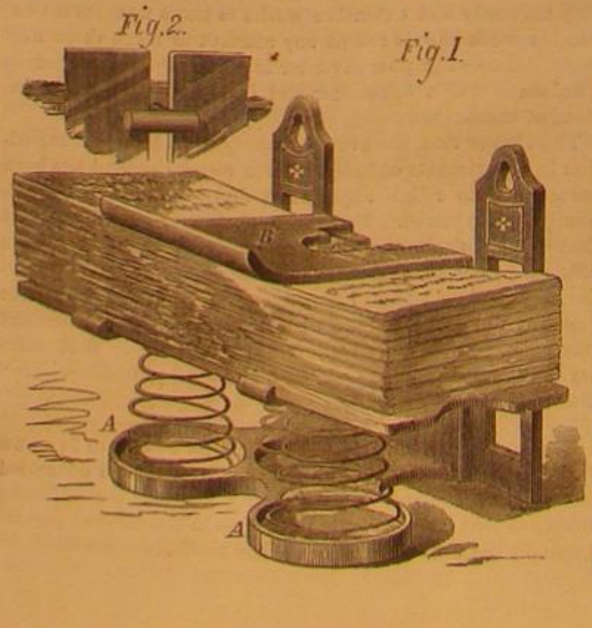
The device herewith illustrated is designed to hold firmly, and without punching or mutilating in any way, all kinds of papers, such as bills, statements, deeds, manuscripts, etc., of any size, either folded or open, and in such a manner that any heading can be found at once, and so that one or several papers may be removed or inserted easily and quickly, with out disturbing those not wanted. It adapts itself to any uneven thickness which may exist in the folds of the papers. When the file is full, the papers are already partially compressed and in proper shape for tying up and putting away in bundles.

In the bed are shallow cups, A, holding conical spiral springs, which bear upward with a constant pressure against a piece on which rests a table. The piece beneath the table has on its under side small cups for confining the upper ends of the springs, and on its back edge a cross, Fig. 2, which works in a slot in the upright portion of the bed, and hold the table in proper position. The table is of wood; the balance of the file is metal. The papers are inserted at a single movement by being taken at both ends between the thumbs and fingers and introduced between the table and the top plate, B.

The file can be suspended on a wall by the ears, as shown, but ordinarily it will rest upon a desk or writing table. The conical shape of the springs allows them, when the file is full, to be received entirely into the shallow cup, thus giving the entire space (about three inches being a convenient size) for the reception of the papers. There is not a screw, rivet, nor fastening of any kind used in the construction of the file, all parts being neatly fitted together.

Patented through the Scientific American Patent Agency, March 2, 1875, to Richard H. Hoffman, of Keyser, Mineral county, West Va. The exclusive right to the patent is offered for sale. For further information, address the patentee as above.

Fig. 2. Fig. 1.



Improvement in Music Printing.

For printing music it is necessary to have, first of all, the composition lightly sketched on sheets of tin, after which it is engraved on the plate by a workman, who holds a punch in his left and a hammer in his right. As the design has to be transferred, it is engraved reversed, which requires both an experienced eye and a steady hand.

M. Lourdel, the well known photographer, of Paris, thought it would be a great saving to suppress the sheets of tin, which cost generally about 82 cents. To do this a piece of transfer paper is taken, which has been previously lined and spaced. The workman has before him a composition case like a printer's, which contains in each division a tool, at the extremity of which is a musical sign. Beside him is a pad impregnated with transfer ink. He lays the ruled transfer paper before him, and with the right hand he takes the musical signs, notes, etc., inks them, and prints the paper without the slightest effort. It is simply a matter of regularity and rapidity, speed being easily acquired after a little practice. The music is then transferred to the stone and proofs taken at will.

Penikese School.

It is certainly a misfortune that the Penikese school, after so promising a start and with its usefulness so well demonstrated by its work during the two summers which it has been in existence, should now be compelled to suspend for lack of funds. Mr. Alexander Agassiz states that the Anderson donation has sufficed to equip the school in an inexpensive manner and to support it up to the present summer; but that this is now exhausted. As an attempt to levy a charge upon the pupils has proved fruitless, nothing remains but to close the doors.

The usual class of scholars who have hitherto taken advantage of the summer session have been principally teachers and students of natural history, of straitened means, and who, although enthusiasts in study, are as a rule unable to contribute toward any educational project, however beneficial, out of their scanty earnings. Consequently, when it was announced that the Penikese school was no longer free, a few individuals responded and the large majority stayed away; and hence the suspension of operations. An excellent opportunity is here offered by some friend of Science to revive the school by means of a liberal endowment, and to avoid the scandal that must certainly be caused if Mr. Anderson's generosity is allowed to be nullified fo want of a few dollars.

ENGLISH GARDENS.

Carclew House, Cornwall, England, the residence of Colonel Tremayne, has a high renown among the horticultural establishments of the West of England, a district enjoying a very mild climate, even for that country, and peopled by a race who are, like the Scotch, gardeners by instinct and inherited disposition. "In this favored spot," says a recent visitor, "rhododendrons of all kinds seem quite at home, and the same may be said of the camellia and Indian azalea, noble examples of which were every now and then to be met with. A Loquat tree, *eriobotrya japonica*, was 10 feet high, as much through, and in the most robust health. The same may be said of *escallonia pterocladon*, quite 15 feet high, having white flowers, and more tree-like in character than the other species. The singular *colletia Bictoniensis* was also here in the shape of a dense bush quite 7 feet in diameter; and there were specimens of *fabiana imbricata* quite as large. I noticed a fine mass of *hedychum flavum* or *flavescens*, which, to all appearance, had not been disturbed for many years, and was flowering most abundantly. I noticed a rhododendron of the true *arboreum* section, or one very near akin to it, with a clear bole more than 6 feet high without a branch, and stout enough to form a gate post for a carriage road. The general character of the place must be extremely rich at the time these shrubs are in flower; and when it is understood that some of them flower in winter, accompanied by camellias, the effect must be gorgeous. Intermixed with these rhododendrons, etc., were magnolias of the deciduous class, assuming the character of timber trees, and there was no lack of flowers, on open standard trees, of *m. grandiflora*."

Although these various semi-tropical shrubs grow freely in the open air, Nature is liberally supplemented by every improved appliance in the way of hot and forcing houses. Orchids of the tropics and all other exotics are grown in great profusion; and the vineries and orchard houses are of great extent, and are renowned for the handsome fruit of nearly all kinds grown in them.

We give herewith a view, showing one portion of the gardens, with the fountain and basin in the center. The garden is geometrical, consisting of twelve beds with borders at the sides, etc., on gravel, the beds edged with box. The four beds through the center in line with the basin are carpet-bedded; four others, flanking the basin, are all planted alike with geraniums, calceolarias, perilla, and lobelia. Outside these, and, as it were, surrounding them, are four other large beds, which are planted with herbaceous plants, etc., and a row of dahlias down the center. In front of the hot-house can be seen a mass of belladonna lily, myrtle bushes, etc. Besides the pampas grasses, in the angles of four herbaceous beds stand *colletia Bictoniensis* and *hypericum oblongifolium*. In the fountain basin are *limnocharis Humboldtii* and *aponageton distachyon*. The terrace above is also a geometrical garden of twenty-seven beds, with borders, on gravel, with box edging, and planted miscellaneously with annuals, violas, etc.; the violas, with a bed of *lobelia cardinalis* (St. Clair), being a great success. Behind the pampas grass, to the right, can be seen the spreading head of *linus patula*.

If any of our readers journey towards the Land's End in the course of this summer, we recommend them to visit these gardens, which have been under the highest cultivation for many centuries past.

GARDEN AT CARCLEW, ENGLAND.

Tough Glass.

An inventor, Mr. Charles Pieper, has devised a way of toughening glass, which the German papers pronounce superior to that of M. de la Bastie, recently described in these columns. The Pieper glass is fully as strong as that of the latter inventor, and its appearance is much purer and clearer. Extended experiments upon it have been begun in Germany. The Association of German Glass Makers have already entered into negotiations with Mr. Pieper for the use of his invention, suspending similar dealings with M. de la Bastie, on account of the immense price asked by him, over eight million dollars.

THE BIRDS OF BRAZIL.

Our engraving exhibits two remarkable ornithological specimens from Brazil, domesticated in the gardens of the Royal Zoölogical Society, Regent's Park, London.

The first is the bell bird, the celebrated *campanero* of the Spaniards, called *dara* by the Indians. He is about the size of the jay. His plumage is white as snow. On his

THE BRAZILIAN BELL BIRD AND THE BANDED COTINGA.

forehead rises a spiral tube, nearly three inches long. It is jet black, dotted all over with small white feathers. It has a communication with the palate, and when filled with air looks like a spire; when empty, it becomes pendulous. His note is loud and clear, like the sound of a bell, and may be heard at the distance of three miles. In the midst of Brazil's extensive wilds, almost out of gun reach, you will see the *campanero*. No sound or song from any of the winged inhabitants of the forest, not even the clearly pronounced "Whip-poor-Will" from the goatsucker, causes such astonishment as the toll of the *campanero*.

With many of the feathered race he pays the common tribute of a morning and evening song; and even when the meridian sun has shut in silence the mouths of almost the whole of animated nature, the *campanero* still cheers the forest. You hear his toll, and then a pause for a minute, then another toll, and then a pause again, and then a toll, and again a pause. Then he is silent for six or eight minutes, and then another toll, and so on. "Actæon would stop in the mid-chase," says Waterton, "Maria would defer her evening song, and Orpheus himself would drop his lute to listen to him, so sweet, so novel, and so romantic is the toll of the pretty snow-white *campanero*. He is never seen to feed with the other *coti-gas*, nor is it known in what part of Guiana he makes his nest."

