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THE ALBION BOILER.

This boiler consists of a shell, fifteen feet high and fifty-four inches in diameter, suspended vertically by four wrought iron brackets, placed equidistant near the top of the shell, and resting on the brick casing, inclosing the shell in a complete oven. The shell is invested on five eighths of its circumference with three lengths of outside circulating tubes of two inches diameter, the outer and inner rows of which run at an angle of about five degrees from the vertical line in one direction, while the tubes of the middle row cross them at the same angle in the opposite direction; these three systems of circulating tubes are respectively 13 feet 10 inches, 12 feet 10 inches, and 11 feet 10 inches in length, having 23 tubes in each set. In addition to these sixty-nine outside tubes, carrying the heated water from the bottom to the top of the boiler, there are seventy-five inside flues, of two and a half inches diameter, and of an average length of ten feet, running from the top of the boiler into a sheet which forms the top of the smoke box chamber, and carrying the products of combustion from the top of the oven, through the boiler, into the chimney, about five feet above the fire place.

Directly under the head of the boiler and top flue sheet are placed three inside tubes running across, and each connecting with two of the outside circulating tubes, which are perforated with small holes on the upper surface, so as to throw water against the underside of the head or top flue sheet, and upon the flues inside the boiler.

This construction will be readily followed in the annexed engravings, Figs. 1 and 2 showing the interior of the boiler in perspective and section, and Fig. 3, in plan.

The products of combustion rise up the outside of the shell, around the circulating tubes, then from the top of the oven descend through the flues inside the boiler, to the smoke box chamber, and thence rise up along one fourth of the outside of the shell to the stack immediately above it, the draft in which is regulated by a self-acting damper.

The water is carried about four and a half feet below the top of the boiler, and the interposition of the smoke box chamber compels the rapid circulation of the heated water through the outside tubes, which inject it against the head of the boiler and the flues inside, which, to some extent, superheat the steam, as the products of combustion are practically exhausted before entering the chimney. The total amount of heating surface is 1,150 square feet.

On May 29, 1873, Mr. H. Robinson, steam engineer, of Boston, made a careful trial at the Albion Print Works, Conshohocken, Pa., of twelve hours evaporation with this boiler, which, with feed water at 75° Fah. and steam at 53 pounds pressure, we are informed, resulted in the actual evaporation of 10·231 pounds of water for each pound of combustible. Compared with other experiments, where the water is taken at 212° Fah. and evaporated at 212°, the result of the Albion boiler is equal to 11·987 pounds of water from and at 212° Fah. for each pound of combustible consumed. This trial was made with a clean grate, the fire having been extinguished several hours, and a fresh fire started.

On the 17th June, 1873, a second trial was made by Mr. W. Barnet Le Van, of Philadelphia, assisted by Mr. H. S. Robinson; this was the trial of the Albion boiler in actual practical work, and was continued for eight hours, including the dinner hour, when the works were stopped. The fire was taken at a certain thickness, and at the termination of the trial was left in the same condition as at the commencement. This second trial showed as an actual working result the evaporation of 9·585 pounds of water, at 78° Fah., by one pound of coal consumed, being equal to the evaporation of 11·195 pounds of water from and at 212° Fah., for each pound of combustible consumed, being about six per cent less than on the former occasion, no doubt due to the fact that the interruption of the dinner hour occasioned a very material loss, as the works were stopped and much heat was lost up the chimney; and this test being intended for practical daily work, the flues had not been specially cleaned out. It shows nevertheless a very large evaporation per square foot of heating surface and per pound of fuel consumed.

This boiler, we learn, has been in satisfactory operation at the Albion Print Works for upwards of three years. Four boilers are in use at that establishment. The circulation is claimed to be as nearly perfect as possible while the space occupied is small, and the method of exhausting the heat compact and complete. The boilers, it is also stated, have always been entirely free from scale, and kept in order without expense.

For further information as to terms and price, apply to J. Eberhardt, agent, Albion Print Works, Conshohocken, Montgomery county, Pa.

Fig. 1.