The second specimen is a relative of the bell bird, and is known to ornithologists as the *cotinga cincta*. Of these, in their natural state, even less is known than of the bell birds. The *cotingas* are distinguished by the brilliancy of the coloration of the males. In the species at present under notice, the under parts are of a deep plum color, while the upper parts, with the band or cinctus across the breast, are of a magnificent ultramarine blue. In size this *cotinga* equals a blackbird. Their food consists of fruits, which their wide gape enables them to swallow with ease. Like their allies the bell birds, they are solitary in their habits, keeping to the topmost branches of trees, and generally residing in the dense forest, though at times they approach the cultivated grounds in search of their food.

Useful Recipes for the Shop, the Household, and the Farm.

According to Niedling, a beautiful orange-yellow tone, much admired in a chest at the Vienna Exhibition, may be imparted to oak wood by rubbing it in a warm room with a certain mixture until it acquires a dull polish, and then coating it, after an hour, with thin polish, and repeating the coating of polish to improve the depth and brilliancy of the tone. The ingredients for the rubbing mixture are about 3 ozs. tallow, ¾ oz. wax, and 1 pint turpentine, mixed by heating together and stirring.

The following is said to be all there is of the cook's secret for producing those world-renowned potatoes served at Moon's Lake House, Saratoga Springs, every summer: Peel good-sized potatoes, and slice them as evenly as possible; drop them into ice water. Have a kettle of lard, as for fried cakes, and very hot. Put a few at a time into a towel, shake them about to dry them, and then drop into the hot lard. Stir them occasionally; and when of a light brown, take them out with a skimmer. If properly done, they will not be at all greasy, but crisp without, and mealy within.

A French journal says that, of the score of fireproof compositions that have been brought forward within as many years past, there is scarcely one that possesses superior or even equal adaptation, to the purpose, to the following: Dissolve, in cold water, as much pearlash as it is capable of holding in solution, and wash or daub with it all the boards, wainscoting, timber, etc.; then, diluting the same liquid with a little water, add to it such a portion of fine yellow clay as will make the mixture of the consistence of common paint, and then stir in a small quantity of paperhangers' flour paste to combine both the other substances. Give three coats of this mixture, and, when dry, apply the following composition: Put into a pot equal quantities of finely pulverized iron filings, brickdust, and ashes, pour over them size or glue water, set the whole near a fire, and, when warm, stir them well together. With this liquid composition, or size, give one coat, and, on its getting dry, give a second coat. It resists fire for five hours, and prevents the wood from ever bursting into flames; that is, it so resists the ravages of fire as, at most, only to be reduced to coals or embers, without spreading the conflagration by additional flames. It is found that a quantity equal to twenty pounds of finely sifted yellow clay, a pound and a half of flour for making the paste, and one pound of pearlash is sufficient to prepare a square rood of deal boards.

Mr. James Hinton, in his "Physiology," affirms that the passage of the ear does not require cleaning by us. Nature undertakes that task, and in the healthy state fulfils it perfectly. Her means for cleansing the ear is the wax, which dries up into thin scales, and peels off and falls away imperceptibly. In health the passage of the ear is never dirty, but an attempt to clean it will infallibly make it so. Washing the ear out with soap and water is bad; it keeps the wax moist when it ought to become dry and scaly, and makes it absorb dust. But the most hurtful thing is the introduction of the corner of a towel screwed up, and twisted around. This proceeding irritates the passage and presses down the wax and flakes of skin upon the membrane of the tympanum, producing pain and inflammation and deafness. Washing should only extend to the outer surface, as far as the finger can reach.

An ink composed of copper 1 part, dissolved in 10 parts nitric acid, 10 parts water being afterwards added, is useful for marking on tin or zinc plant labels.

A simple mode of keeping butter in warm weather is to set over the dish containing it a large flower pot or unglazed earthenware crock, inverted. Wrap a wet cloth around the covering vessel, and place the whole where there is a draft of air.

Rats detest chloride of lime and coal tar.

White horn buttons may be made to imitate mother-of-pearl by being boiled in a saturated solution of sugar of lead and then laid in very dilute hydrochloric acid.

The following is a simple way of obtaining copies of writing without the use of a copying press: Mix white sugar with the ink, 1½ drams sugar to 1 oz ink. Use this with an ordinary pen, and place over the writing a moistened sheet of unsized paper. Lay both leaves between two layers of carpet; put the whole under a piece of board large enough to cover. Then stand on the board for a few seconds. An excellent impression will be found on the copying paper.

To extract rust from steel, immerse the article to be cleaned in a solution of ½ oz. cyanide of potassium to a wine glass full of water until the dirt and rust disappear. Then clean by means of a tooth brush with a paste composed of cyanide of potassium, Castile soap, whitening, and water.

Awnings can be rendered waterproof by plunging the fabric into a solution containg 20 per cent of soap, and afterwards into another solution containing the same percentage of sulphate of copper. Wash, and the operation is finished.

The best pine wood evaporates 5 lbs. of water per lb. wood consumed in a steam boiler furnace. One cord of wood can be consumed per hour on 60 square feet of grate. One pound carbon burnt to carbonic acid requires the oxygen of 153 cubic feet of atmospheric air.

Iron filings in a weak solution of sal ammoniac, mixed with Portland cement, are said to double the strength of the latter

The following compounds are useful for soldering or tinning: Tin, 1 part muriatic acid with as much zinc as it will dissolve; add 2 parts water and some sal ammoniac. Brass and copper, 1 lb. muriatic acid, 4 ozs. zinc, 5 ozs. sal ammoniac. Zinc, 1 lb. muriatic acid, 2 ozs. sal ammoniac with all the zinc it will dissolve, and 3 pints of water. Iron, 1 lb. muriatic acid, 6 ozs. sperm tallow, 4 ozs. sal ammoniac. Gold and silver, 1 lb. muriatic acid, 8 ozs. sperm tallow, and 8 ozs. sal ammoniac.

For silvering metals, 10 parts nitrate of silver, 10 parts common salt, and 30 parts cream of tartar may be used. Moisten the powder with water when ready to apply.

Hardening Glass.

This is a process that has been patented by Mr. Macintosh, of Westminster, a civil engineer who has devoted much time and attention to the hardening of iron, steel, and alloys. Starting on the broad ground that, the lower the degree of temperature of the liquid in which certain heated bodies were plunged, the harder such bodies became, Mr. Macintosh has found that glass, graphite, uncrystallized carbon, slag, and other analogous substances may be rendered exceedingly hard by means which are usually indicated for metals. Colored glass may, by this treatment, be rendered so hard as to be effectively used as a substitute for gems, and, what is curious, may be pulverized and used in the same way as diamond dust or emery powder.

In hardening the substance, the method pursued by the patentee is to place a small quantity of fused or nearly fused clear or colored glass in iron or other molds to shape the glass, and the substance is taken out of the molds and placed in platinum molds, and fused or nearly fused, and suddenly deprived of its caloric by frigorific mixtures of iced water and salt, or any of the freezing compounds that produce extreme cold; the sum and substance of which is that the glass is heated to a very high degree of temperature and then rapidly cooled in a very frigid fluid. A startling statement is made by Mr. Macintosh when he asserts that, when the component parts of gems are treated by the above process, he is enabled to produce thereby fictitious gems even harder than real diamonds.

Velocity of Light.

Professor Cornu, of the *Ecole Polytechnique*, Paris, has put into successful use a new instrument for measuring the velocity of light between two stations, in which an electrical registering apparatus is used, giving, it is believed, more accurate measurements than the well known toothed wheel arrangement of Fizeau. Foucault fixed the velocity of light, by his instrument, at 185,157 miles per second. Professor Cornu, by his new instrument, fixes the velocity of light at 186,660 miles per second, or 1,503 miles faster per second than Foucault.

An Engineer on Boilers.

"Then there's the boiler; that takes a heap of watching all the time. We have steam enough ordinarily, might say, when we don't want it; but there are times when we can't get it to save our souls; no more than enough to get along with. She fires hard. I never saw a boat yet that had too much boiler; nor no other man. Yet tell the owners that, or the makers of the engines, and they will say: 'Oh, big boilers take up too much room;' and then they go and put in a little kettle with not enough fire surface in it, and burn coal enough in a year to pay for a decent boiler. The best made boilers in the world will bear a heap of watching. You know the engine pumps water into them all the while to keep up the supply. Well, the pumps will work all right for months at a time; first thing you know of, sometimes when you are in trouble about other things, the pumps will stop working, and you can't get a drop of water in her to save you, then you have got to look sharp. What makes it act so? What makes everything go wrong in this world? That's what I want to know; when it's once set right, it ought to go right, but it don't. Sometimes the check valves get held up, and the water don't go down in the boiler at all, but just surges back and forth from the pump pressure and the boiler pressure alternately; sometimes dirt gets under them, chips and things; then, again, joints will blow out in the band hole plates, and make a heap of trouble. No matter how trifling a thing is to us, it is sure to make a disturbance with the passengers, and that's what we have to avoid as much as possible, for they are easily scared."—*New York Sun.*

The Coke-Manganese Galvanic Cell.

The well-known Leclanché's cell is now in use for many purposes, giving a very constant current, but which, however, is much decreased by the resistance of the tar covering the top of the porous cell, and by the decomposition of the manganese dioxide, which is transformed during the action of the cell into oxide; the latter oxide closes the pores of the cell. Sergius Kern's cell is a modification of Leclanché's one, and the experiments proved it to act very constantly.

Two parts of cleanly washed coke, and one part of manganese dioxide in the state of powder, are well mixed together with a small quantity of water acidulated with some drops of nitric acid; the mixture then is strongly pressed into brown paper cartridges 5 inches high and 1½ inches diameter. The resulting coke-manganese cylinders are dried in a warm place, but not over a fire, because the heat, as it is known, decomposes the manganese dioxide.

The dried cylinders are placed in glass jars containing concentrated solution of ammonium chloride, and surrounded with zinc plates curved in the usual manner. By this arrangement the use of porous cells is avoided, and a battery of such elements acts more constantly; besides this, the construction of it is cheaper. Instead of having glass jars, Kern uses wooden boxes, the size of the glass jars; the internal parts of the boxes are covered with the following mixture, melted in an iron cup:—2 parts of wax, 10 parts of common resin (colophony), 2 parts of red lead, and ½ part of gypsum.

The zinc of the element is the negative pole; the coke, the positive pole.

Recent American and Foreign Patents.

Improved Steam Boiler Furnace.

Walter Dawson and James Hughes, Scranton, Pa.—This invention consists in the formation of the side sheets of the furnace to protect the corner joints and flanges from the intense heat of the fire. In ordinary boilers, the side sheets, which lap on to the flanges of the front and tube sheets, are straight sheets, which leave the flanges and rivets exposed to the full heat of the fire. The furnace consequently fails at the corners from the heat and corrosion caused by the increased thickness of iron at those points. The object of the improvement is to prevent this, and to make the corner joints as durable as any portion of the furnace; and for this purpose the side sheets bulge inward throughout the entire width, where the central portion of the sheet is on the same plane as the joints, with bulges adjacent to the flanges to protect the joints. By this means the joints are protected from the intense heat of the fire, and are preserved and rendered as durable as any part of the furnace.

Improved Mechanical Movement.

James R. Devor, Goshen, Ind.—This invention relates to a new mechanical device, by means of which belt pulleys, cogged gearing, and other mechanisms may be made to run on shafts which are not parallel to each other. Balls are fastened tightly on the shafts. A portion of the ball sockets consists in two disks, having each a broad slot through which the shaft passes. These slots allow the shaft to turn in either direction. The inside pulleys form the box, and are made concave to fit the ball, having flanges which lap on the disks. The pulley is carried or revolved by the pins through the pulley, and the slots in the ball on opposite sides. Attached to the disks on each or opposite sides of the ball are yokes connected together by a rod, which support the belt guide. The spaces inside the disks are for allowing the box lateral play on the ball.

Improved Construction of Watch Movements.

James H. Flynt, Duluth, Minn.—This is a watch movement in which motion is communicated from the mainspring barrel to the escapement wheel through a single pinion and wheel, said wheel being of nearly the circumference of the pillar plate, and arranged between the face and the pillar plate.

Improved Milk Cooler.

Henry S. Murray, Andes, N. Y.—The outlet tube consists of an annular socket with a shoulder, which is soldered around a bottom perforation of the milk pan, and seated on a circumferential collar of an exit tube of the tank. A top flange of the exit tube extends into the socket, forming, in connection with the shoulder of the socket, the seat for the circumferential flange of a short tube, which screws into the threaded part of the exit tube so as to bind the socket, exit tube, and connecting tube firmly together. Intermediate packing rings produce the water and milk tight connection of the pan and tank, so that the milk may be drawn off without leaking, or mixing with water from the tank. A screw cap is screwed into the binding tube of the faucet, for closing the same, in the same manner as in the water exit tube, and retained until it is necessary to draw off the milk, in which case the screw cap or plug is withdrawn.

Improved Seed Sower.

John W. Talley, Paxton, Ill., assignor to himself and Thomas W. Buell, of same place.—The invention consists of a vertical lever for working the slide, which is moved in one direction by a vertical lever at the end of the roller, so as to be operated by tappets thereon. It is connected to the slide lever by a rope going around a guide pulley at one corner of the machine. In the other direction the slide lever is worked by a spring, which is forced as the tappets escape from the lever. A stop cord is connected to the tappet lever to prevent the spring from throwing it and the slide lever too far. The machine is designed for sowing grass, flax, and other small seeds, and will generally be used with a roller for smoothing the ground at the same time; but it may be used with wheels.

Improved Milking Tube.

Sylvester A. Smith, Muscatine county, Iowa.—This invention consists in a tube provided with a grooved head in which is a slide valve, while the body is tapered to an open end that enters the teat and udder of the cow.

Improved Hod Elevator.

William Murphy, New York city.—This invention consists in rods attached to the framework of the elevator in such position as to be over the inner part of the side bars of the base of said elevator frame. These receive hooks attached to the handles of the hods. Hooks are attached to said handles to adapt the hods to be hung upon and supported by the rods attached to the frame work of the elevator.

Improved Mode of Inlaying Jet with Metal.

William Stephans, New York city.—This invention consists in a mode of inlaying jet with metal, by burning a recess of the proper size and form in the jet, by means of a recessed die and a sheet metal guard plate. In this way pieces of metal of any desired form, no matter how irregular or complex, may be easily and quickly inlaid in jet, and the work may be done without danger of cracking or chipping the jet. When the pieces are large, pins may also be applied to their ends to assist in securing them in place.

Improved Cloth-Measuring Machine.

Joseph S. Gold, Washington C. H., Ohio.—The cloth roll is turned by the cloth, which is drawn through the machine by winding it on cloth rollers with a crank, and the cloth is pressed on the cloth roll by a roll with sufficient force to cause it to turn the machine. A tape shows, by the marks upon it, the measure of the cloth.

Improved Gang Plow.

Thomas M. Nichol, Sparta, Ill.—By suitable construction, by operating levers, the axles may be adjusted to cause the machine to run level upon sliding ground, or when one of the wheels is running in a furrow. The points of attachment of the plow beams may be raised and lowered to adjust the plows to run deeper or shallower in the ground, as may be required. This manner of attaching the plow beams allows their rear parts to have a free vertical movement. The plows are held at the same distance apart, and each plow may be allowed to rise independently of the other.

Improved Reversing Pulley or Gear Wheel.

Henry W. Sherrill, New York city.—This invention relates to an improvement in pulleys or gear wheels, whereby the same pulley or gear is used for reversing the motion of the shaft or arbor. The advantages of the arrangement are found in the small space occupied by the single pulley or gear, and in a single belt to serve in the place of a number of belts and pulleys for producing the same effect, and in the facility with which a greater speed can be obtained in the reverse motion.

Improved Twister for Making Thread, Twine, etc.

Lavancia M. Sutherland, Catskill, and Thomas Groves, Brooklyn, N. Y., administrators of James Sutherland, deceased.—This invention consists of a slitted bent pipe, hinged or jointed to a water pipe, and interposed between the fliers and the tension rollers for wetting the strands while being twisted; also the combination of the cock of the water pipe that supplies water to wet the strands, with the ordinary belt shifter of the machine, so that the flow of the water through said pipe may be stopped and started, and by the same operation.

Improved Locking Device for Machinery.

Timothy D. Marsh and Franklin M. Crane, Jersey, Ohio.—A hub on the shaft carries a slotted arm which receives the pin of a reversing lever connected with the hub. Extending in opposite directions from it are two loose arms, the outer ends of which are fitted into slots of two friction shoes. In the cap plate are two pins for each of the arms, arranged to give the arms a little play and allow the shoes to bind against the frictional surface and hub. In reversing the action of the device, a lever is moved, by means of a pin, from one side to the other of the stud on the cap plate. When the lever is moved over the stud, the action is reversed; and when the lever is left on the stud, the arms bind when the shaft is turne1 in either direction and prevent all motion, from the fact that,when the shaft is turned either way, the movement of the square hub causes the arms to bind and the shoes to catch against the frictional surface.

Improved Wagon Jack.

William Henry Horn, Santa Cruz, Cal.—In using the jack a lever is turned up to lower the bar to its lowest position. A block is then adjusted to the hight of the axle to be raised, and the jack is adjusted to bring the block beneath said axle. The lever is then turned down to rest upon a stop. This movement raises the bar and block raising the axle. As the lever is lowered, a loop or link passes back of the axis of the hinge of the said lever, and the various parts of the jack are locked, supporting the axle in its raised position.

Improved Nursery Chair.

Calvin A. Watson, New York city.—This is a nursery chair constructed of a seat board with central aperture, supported on hinged legs, and provided with hinged side boards held open by a removable brace piece. It may be readily folded into a small compass for packing, etc.

Improved Draft Equalizer.

William Snow, Waverly, Ill., assignor to himself and Joseph H. Challen, same place.—This is a draft equalizer, formed by connecting a single tree directly to a double tree by means of a clevis, and with its ends projecting past the inner ends of the single trees, which form part of the double tree proper.

Improved Steam Boiler Furnace.

Walter Dawson and James Hughes, Scranton, Pa.—This invention relates to the fire boxes or furnaces of steam boilers, and consists in the formation of the side sheets of the furnace to protect the corner joints and flanges from the intense heat of the fire. The side sheets are bulged or projected inward.

Improved Milk Cooler.

Daniel Gurnsey, Watertown, N. Y.—This invention is intended to remedy the unequal distribution and cooling capacity of the water in ordinary milk coolers, which enters at one side and is gradually warmed up on its passage through the cooler, so that the temperature at one end of the pan, where the cool water enters, is considerably lower than at the other end. The uneven temperature of the milk retards the progress of raising the cream and decreases the yield of butter. The apparatus consists of devices for admitting the cool water simultaneously at the end and at central points of the bottom of the cooler, and drawing it off by suitable channels and regulating devices at the opposite end.

Improved Refrigerator.

August F. Bronner, New York city.—This invention consists of an ice box with double unfilled walls, of which the side walls are employed for conveying the ice water from the central and upper part to the bottom part, for utilizing the cooling effect on the air passing in the same direction. The drip water is conveyed by inclined troughs of the side walls to a front channel, and then through perforations of the same over the inclined bottom to the rear exit aperture.

Improved Carbureting Gas Machine.

Elon Foster, New York city.—This improved gas machine, for carbureting air or gas, is so constructed that it will operate equally well whether a large or small quantity of the hydrocarbon be in the tank. The air or gas is brought into contact with the hydrocarbon twice before it escapes through the outlet pipe.

Improved Gas Burner for Heating Purposes.

Anatole Ehret, San Francisco, Cal.—This consists of a chamber in the standard on which the burner is mounted, into which the gas pipe leading to the burner discharges, and into which there are air pipes entering from the base of the stand, so as to draw in an abundant supply of air to mix with the gas. The invention was described and illustrated on page 290 of our current volume.