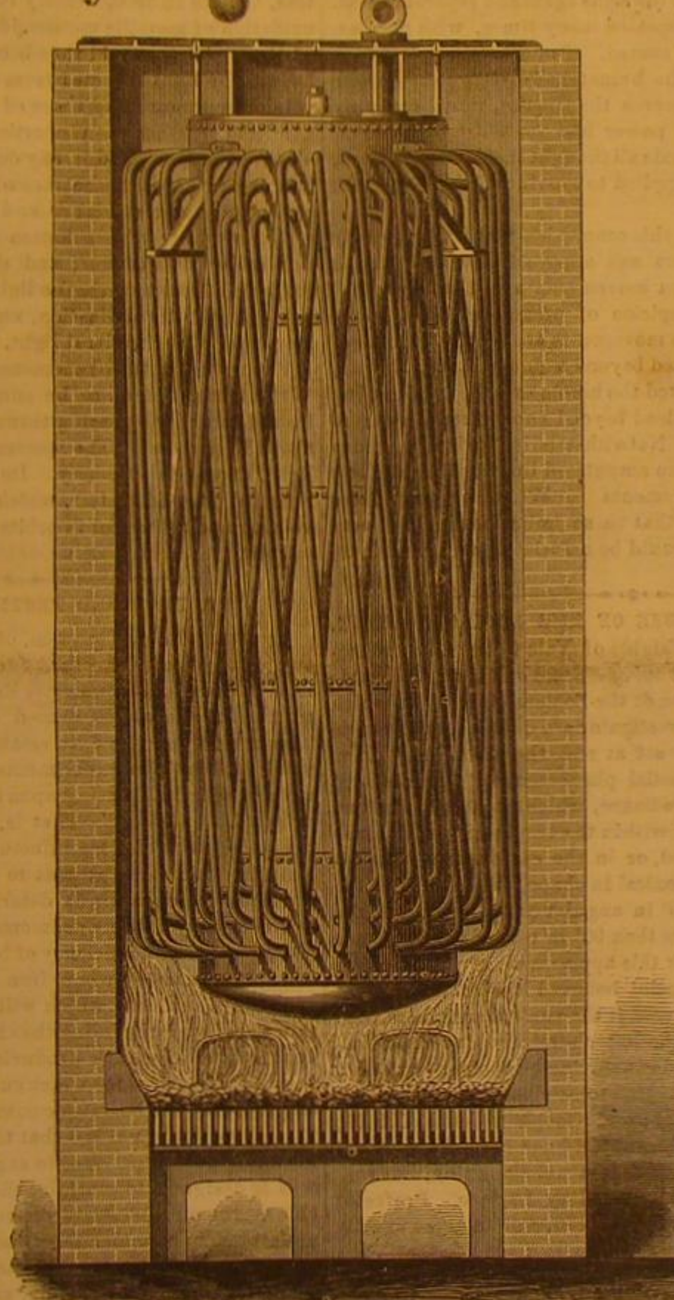
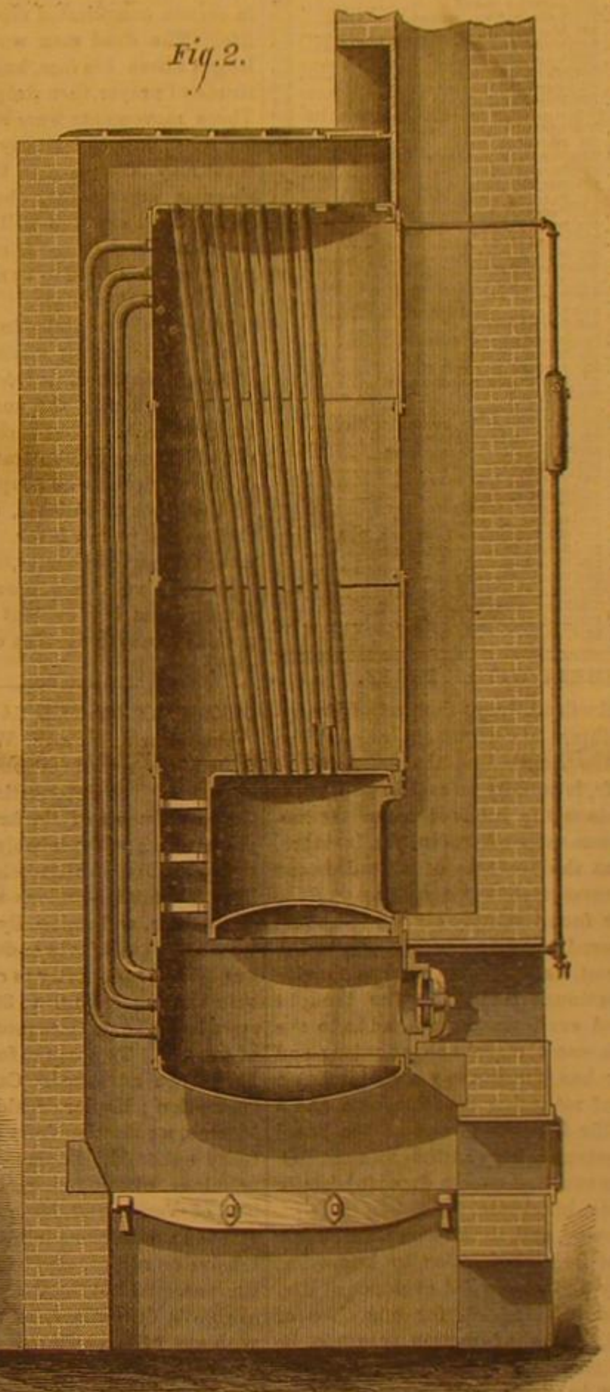
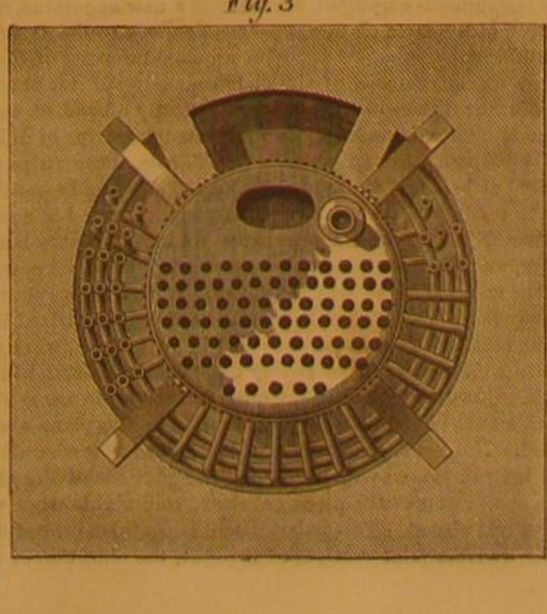