Improved Portable Toilet Waters and Extracts.

A. Gibbs Campbell, Paterson, N. J.—This is a compound for the production of toilet waters or extracts by lixiviation with alcohol, the compound consisting of a mixture of carbonate of magnesia with one or more fragrant attars.

Improved Pitman Connection for Pumps.

James M. Langley, Double Bridges, Tenn., assignor of one third his right to James C. Sawyer, same place.—To the end of a piston rod is pivoted the end of a pitman, the other end of which is pivoted to the crank pin of the crank. To the pitman, at a little distance from the crank, is rigidly attached a short stud, to which is pivoted the end of another pitman. The outer end of the second pitman is pivoted to an arm rigidly attached to a rock shaft. To the rock shaft are attached one, two, or more cranks, to the pins of which are pivoted the ends of the piston rods of the pumps, so that the pumps may be operated by the rocking of the shaft.

Improved Steam Pumping Engine.

Charles H. Hudson, Chicago, Ill.—The valve is composed of three disks of like diameter, keyed on a stem. The steam which has acted on the piston and filled the cylinder space is allowed to act on the valve and move it into the alternate position necessary to cut off steam from the right hand end of the cylinder, and admit it, by the corresponding ports, to the left hand end of said cylinder, to move the piston in the reverse direction. Simultaneous with the above described action of the steam on the valve, it exhausts into the outer air. The regular exhaust from the cylinder into the valve chamber is always through the ports by which the steam entered the cylinder at the previous stroke of the piston. The openings between the passage and the valve chamber are closed alternately by the end disks forming part of the valve, the thickness of the disks exceeding the diameter of the openings, and the projecting ends of the valve stem governing the position of the valve, so that one of the disks always comes directly opposite, and thus covers, the nearest opening each time the valve is moved and comes to rest. By a suitable arrangement of water valves, the supplementary chamber, requisite in pumps whose valves close by gravity, is dispensed with, and space and material are economized.

Improved Car Coupler.

W. H. Adams, Mount Gilead, Va.—This invention relates to automatic couplers where a spring catch is pushed aside by a link hook or arrow head, behind whose shoulders it then closes. The invention consists in four features of improvement whereby cars may be coupled and uncoupled with great facility, without complication or expensive mechanism, and is self-detachable when a car runs off the track.

Improved Hydrant.

James W. R. Fisher and William H. Fisher, Martinsburg, W. Va.—This invention consists of a case made in sections, a lever-held pipe, valve chamber, and chamber for the inlet pipe, together with an elastic cup, the whole so jointed together as to be readily separable without removing the inlet pipe chamber.

Improved Furnace.

Smith W. Kimble, Springfield, Il'.—This invention consists in connecting the combustion chamber and ash pit of a furnace by a throat, provided with a drop door, and also in flues that connect on one side of the combustion chamber, pass over it, and are attached on the other side to a pipe resting loosely in brackets.

Improved Sash Fastener.

Ira David Woolf, Oneonta, N. Y.—This consists of a spring bolt, which works through a hole in the sash and enters the casing, the bolt having a peculiar stop lug, which passes with the bolt through the slot in the plate. A spiral spring is attached to and surrounds the bolt, which spring bears against the plate and has a certain degree of tension, which serves to force the bolt inward with a constant pressure. When the bolt is withdrawn from the casing, the end of the stop lug may be made to rest on the outside of the plate by drawing the bolt downward, which renders the bolt inoperative. The bolt may be attached to either of the sashes of the window, and will hold them in any desired position, and fasten them so that they cannot be moved from the outside.

Improved Magazine Fire Arm.

Frederick M. Shinn, Leroy, Kan.—The gun has two magazines under the barrel, discharging into a revolving chambered cylinder, by which the cartridges behind the barrel are to be shoved out of the chambers of the cylinder into the barrel by a breech rod. When the breech rod is drawn back it pulls the shell back into the cylinder by its spring catch; and as soon as that takes place the ejector is forced up by a projection of the guard, which presses it up at the bottom. The ejector engages the shell under the rim of the base and lifts it out of the chamber of the cylinder. As soon as the shell has been lifted out, a pawl on the ejector engages the cylinder by a notch in the rear end, and turns it sufficiently to bring a cartridge into range with the barrel. Then the guard is pulled back and the breech rod thereby pushed forward to push the cartridge into the barrel. The ejector is at the same time pulled back by its spring, and the gun is then ready for firing again.

Improved Horse Yoke.

Rufus Stratton and George Olmsted, Hazardville, Conn.—The hames are fastened at the upper end by a screw, and have projecting ears, which are slotted horizontally to receive the outer ends of the yoke, where they are jointed by pins or screws. The yoke is made in two parts. Horizontal bars project from the side bows and lap past each other, and work on the draft pin, which pin passes through both bars. The ends of these bars play up and down to accommodate the position of the horses.

Improved Umbrella Support for Vehicles.

Alexander J. Hood, Warren, Ill.—This device is designed for supporting umbrellas in vehicles; and consists of a stand attached to the seat, having an adjustable grooved arm and band for holding the staff of the umbrella.

Improved Clothes Pounder.

Chauncey B. Hart, Fairport, N. Y., and George W. Hart, Medina, Mich.—This is a device for washing clothes by forcing the water out of them by atmospheric pressure, and then allowing them to be again saturated. There is a disk of wood or metal, to the outer side of which is attached a handle. To the under side is attached the end of a coiled spring. The last coil at the other end of the spring is attached to a metallic ring. The head and the ring are also connected by a strip of canvas, the edges of which are attached to the edges of the said head and ring. In the head are formed holes which are covered by valves opening downward. In using the device, it is placed upon the clothes in a tub, and the head is forced downward by means of the handle. This compresses the air and forces it into and through the clothes, driving out the water. As the head is raised, the valves are opened by the pressure of the atmosphere, which enables the device to be raised and again operated upon some other part of the clothes.

Improved Hat.

John Case, Alexandria (Frenchtown P. O.), N. J.—This hat is composed of an outer conical portion attached to a hat of the ordinary shape, so that a space is left above the crown and at the sides between the two parts. The outer conical hat is supported on the crown of the inner hat, with its lower rim extending down to about a level with the brim of the inner hat. The two parts are joined or connected at the crown angle of the inner hat. The object is to leave an air space.

Improved Horse Detacher.

Amos Barker, Nebraska City, Neb.—This consists in the application, to the single trees, of an armed vibrating rod, operated by cord or chain, in connection with pivoted hooks for attachment of the traces. The traces are released by pulling a cord which withdraws curved arms for the pivoted half circle hooks. The neck yoke then moves forward upon the tongue, the cord will turn the rod, withdrawing the curved arms from the pivoted half circle hooks, and allowing the neck yoke to drop, and the horses will be entirely free from the vehicle.

Improved Middlings Purifier.

Simeon Crittenden and James Waters, Chatfield, Minn.—In the bottom of the hopper is placed a roller, which distributes the middlings and feeds them in a thin sheet to the bolt, which is hung in a slightly inclined position from the casing by pivoted arms. The bran escapes from the tail end of the bolt, and the flour passes through the bolt cloth and falls upon zigzag plates, the ends of which are inserted in grooves in the side bars of the frame, which last is agitated by a pitman. As the flour from the bolt falls upon the plates, it slides down upon said plates, passes through the narrow slits between their lower edges, and falls into the upper carrier trough. A number of plates are placed between the zigzag plates and the upper carrier trough. The upper edge of each successive plate rises above the preceding plate from the head end of the machine toward its tail end, to prevent the flour passing in that direction. In the head end of the machine, between the zigzag plates and the upper carrier trough, is placed a fan blower, the wind from which is discharged into the machine below the zigzag plates. The blast from the fan blower is directed upward by the inclined plates, and is divided by the graduated hights of said plates, so as to be about equally distributed from one end of the machine to the other.

Improved Binding Attachment for Sewing Machines.

Hamilton C. Jones, Brooklyn, N. Y.—This is an improved binding attachment to sewing machines, by which the binding is fed in an even and regular manner with the material to the presser foot and needle, so that the upper and under folds are simultaneously stitched to the goods, and the binding laid neatly in proper width on turning angles or abrupt circles. The invention consists of a spiral adjustable rear guide, and a double tapering front guide, with extension arm or tongue at the lower guide scroll for the under fold, and a serrated spring arm at the upper scroll for the upper fold for feeding the double folded binding and intermediate material to the presser foot and needle.

Improved Butter Package.

Henry R. Scott and Dennis W. Granger, Franklin, N. Y., assignors to themselves and Andrew J. Dibble, of same place.—The body of the package is made rectangular, with slightly flaring sides and ends. To the ends are attached short upright bars, which are flush with bars attached to the cover. Tenons formed upon the ends of the latter bars enter mortises on the upright bars. Spring catches enter holes in the edge of the cover, and thus lock the cover in place upon the box. In the catch holes are placed small sliding bolts, which, when pushed outward, push the catches outward, and thus release the cover.

Improved Plaster Sower.

Frank Charles Moder, Hortonville, Wis.—The box is provided with a crooked stirrer and reciprocating distributor, the one keeping the plaster thoroughly stirred up and the other sprinkling it over the plants.

Improved Thill Loop.

Frank S. Berry and George F. Alexander, New Sharon, Me.—This is an improved thill loop for single harness for supporting the thills, which is so constructed as not to wear the thills or their patent leather covering, when covered.

Improved Table.

Louis Postawka, Cambridgeport, Mass.—This is a fastening for table standard legs. The stand consists of a headed and end-threaded bolt, and a tubular filling, which is let into and adhesively secured to a socket.

Improved Device for Forging File Blanks.

Theodore L. Grover, Brooklyn, E. D., N. Y., assignor to Bertrand Clover, N. Y. city.—The dies are made with reduced or contracted parts for drawing the bars down to form the blanks. There are also smoothing faces for smoothing and finishing the wide sides, and a recess in the upper corner of the stationary die, in which to taper or otherwise shape edges or narrow sides or the tang.

Improved Cultivator.

Amos B. Colver, Albany, Oregon.—This invention consists mainly in the mode of raising and lowering the entire plow frame and attaching it to the wheel frame. When a main lever is lifted by the driver from a seat on the rear axle, the whole plow frame is acted upon by the connecting front and rear links, and lowered toward the ground for the work of the plows. By pressing the main lever down, the plow frame is raised to sufficient length above the ground.

Improved Churn.

Benjamin F. Price, Mount Sterling, Ill., assignor to himself and A. A. Hill, of same place.—A coupling enables the dasher shafts to move up and down in vertical lines while the upper ends of the connecting rods move through the arcs of circles. The dasher shafts pass down side by side through the churn cover. The dashers, which are placed the one directly above the other, are attached eccentrically to the lower ends of the shafts. In the dashers are formed a number of holes, which flare upward and downward from the central plane, so that more milk may enter said holes than can pass through freely, which subjects the milk to great friction, and brings the butter very quickly.

Improved Lamp Burner.

James Pigot, Brooklyn, N. Y.—A prolongation of the lower portion of the air tube, in the form of a flat partition plate, separates the flat portion of the wick tube into two parts. Springs are employed in connection with the partition and ratchets, for pressing the wick into the ratchets with uniform effect for thick and thin ones.

Improved Car for Elevated Railways.

Roy Stone, Vandalia, N. Y.—This is an improved car for that class of elevated railways which are constructed on three rails supported on a longitudinal girder stretched from column to column, the car being placed thereon in the nature of a saddle bag, with symmetrical parts at both sides of the girder. The car is surrounded by platforms, and provided with end and central staircases, to give ready access to all the seats.

Combined Blotter, Paper Cutter, and Ruler.

Frank R. Angell, Los Angeles, Cal.—This is a paper cutter rule having two cross slots at one end and a single cross slot at the other to admit of receiving blotting paper.

Business and Personal.

Charge for Insertion under this head is $1 a Line.

Notes & Queries

R. J. can dye cotton goods by the process described on p. 405, vol. 29.—A. J. B. can proportion his safety valves by the formula given on p. 363, vol. 29.—R. N. can make lard oil by the process given on p. 283, vol. 30.—R. S. T. will find a good recipe for furniture polish on p. 315, vol. 30.—R. N. S. can blue steel by the method detailed on p. 123, vol. 31.—N. T. will find, on p. 58, vol. 24, descriptions of various processes for molding.

(1) J. W. R. says: I have a boiler 16 feet by 40 inches, with 2 flues of 14 inches each and a 30 foot stack. My engine is 8 by 16 inches, running at 180 revolutions, and it does good work at 50 to 80 lbs. of steam. But it costs me all I make to pay for wood for fuel, burning 2 cords per day. I think my work ought not to take over ¾ of a cord per day. Is there really that difference between a two-flued boiler and a tubular or locomotive boiler? A. We do not think that the amount of fuel burnt is excessive. Measure your feed water, if possible, so as to get some idea of how much water is evaporated.

(2) F. S. S. asks: Will the flesh or grain side of a belt give the most friction? Which will wear the longest? A. A belt should be run with the grain side next the pulleys for both reasons.

(3) C. M. asks: Is there any cement that will answer to cast hot metal in, which would last for a long time? The metal runs at about 1,300° Fah., and it is necessary that the mold should get very hard, have a good polish, and not contract or expand more than iron. A. No. Iron is best. Use plaster of Paris for light castings.

(4) G. B. P. asks: What is saleratus? A. It is bicarbonate of soda.

(5) W. P. says: In your issue of April 10, 1875, C. H. P. asks: What is the difference between one square mile and one mile square? You answer: None. You are wrong. There is as much difference as between a circle and a square. A mile square is a square surface having sides each a mile in length. A square mile is a unit of area, and may be of any shape; and although it may be a mile square, it is not necessarily so. A. You are wrong. The difference between two quantities is found by subtracting one from the other. If nothing remains, what is the difference?

(6) J. H. F. asks: In building an ice house, I constructed a dumb waiter which I can lower to same level as bottom of house. I am told that whatever is put therein, as meat, milk, butter, will taste of the new wood lining down which the waiter slides. What is the best plan to overcome this? A. Try two coats of paint without turpentine.

(7) A. F. says: I have had the walls in my house painted with oil color, and find that those parts from which the light has been excluded (by the hanging of pictures or other articles) have changed color to a yellowish tint. Is there a way of removing these stains? A. Peroxide of hydrogen and ozone have been recommended in such cases, but their application is difficult.

(8) O. P. asks: How many pounds to the square inch is atmospheric pressure? A. About 15. Is it possible to distinguish the electricity of iron, copper, brass, etc.? A. No.

(9) G. L. S. J. asks: 1. Which contains the most electricity, air or water? A. There is no practicable means of ascertaining. 2. What number of insulated copper wire would you use to wind magnets for a line of 3½ miles? A. No. 24 B. W. G. 3. What form of battery would you recommend for such a line, with ground plate for the return circuit? A. The gravity or Callaud.

(10) F. P. asks: 1. Will winter apples keep as well if grafted upon the stock of a fall apple as they will upon the stock of a winter apple? A. Yes. 2. I set the graft with the end of the grain of the graft meeting the side of the grain of the stock, or with the end of the grain of the graft meeting the end of grain of the stock. Which is correct? A. The latter.

(11) C. S. C.—Your boiler is too small. Plumbago and gas carbon are infusible.

(12) A. P. F. asks: If two engines and trains of equal weight and resisting power, both moving at the same speed, should approach each other upon a level track and collide, would either train prove a greater wreck than if, running at the same speed, it had impinged upon an immovable object? A. Either train would have the same effect upon the other as an immovable body; for the reason that, at the time of collision, the motion of each train would be instantaneously arrested. At all events, we are confident that the wreck would be quite as complete in one case as in the other.

(13) Inquirer.—The solid column of iron will support a greater load than the hollow column, both being of the same diameter.

(14) S. asks: 1. What are the dimensions of the dry dock at the Brooklyn navy yard? A. It is 286 feet long and 30 feet wide at bottom; 307 feet long and 98 feet wide at top, with a lock chamber by which the length of the dock can be increased 52 feet. The bottom of the dock is 26 feet below mean high tide. 2. How long does it take to empty it? A. The dock, when filled by the tide, contains about 600,000 cubic feet, and the pumping engine can remove the water in 2 hours 10 minutes.

(15) J. F. M. asks: How much steam ought a horizontal boiler, shell ⅜ and heads ½ inch thick, single riveted, length 3 feet, diameter 22 inches, with a number of pipes connected to boiler for grate bars, and a dome 1 foot in diameter and 2 feet long, to carry? A. You can carry 130 lbs. steam; and then you can find out how fast your boat goes.

(16) R. B. C. says: I am building a propeller boat for towing, 60 feet long, 14½ feet broad, and 7 feet deep. I am going to put in a 16x16 inch cylinder, and want to make 150 revolutions per minute. What pitch ought I to have on a 6½ feet wheel? A. Make a true screw, pitch 8½ to 9 feet. We shall be glad to receive particulars of the performance of the boat.

(17) S. B. McC. asks: 1. What kind of coal is used in the foundery business? A. You can use charcoal, anthracite, soft coal, or coke. 2. How much iron would 1 tun of good coal melt? A. With hot blast, about 1 tun.

(18) C. M. B. asks: 1. What is an oscillating engine? A. One in which the cylinder swings during the revolution, the piston rod being connected directly to the crank pin. 2. What is the meaning of back lash in an engine? A. The striking of one connection against another, due to a stoppage or change of motion of one of the connections. 3. Why do all tugs use upright engines instead of horizontal ones? A. On account of the economy of space and the facility of arrangement, together with considerations of cost, weight, and durability.

(19) L. D. L. asks: What is the water pressure per square inch at the bottom of a pipe 100 feet in perpendicular hight? A. About 43 lbs.

(20) J. K. asks: Please give me a rule for finding the wearing line of a saw tooth. What is the radius to be taken, in proportion to the diameter of saw? I want to lay it off for gumming the saw, and to have no further trouble. A. It will depend upon the form of teeth. Make a diagram of the saw, and continue the backs of the teeth, which will give you the lines required.

(21) E. S. M. says: I have a yawl 24 feee long by 5 feet beam, which I wish to propel at the rate of 6 or 7 miles an hour. What should be th- dimensions of boiler, engine, and screw? A. Engine 3 by 5 inches, propeller 20 to 24 inches in diameter and of 2¾ to 3 feet pitch. Boiler 24 to 30 inches diameter, 3½ feet high.

(22) G. E. R asks: In screwing gas or steam pipe, what number of threads are used for pipes of different sizes? A.

Inside diameter.	Threads per inch.	Inside diameter.	Threads per inch.
⅛	27	1½	11½
¼	18	2	11½
⅜	18	2½	8
½	14	3	8
¾	14	3½	8
1	11½	4	8
1¼	11½		

Taper of threads, $\frac{1}{16}$ per inch of length. These inside diameters are only estimated, as they vary for pipes of different strength, the thickness varying for the different grades, and the outside diameter remaining the same.

(23) P. R. says: 1. A friend states that the top of a chimney about 400 feet high will, in a severe storm, swing from 2 to 3 yards out of perpendicular. I say it is simply impossible. Which is right? A. It would be possible, but improbable. 2. My friend also says that, somewhere in Europe, there are very tall towers or chimneys considerably out of perpendicular. Is this so? A. You doubtless refer to the leaning towers of Pisa and Bologna. The tower of Pisa is 315 feet high, and a plumb line from the top of the inclined side will meet the ground 12 feet 4 inches from the base. The tower of Bologna is 134 feet high, and a plumb line falls 9 feet 2 inches outside the base.

(24) G. L. R. L. asks: What would be a safe pressure for a boiler 9 inches high by 1 foot in diameter, with four 1 inch tubes, made of sheet copper $\frac{1}{32}$ inch thick? A. From 15 to 20 lbs. per square inch.