Fig. 2.



THE ALBION BOILER.

Fig. 3



Development of Heat by Friction of Liquids against Solids.

The energetic absorption of a liquid by a porous body is accompanied by an elevation of temperature, probably resulting from the friction of the liquid against the interior of the capillary canals against which it passes. M. Maschke gives, in *Les Mondes*, numerous measures of this increased temperature, obtained by causing amorphous silica to absorb various liquids. Among the cases considered were: Amorphous silica first wet and then dried at a moderate temperature so as to contain no more than 29 8 per cent of water, treated with water; silica at 18 per cent water, with water; silica dried, with water; silica calcined, then exposed to moist air (22.68 per cent H_2O), with water; silica calcined, then exposed to very humid air (28·24 per cent H_2O), with water; silica calcined and cooled with sulphuric acid, treated sometimes with water, or benzine, almond oil, concentrated sulphuric acid, or alcohol. The experiments lasted each from 10 to 45 minutes, the thermometers, suitably arranged, showing the increase of temperature at their close. The investigator operated at a normal temperature of about 60° Fah. The elevation observed varied in the majority of cases from 1·8° to 14·4° Fah. In calcined and dry silica, treated with concentrated sulphuric acid, the thermometer rose from 63° to 92·6°. In one part of calcined silica mixed with 3·2 parts of alcohol, the increase was from 55·4° to 78·8°. Quartz or powdered glass, treated in the same manner as the silica, gave no appreciable increase of heat.

A Mass Convention of Millers.—The first annual meeting of the Millers' National Association is to be held at St. Louis, Mo., on June 3rd. All persons interested in the milling business are invited to attend. A large attendance is expected; and by the interchange of opinions, addresses, etc., much valuable practical information will doubtless be elicited.