(25) A. M. G. asks: What is meant by "a twin screw propeller?" A. Twin screw propellers are two propellers side by side. These propellers are commonly called twin screws. For information in regard to your other questions, you should consult some good treatise on the screw propeller, as their discussion would occupy too much space for these columns.

(26) H. K. asks: 1. Will a boiler 24 inches long, 15 inches in diameter, with 5 two inch return flues, produce steam enough to get the full working capacity out of a 1½x3 inches engine? A. Yes. 3. If the boiler were made of ⅛ inch copper, would it be strong enough to sustain 50 lbs. to the inch with safety? A. Do not run it above 40 lbs.

(27) R. A. P. asks: 1. I claim that the shorter an exhaust pipe is, the better for an engine running at 95 revolutions per minute; others claim that an exhaust one hundred feet high of 4 inches diameter to an engine 12x24, making 95 revolutions per minute (slide valve cutting off at ¾ stroke), would be beneficial. They claim that the steam passing through that length of pipe would produce a vacuum, and the steam would rush from beneath the valve to fill the same. Is this so? I claim that, if there be a partial vacuum, the exhaust produces it; and if we can produce a vacuum in that length of pipe, without loss of power, why not make use of all the exhausts that are puffing outside of our numerous manufactories? A. We doubt the formation of a vacuum in such a case.

(28) R. S. E. says: I want to make a piston to work inside a sheet copper cylinder, for holding oil, and I wish to have the piston move easily. What is the best material? A. Make it either of wood or metal, and pack it with hemp.

If I put a coiled cast steel spring in connection with a steam boiler, in the steam space, but not where the water can touch it, shall I run a risk of drawing the temper? A. The spring will retain its temper for some time under these circumstances, but not as long as under ordinary temperatures.

(29) C. B. D. asks: For an engine of 3 inches stroke and 2 inches in diameter, what size boiler will be necessary, and of what metal should it be? A. Make the boiler of wrought iron, 20 inches in diameter and 3 feet high.

(30) H. G. H. says: A steam gage is found by a test gage to show a pressure of but 130, when it should have shown 185 lbs. per square inch. Is it correct to say that the gage is 55 lbs. light or 55 lbs. heavy? A. The former would be the more correct of the two.

(31) S. M. asks: We run a 4½ horse power upright engine and boiler. Last winter we inserted a pipe to convey steam for heating purposes, and from it connected another pipe to heat water in a tank. We found it impracticable to run the engine and admit steam in this heating pipe at the same time, by reason of the water rising in the boiler and into the cylinder. What is the cause, and what the remedy? A. Either the steam room in the boiler is too small, or the connections are improperly made.

(32) A. P. asks: How can I deodorize kerosene oil? A. Digest the oil with a quantity of chloride of calcium reduced to a fine powder, at a temperature not exceeding 140° Fah. for several days. It should then be drawn off from the limey sediment and treated with a little carbonate of soda. The alkaline sediment should next be drawn off, and the oil washed with water.

How is dammar varnish made? A. It is formed by dissolving gum dammar in oil of turpentine.

Can the coloring matter called reginine be obtained? A. Yes, in the shops.

(33) T. M. C. asks: What is the best remedy to prevent unpleasant odors from the feet caused by perspiration? A. Use carbolic soap.

(34) R. B. N. says: We cut muriatic acid with zinc, then dilute with ⅝ water, to solder tin. Are the fumes, arising from soldering with this production by the application of hot copper, injurious to health? A. Yes.

In canning lobsters, we do not use the bodies. Can they be utilized by being converted into guano or manure? A. They may be used directly as a manure.

I have replaced the copper used in soldering tin, with cast steel; can I tin the steel to stand heat permanently? A. Use a coppered iron.

(35) F. B. G. asks: What can I use as a solvent for marine glue which has become hard with age, so as not to destroy its adhesive properties? A. The proper solvent for this is ether containing little alcohol, in which it dissolves with the aid of heat and agitation. The operation should not be conducted in the vicinity of any flame.

(36) J. C. R. asks: 1. What are the analyses of oxide of zinc, red lead, litharge, and raw and boiled linseed oil? A. Oxide of zinc is composed of zinc 65 parts, oxygen 16 parts, litharge of lead 207 parts, oxygen 16 parts. Red lead consists of lead 621 parts, oxygen 64 parts. Linseed oil consists of 76 parts of carbon, 11 of hydrogen, and 13 of oxygen. The boiled is the raw oil heated with litharge. 2. Why does litharge dry so much faster than oxide of zinc, when mixed with linseed oil? A. Because drying results from the absorption of oxygen from the air, and this result is more promoted by the litharge than by the oxide of zinc. 3. What pigment is of a nice orange color, suitable for striping? A. Try chrome yellow. 4. How can linseed oil be refined and bleached? A. By successive treatment with acid, alkali, and water. 5. What is oxychloride of zinc? A. It is a combination of zinc, oxygen, and chlorine, made by union of the oxide of zinc and the chloride of zinc.

(37) L. K. Y. asks: Is the band saw patented? A. No.

What does 1 oz. of pure sheet silver cost, and 1 oz. gold? A. One oz. of pure gold will cost about $25; of silver, about $1.50.

In what kind of oil or solution should I harden my steel burnishers? A. Any fatty oil will answer.

(38) A. M. H. asks: Considering iron pyrites as $Fe\,S_2$, what would be the formula for the residue when as much sulphur as possible has been driven off by heat? Some of the books say $Fe_3\,S_4$, others say Fe S. Which is right? A. When iron pyrites have been subjected to roasting, it has been found that it has assumed magnetic properties, and, according to Berzelius (who investigated the matter), its composition is $Fe_7\,S_8$. This has been confirmed by Rammelsburg.

(39) C. L. says: For soldering and other blowpipe work, alcohol at $3 per gallon is too expensive, and we have no gas. What can I burn in place of alcohol that will burn freely, be clean, and get up heat enough to melt gold or silver on a piece of coal? A. Rape seed oil.

(40) O. U. asks: 1. Of what cloth are artificial leaves made, and how is the gloss put on them? A. Usually of the fine glossy silk stuff known as taffeta. The taffeta is dyed of the proper green in the piece before cutting out. It is then stretched out to dry, and afterwards further prepared with gum arabic on one side, to represent the glossy upper surface of the leaves, and with starch on the other, to give the velvety appearance of the under side. The latter preparation, colored to suit the exact shade of green to be given to the leaf, must be just of the proper consistence, making the leaf neither too stiff or too limp, while it gives the proper kind of under surface. Where the leaf requires a marked degree of this velvet texture, it is given by the nap of cloth, reduced to a fine powder and properly tinted. A little gum is lightly passed over the surface, and when partly dry this powder is dusted over the surface, the superfluous portion being shaken off. 2. Are the veins and coloring done by hand? A. For giving to the leaf the appearance of nature, by representing the veins and indentations which they always exhibit, various gauffering tools are made use of.

(41) J. B. H. asks: 1. Can I correct my clock by the aid of the almanac? A. Find the moment that the sun is on the meridian, by the sextant. An almanac calculated for that meridian will give you how much the sun is fast or slow for that day, which will be the correction required. 2. How is it that the almanacs differ as to the time of sunrise, etc., at any given place? A. They should not if properly calculated for the meridian of the place.

(42) T. G. B. asks: Can kalsomining be done on a papered wood ceiling, and how should it be mixed and put on? A. Yes; use a large proportion of glue.

How can I clean up an old gilt window cornice to make it look like new? A. Use a very soft sponge and tepid water.

If a body in motion strikes another body of equal weight at rest, which receives the greatest shock? A. The shock will be mutual and equal.

How is dry steam made? A. By superheating.

(43) W. T. G. asks: Please give me a recipe for making a gold ink. A. The ordinary gold writing ink is made by simply mixing gold powder with some mucilaginous liquid, in which the very finely divided powder is held in suspension.

(44) D. W. S. says: I have made a mixture of equal parts of strong lye and water, saturated with sulphate of copper, and obtained a green mass of the consistence of cream. What is it? A. The addition of an alkali to a solution of sulphate of copper is always accompanied with a precipitate of hydrated oxide of copper, which is insoluble. This body is of a green color, and has simply rendered the solution turbid.

How is verdigris made? A. Verdigris is a subacetate of copper, and is formed by placing plates of the metal in contact with the fermenting mass of the grape, or with cloth dipped in vinegar.

What is glass etching, and how is it done? A. It is the art of producing designs, etc., on glass by the corrosion of its surface by means of hydrofluoric acid. The glass is first coated with a thin film of wax, through which, to the surface of the glass, the lines of the drawing are cut with fine steel instruments. On submitting the plate so prepared to the action of the acid, the surface of the glass only, immediately under the lines cut through the wax, is reached and acted upon by the acid.

How can I make a small hand stamp? A. There are several methods that accomplish this; one of the best is that known as the Woodbury process, which consists in first photographing the object on a plate prepared with a solution of bichromate of gelatin, the action of light on which is to render the bichromate insoluble. Upon immersion in water, the parts of the plate not affected by the light dissolve out, leaving the picture standing in relief, which, on drying, becomes very hard. It is next placed upon a smooth, even block of zinc, and submitted to great pressure in a hydraulic press. The zinc die thus produced is used for printing.

How can I transfer engravings on to plate glass? A. Fix the engraving to the glass with ordinary paste. Etch with hydrofluoric acid, specific gravity 1·14. At the end of a few minutes, wash off the paper, and the design will be found reproduced upon the glass, the printer's ink having protected it.

(45) A. Z. asks: What will neutralize tartaric acid in sugar or candies? A. Freshly precipitated chalk will answer, or carbonate of soda; but it will be necessary for you to experiment with small quantities of the sugar until the proper proportion is determined. Care should be taken that the acid should always be slightly in excess of the alkaline substance used.

(46) H. S. asks: To what degree must water be heated to become steam? If there is a certain degree, why does not water in a vessel (as it necessarily is all of the same temperature) all go off into steam at once? A. The specific heat of water is found to be the highest of any known substance, and is taken as unity. If we take an ounce of water at 170° Fah., and an ounce of ice at 32°, and put them together, we shall have, when the ice is melted two ounces of water at 32°. The ounce of water has therefore parted with 142° of its heat in melting, the ice, which heat is said to have become latent. Water, at the normal atmospheric pressure, boils at 212° Fah., which is its maximum of temperature. Here again this apparent anomalous phenomenon occurs. As the temperature of the water reaches 212°, it becomes stationary; any further addition of heat is absorbed in converting the water into steam, which has the exact temperature of the water that produced it. Here also heat has been rendered latent, with an accompanying change in form of the water. As from ice to water, so from water to steam; or, from solid to liquid, so from liquid to gaseous. On condensation of the steam, and recongelation of the water, the exact amount of heat absorbed by the body is given out. A certain weight of steam condensed, at 212°, gives out 950° of latent heat. In its descent from 212° to 32° it gives out 180° of sensible heat, and again in its recongelation it restores 142° of latent heat, amounting together to 1,272°. Pressure influences the boiling point of water, and for that reason water may be heated (with the application of an adequate pressure) so as to melt lead. Likewise as the pressure decreases, the boiling point is lowered. At the hospital of San Bernard, in the Swiss Alps, which is 8,400 feet above the sea, water boils at 184° Fah

(47) G. A. F. asks: How can I tell if a piece of quartz polished on one side is artificially colored? A. By seeing whether rubbing with benzine affects the color, also whether, on careful heating as near redness as can be done safely, the color changes or blackens.

(48) A. H. W. G. asks: I intend making small quantities of nitrate of silver. What kind of furnace would you advise, to burn coal or wood? A. A stove of suitable form will answer the purpose.

In making a swimming belt, what weight of cork is necessary for supporting a man of 170 lbs. weight, and what kind of cloth should be used for covering? A. About 10 to 12 lbs. cork. Use canvas, a light duck.

Have photographs ever been taken with the natural colors of objects? A. No.

What is a good work on founding and casting, etc., and on beet root sugar? A. Ure's Dictionary is an excellent authority on all the subjects you mention.

(49) F. C. asks: How can I detect adulterations in claret wine? A. Such tests are too complicated for description here, and require a considerable knowledge of chemistry to be at all satisfactory.

(50) S. G. asks: Can you tell me of an easy way of separating water into its parts, and burning the gas? A. Water is decomposed when it is made part of a galvanic circuit of an adequate electromotive force, the oxygen being freed from the positive pole, while the hydrogen is found at the negative. The gases may without difficulty be collected separately, and burned in a compound blowpipe; but the experiment is a costly one.

(51) J. A. H. asks: What is burnt lead? A. When metallic lead is exposed at a high temperature (above 612° Fah.) to the action of the air, it is rapidly converted into the oxide, which has the appearance of small beautifully colored yellow flakes or leaves. This is readily soluble in weak acids.

(52) W. S. asks: What tests are used to detect acids in oils? A. You do not state what kinds of oils. If free acids be present, the addition of a little concentrated solution of carbonate of soda to a sample of the oil will immediately cause an effervescence to take place.

(53) F. H. Jr. says: I have drawn some portraits in pencil on common drawing paper, and a few of them became soiled by handling. I want to go over them again with India ink. In what can I dissolve the ink so that it will not blur when I clean them? A. Good India ink, rubbed up with water, will not rub off when dry.

Is not the earth about as heavy now as it was at its creation? A. Probably heavier, on account of the constant falling of meteoric masses from the depths of space upon the earth's surface.

What are the two specimens enclosed? A. Iron pyrites.

(54) J. B. B. asks: What is decarbonized steel? A. It is a fancy name given to the material of which cheap gun barrels are made.

(55) T. S. S. says: We wish to run a millstone by a belt. There is not room enough between the timbers to use a 12 inch belt. I say that we can use two 6 or 7 inch belts, one on top of the other, on the same pulley, and get the same power that would be given by one 12 or 14 inch. My partner says we cannot. Which is right? A. The driving power of a belt depends upon the friction between it and the pulley; and this, in turn, depends upon the pressure or tension of the belt. Two belts being twice as strong as one, the tension can safely be doubled. Hence you may do the work of a 12 inch belt with two 6 inch belts, one above the other. There are some practical difficulties in the way, however, and you can readily put in an angular belt, which will do the work and take up less room.

(56) S. says: 1. I am building a small engine of 4 inches stroke and 2½ inches diameter. How large should I have the ports? A. Make the port area from $\frac{1}{10}$ to $\frac{1}{15}$ the area of the piston. 2. Which would be the best packing for the piston? A. Thin rings without springs will answer for piston packing.

(57) W. B. M. says: In reply to the question: What power (as usually rated on steam engines) is required to drive a 15 inch circular saw in 6 inch soft wood? You answer: "From 12 to 15 horse." I differ with you on this point, as I know of a 9 horse power engine which drives a 48 inch circular saw. A. By reading our reply again, you will see that the power was given for driving the saw up to its full capacity, that is, at the greatest speed and with the largest feed that could be safely maintained.

(58) H. L. K. says: A friend says that the pressure of steam has nothing to do with calculating the power of a steam engine, provided the engine has a governor on it; he contends that an engine working at 20 lbs. pressure will do as much work as it would working at 90 lbs. pressure. I claim that the power is calculated by the pressure of steam, length of stroke, and diameter of piston. Which is right? A. You are.

If a heavy weight were let fall into the deeper parts of the ocean, would it reach a point where it would remain stationary before it comes to the bottom? A. Yes, if the water is deep enough.

It is said that a ship on the ocean draws less water as it recedes from the shore, and that in fresh water a boat will gradually rise as it removes from the shore. Will the saltness of the water in the former case, and the warmth in the latter, account for these facts, provided they are true? A. Yes.

How do you account for this apparent inconsistency: A meat diet shortens life, yet life may be prolonged by food which supplies the waste of the system? A. Who is responsible for the statement that a meat diet shortens life?

(59) J. R. E. asks: I would like to know the best way of transmitting power from a water wheel on nearly level land to a distance of 1,000 feet? A. The most economical system under ordinary circumstances will be by means of a wire rope.

(60) H. H. C. asks: Is there anything less expensive than alcohol that will be as safe and clean for making steam in a small boiler fitted in a boat 3½ feet long? My lamp uses about a pint of alcohol in two hours. I have tried kerosene and found it too smoky. A. There are lamps for burning kerosene that do not smoke and are quite effective. We doubt, however, whether you can find anything that gives so little trouble, and is so generally satisfactory, as alcohol.

(61) M. G. asks: In a steam boiler, with the steam up, is the pressure more or less below the water level? A. The pressure is least at the top of the boiler, and increases towards the bottom, by the weight of the steam and water above.

(62) J. W. M. asks: Having occasion to open the steam chest and cylinder of my engine, neither of which had been examined for more than a year, I found the flanges under the rubber packing eaten into hollows about half way across. When cleaning I found the metal in these places would cut like, and had all the appearance of, plumbago. The joints thus affected were all below the tallow cup. The cylinder (on the upper side principally, and close to the covers) had hollows eaten into it; from one of these hollows I scraped the enclosed sample. The interior of the piston was nearly solid; and in cleaning away I found the face of the piston with hollows nearly quarter of an inch deep. Can you tell me the cause of the corrosion? Is the enclosed simply rust and grease, or has the iron undergone some chemical change? A. It was no doubt caused by impurities in the tallow. The iron is chemically changed, being converted into an oxide, which resembles plumbago. The use of tallow is becoming less common, as engineers discover its effects. Pure tallow is an excellent lubricant for cylinders, but little of the tallow that is sold is pure.

(63) R. C. asks: How can I mend the broken glass of an aquarium? A. Fasten a strip of glass over the crack, inside the aquarium, using for a cement white shellac dissolved in ½ its weigh of Venice turpentine.

(64) W. E. C. asks: What is the shortest method for finding the amount of water in a plain cylinder boiler when partially filled? A. Find the area of the cross section of that part of the boiler which is filled with water, and multiply by the internal length of the boiler. You will find rules for this area in any good treatise on mensuration.

(65) A. F. H. says: In a communication about tides, it was claimed that the Hudson river was 25 feet lower at New York city than at Troy, N. Y. Is this so? A. No. The fall from Albany to New York city is only 5 feet.

If a steamboat going at 20 miles an hour has occasion to back, how is sufficient power applied at the dead centers to overcome the resistance of the water against the paddle wheels? A. The power is exerted at other parts of the stroke, and the wheel is generally counterbalanced.

Can an ordinary rifle ball (60 to the lb.) be dropped from a hight sufficient to perforate a two inch oak plank, upon striking the earth? A. We think not.

(66) E. N. B. asks: How fast should a ½ inch twist drill run to drill common iron? A. From 150 to 175 revolutions a minute.

(67) A. S. says: I have a steam engine, of which the lid of the steam chest has a hole about ¼ inch in diameter, probably the result of bad casting. I have poured melted Babbitt metal into it, but it will not last. I cannot put a screw tap into it. How can I plug it? A. Braze a plug in.

My cold water pipe is of lead, and it is very troublesome to keep the joints tight. I always used wrap joints made of thick cloth, with a coat of white lead, and wrapped tight with string. Can you tell me of some other means of closing these joints? I cannot get at them to solder them. A. The plan you follow is the best under these circumstances, if you cannot solder the joints; but if you can get at them to wrap them, they would seem to be accessible for soldering.

Can I find the horse power of a machine when the pressure of steam in the boiler is known? A. Not without more particulars than this.

(68) J. H. P. asks: Will a coil of steam pipe heat a kiln any higher than the heat of the steam? A. No.