Preserving Wooden Taps for Casks.—The articles should be plunged in paraffin heated to about 248° Fah. until no air bubbles rise to the surface of the melted material. They are then allowed to cool, and the paraffin is removed from the surface, when nearly congealed, by thorough rubbing. Taps thus treated, it is said, will never split or become impregnated with the liquid, and may be used in casks containing alcoholic liquors.

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Contents:

(Illustrated articles are marked with an asterisk.)

MUSCULAR MOVEMENT WITHOUT LIFE.

"We find no motion in the dead," says the first of Tennyson's "Two Voices," clinching his argument as with an axiom. The converse of the proposition, that where there is motion there must be life, is equally an article of popular belief. Especially is conscious life inferred when the motion imitates voluntary movements. A coffin, for instance, is opened for a last look at the features of a dead friend before the remains are removed from the receiving vault to the grave, and the body is found completely turned over; or the hands, no longer crossed upon the breast, expressing "long disquiet merged in rest," are so displaced as to give unmistakable proof of continued motion. The thought that life must have directed such movements adds to the pangs of bereavement the keenest regret and anguish; and too frequently the mourner has borne away a self inflicted brand of Cain. The idea of returning consciousness and a second death within the coffin in consequence of too hasty burial is too horrible to contemplate; and the faintest suspicion that one has been the cause of such a dreadful fate to another is full of unutterable bitterness.

To those afflicted in this way, and those who fear such a fate for themselves, it must be a consolation to know that muscular movements are by no means valid evidence of life. We do find motion in the dead. Indeed, for one class of muscular actions, at least, arrest of motion seems to be rather an accidental than a necessary attendant of death.

The persistence of motion in decapitated snakes, turtles, and other low forms of life is familiar to every one. It is commonly explained by the relatively large nervous ganglia, independent of the brain, of such creatures. But it appears that many if not all muscles may contract without that stimulus of nervous action, with which alone we associate the possibility of conscious life. A striking illustration is given by Dr. Brown-Séquard in the case of two decapitated men. The arms were cut off; and for thirteen or fourteen hours, their muscles contracted in response to irritation by galvanism or mechanical stimulants. After that length of time, all signs of life had disappeared. He then injected the blood of a man into one of the arms and the blood of a dog into another. Local life was restored in both; the muscles became irritable, and the strength of contraction, extremely powerful. In the arm in which human blood had been injected, the contraction was stronger than during life; yet the nerves remained quite dead.

On another occasion the same observer kept the eye of an eel, removed from the body, at a temperature of about 36° to 40° Fah., for a period of sixteen days. By that time the eye was in almost complete putrefaction, yet the iris contracted when exposed to light. Nervous action was impossible, and muscular fibers themselves were considerably altered; yet they acted.

It is in connection with the rhythmical movements of the heart and other organs, however, that the most striking proofs of muscular action independent of the nerve centers, are found. The diaphragm, for example, may be separated completely from the spinal chord without interruption of its rythmic action. Similarly the heart of a dog has continued to beat for forty-eight hours after its removal from the animal, and there is recorded the case of a man at Rouen whose heart was found to beat for thirty-six hours after the death of the body by decapitation. "I dare say," observes Dr. Brown-Séquard, "that the great cause why we see those organs stop at death so quickly is that the phenomena of arrest of their activity have taken place at the time of death," the phenomena of arrest, we may add, being quite independent of the cessation of life. Other observers have demonstrated the rhythmic action of numerous other organs in man and the lower animals: motions that persist after, not death merely, but the entire separation of the parts from the rest of the body. Indeed Dr. Brown-Séquard claims to have found that rhythmical motion is a common property of all contractile tissues, but one which shows itself only under certain conditions, different from the ordinary circumstances of life.

Still more remarkable is the fact that motions closely mimicking voluntary movements can go on in the absence of conscious life.

Dr. Séquard mentions a case in which he was called to see a man who was thoroughly dead of cholera, yet who persisted in certain complicated movements distressingly suggestive of life. The dead man would lift up his two arms at full length above his face, knit the fingers together as in the attitude of prayer, then drop the arms again and separate them. These movements were repeated many times, with decreasing force, until at last they ceased. To persons not knowing what may take place in the human body after death, these singular movements, observes the Doctor, must certainly have looked as if the will power had been directing them. In fact the family and friends all thought the dead man alive, and many tests had to be applied to convince them that death had really taken place.