(69) C. W. M. asks: 1. How can I remove a lime deposit or scale that has formed on the bottom of the boiler, and how can I prevent its formation? A. Try some of the scale preventives that have been noticed in our columns. 2. Should a boiler be refilled immediately after being blown off, or allowed to cool? A. It should be allowed to cool. 3. In what manner is it best to treat a boiler that is not going to be used for a long time? A. Either dry it thoroughly and give it a coat of oil, or leave it full of fresh water.

What is the best method of grinding a spindle valve? A. There are several machines for refitting valves and seats that seem to give very satisfactory results.

(70) W. says: 1. I want to run a 58 inch saw at 600 revolutions. It will be run from a shaft, which also runs several other, smaller saws. Engine is 15 inches diameter x 3 feet stroke, with a wheel 10 feet in diameter. Saw pulley is 2 feet in diameter. What is the best practice as to speed of engine? A. If the engine is in good order, you can run it at 75 revolutions a minute. 2. What should be the size of the pulley on shaft? A. You can drive the main line of shafting at 250 revolutions a minute. This will give you an idea in regard to the size of pulleys.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. J. W.—It is a micaceous hematite. It is useful for iron ore, and for making a sparkling paint, for dusting fancy signs.—C. A. P.—It is magnesian limestone, and does not indicate the presence of a water-bearing stratum.—G. M. F.—They are lead, zinc, and antimony.—R. G. V.—It is a decomposed magnesian mica, of no value.—W. L. K.—It is plumbago, but not entirely pure.—A. M. G.—No. 1 is not iron; it is a magnesian limestone containing a small percentage of iron. No. 2 is a highly bituminous coal.—J. F. W.—It is not kaolin; it is sulphate of barytes, sometimes used to adulterate white lead paint.—P. F.—It is bronze mica. See *Science Record* for 1875.—J. D. P.—It is plumbago, but very impure. It should be experimented upon to see whether it could be used for polishing or for crucibles, etc.—E. B. K.—It is black tourmaline, a hexagonal crystal. It is a compound of boracic and silicic acids with alumina, lime, magnesia, soda, and potash.—S. D. M.—These disks are not fossils. They are marks of structure which are sometimes developed in anthracites as well as bituminous coals. The disks are frequently 1½ inches in diameter, as may be seen in some of the Pennsylvania anthracites and in Wigan coal of England. These structural markings appear to have arisen from a partial attempt at crystallization or from a tendency to develop planes at right angles to the direction of pressure, subsequent to the formation of the coal, and at a time when it was being consolidated under an increase of pressure and heat.—J. H.—It is an impure steatite or soapstone. The brown specks are coatings of oxide of iron.—J. F. W.—It is galena.—G. B. C.—Both specimens contain iron pyrites.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Locomotive. By J. F. J.
On the Use of Mosquitoes. By S. J. W.
On Gas Lighting. By J. D. P.
On the Trevelyan Rocker. By R. S.
On the Earth's Aerial Motion. By D. L. C.

Also enquiries and answers from the following:
E. C.—J. F.—R. J. S.—F. C. W.—N. J. K.—R. F.—N.—J. C. W.—J. G. A.—G. C.—W. T. D.—H. D.—J. S.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who sells gas machines? Where can pure iron for chemical experiments be obtained? Whose is the best oil can? Where can box corner grooving machines be found? Whose is the best pump for mine purposes?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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DESIGNS PATENTED.

8,315, 8,316.—CASSIMERES.—F. S. Bosworth, Providence, R. I.
8,317.—TYPE.—J. M. Conner, Greenville, N. J.
8,318 to 8,320.—EMBROIDERY.—E. Crisand, New Haven, Ct.
8,321.—MONEY BOXES.—C. Ferguson *et al.*, Derby, Conn.
8,322.—FORK SHANKS.—J. W. Gardner, Shelburne, Mass.
8,323.—WAINSCOTING.—J. Milne, Philadelphia, Pa.
8,324.—MEDAL.—J. H. Schreiner, Philadelphia, Pa.
8,325.—PEDESTAL.—W. Tweeddale, Brooklyn, NY.
8,326.—CASSIMERE.—W. B. Weeden, Providence, R. I.
8,327.—COFFIN HANDLE.—G. Rogers, W. Meriden, Conn.

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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, APRIL 29 to May 18, 1875.

4,705.—E. W. Grant, Ypsilanti, Mich., U. S. Step ladder. April 29, 1875.
4,706.—J. Doman, Owen Sound, Ont. Snow plow. April 30, 1875.
4,707.—J. W. Elliott, Toronto city, Ont. Fuel saver. April 30, 1875.
4,708.—S. Sherwood, Independence, Iowa, U. S. Water wheel. April 30, 1875.
4,709.—B. A. Higgins, New Portland, Me., U. S. Bending wood for shovel handles. April 30, 1875.
4,710.—J. B. Camyré *et al.*, Montreal, P. Q. Manufacture of cigars. May 6, 1875.
4,711.—J. Marin, St. Hyacinthe, P. Q. Planing and graving machine. May 8, 1875.
4,712.—D. Spinelli, Montreal, P. Q. Making soaps from mineral oils. May 8, 1875.
4,713.—S. Hall, Toronto, Ont. Concavo-concave-convex churn dasher and handle. May 11, 1875.
4,714.—E. G. Scovil, St. John, N. B. Charging iron into heating furnaces. May 12, 1875.
4,715.—L. Goddu, Boston, Mass., U. S. Machine nail rod. May 15, 1875.
4,716.—Wm. Brown, Easton's Corners, Ont. Swing gate hanger. May 15, 1875.
4,717.—S. M. Barré, Montreal, P. Q. Ironing board, etc. May 15, 1875.
4,718.—J. P. Bass, Bangor, Me., U. S. Photograph burnisher. May 15, 1875.
4,719.—R. B. Palmer, Chicago, Ill., U. S. Earth auger. May 15, 1875.
4,720.—J. D. Brewer, Muncy, Pa., U. S. Fishway. May 15, 1875.
4,721.—P. W. Hart, Camden, N. Y., U. S. Clothes pounder. May 15, 1875.
4,722.—J. Outerson *et al.*, Windsor Locks, Conn., U. S. Filter. May 15, 1875.
4,723.—H. A. Payne, Adams, N. Y., U. S. Wheel hub. May 15, 1875.
4,724.—W. R. Barton, Georgetown, Mass., U. S. Welt knife. May 15, 1875.
4,725, 4,726.—A. L. Corey *et al.*, Ypsilanti city, Mich., U. S. Chain pump bucket. May 15, 1875.
4,727.—B. and A. Tolton, Eramosa, Ont. Pea harvester May 18, 1875.
4,728.—P. P. Mast, Springfield, O., U. S. Feeding mechanism for grain drills. May 18, 1875.
4,729.—W. R. Barton, Georgetown, Mass., U. S., *et al.* Peg cutter handle. May 18, 1875.
4,730.—D. McDonald, Hamilton, Ont. Door fastener. May 18, 1875.
4,731.—S. I. Robertson, N. C., U. S. Box clamp for tobacco presses. May 18, 1875.
4,732.—J. Abell, Woodbridge, Ont. Reaper cam. May 18, 1875.
4,733.—J. B. Jones, Montreal, P. Q. Automatic railway signals. May 18, 1875.
4,734.—Wm. J. Copp, Hamilton, Ont. Cold air duc stone. May 18, 1875.
4,735.—J. H. Ashdown, Renfrew, Ont. Barrel stand and tilter. May 18, 1875.
4,736.—M. Johnson, Lockport, N. Y., U. S. Hoe. May 18, 1875.
4,737.—W. Warren, Chicago, Ill., U. S. Center piece May 18, 1875.
4,738.—D. Renshaw, Cohassett, Mass., U. S. Steam generator. May 18, 1875.
4,739.—C. W. Sulzbach, Virginia City., Nev., U. S. Boiler protector. May 18, 1875.
4,740.—J. Best, Chicago, Ill., U. S. Self-heating flat iron. May 18, 1875.
4,741.—H. Baughman, Doran Gold Mine, S. C., U. S. Saw gummer and sharpener. May 18, 1875.
4,742.—P. C. Ingersoll, Greenpoint, N. Y., U. S. Bed bottom. May 18, 1875.
4,743.—J. Ash, Montreal, P. Q. Compound for bites of insects, etc. May 18, 1875.
4,744.—R. Dudley, Erie, Pa., U. S. Wagon tongue support. May 18, 1875.
4,745.—A. W. Olds, Green Oak Station, Mich., U. S. Fence. May 18, 1875.
4,746.—D. S. Cornell, Warwick, Ont. Washing machine. May 18, 1875.
4,747.—R. Daine, Dartmouth, N. S. Portable damper. May 18, 1875.

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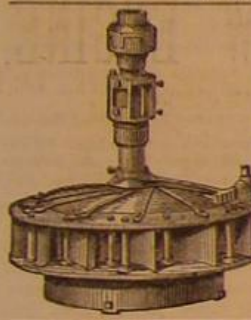

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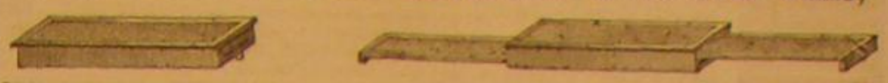

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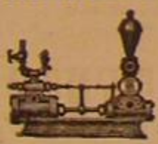

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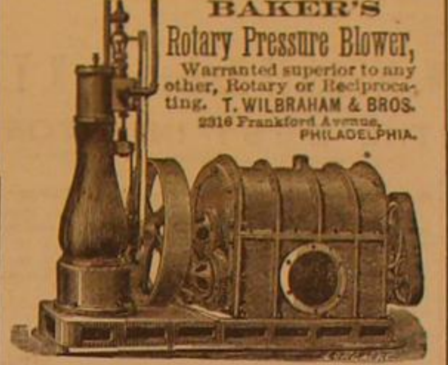

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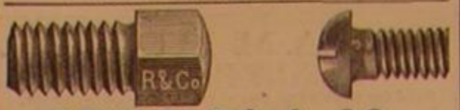

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