It is worthy of notice in this connection that it is generally with the victims of cholera and other sudden and violent diseases that *post mortem* movements are most common, and consequently the suspicion of premature burial most likely to arise. That such movements are wholly independent of life was demonstrated beyond a doubt by Dr. Dowler, of New Orleans, who adapted the heroic expedient of cutting off the limbs of patients, dead beyond hope of recovery from cholera and yellow fever. Notwithstanding their separations from the nervous center, the amputated limbs continued their seemingly voluntary movements. Whatever may have caused them, it is evident that these imitations of life were not due to anything that could be associated with consciousness.

DISCOVERY OF THE CAUSE OF THE ZODIACAL LIGHT.

Professor Arthur W. Wright, of Yale College, communicates to the *American Journal of Science and Arts* a valuable paper on "The Polarization of the Zodiacal Light," in which the experiments of the investigator are detailed, and results given which will probably set at rest the moot question as to the nature of that celestial phenomenon. The zodiacal light is a faint nebulous radiance, which, at certain seasons of the year, and especially within the tropics, is seen at the west after twilight is ended, or in the east before it has begun. The luminosity is conical in shape, the breadth of the base varying from 8° to 30° in angular magnitude, and the apex being sometimes more than 90° in rear of or in advance of the sun. To account for this appearance, several theories have been advanced. Cassini believed it a lenticular solar emanation; Kepler considered it the sun's atmosphere, and Maeran, a reflection from the latter stretched out into a flattened spheroid. Laplace declared the phenomenon to be a nebulous, rotating ring, situated somewhere between the orbits of Venus and Mercury; and Chaplain Jones, U.S.N., whose examinations into the subject have been the most extensive on record, also believed it a nebulous ring, but continuous, and not located as stated by Laplace. Professor Wright's deductions, as will be seen, fail to agree exactly with any of these views.

But few attempts, it appears, have ever been made to determine whether or not any portion of the light is polarized, and up to the present time, knowledge on the subject has been uncertain and contradictory, pointing either to the idea that the rays are not polarized at all, or that the proportion of polarized light is so small as to render it nearly impossible to be detected. Professor Wright, becoming convinced that the difficulty should be ascribed to the imperfections of the instruments employed, constructed a new apparatus, consisting of a quartz plate, cut perpendicularly to the axis and exhibiting, by polarized light, an unusual intensity of color. It is a macle, the body of the plate consisting of left handed quartz, through which passes eccentrically a band of right handed quartz, bounded by two intermediate strips of different structure. Placed between two Nicols, these strips appeared as bands of color, upon dark or light ground according to the turning of the prisms. This plate, mounted in a tube with a Nicol, formed a polariscope of extraordinary sensibility, and the first favorable opportunity to test its powers on the zodiacal light was improved. It was almost immediately found to indicate the existence of light polarized in a plane passing through the sun; and in no instance, when the sky was clear enough to render the bands visible, did their position, as determined by the observation, fail to agree with what would be required by polarization in the plane above noted. Not the slightest trace of bands was ever seen when the instrument was directed to other portions of the sky. The observations took place on clear, cold nights when the moon was absent. The polarization, it was also proved, did not arise from faint vestiges of twilight, the reflection of the zodiacal light itself in the atmosphere, or from impurities in the latter.

Further experimenting was at once proceeded with to determine the percentage of light polarized, and it gave, as the mean of numerous determinations, the angle 36·6° corresponding to a proportion of 16 per cent; 15 per cent, Professor Wright thinks, may be safely taken as the true value.

The fact of polarization implies that the light is reflected, either wholly or in part, and is thus derived originally from the sun. No bright lines were found in the spectrum, nor could any connection be traced between the zodiacal light and the polar aurora. This is important, as excluding from the possible causes of the light the luminosity of gaseous matter, either spontaneous or due to electrical discharge. Further, it cannot be supposed that the light is reflected from masses of gas or from globules of precipitated vapor, as the latter, in empty space, must evaporate, and the former expand to too low a density to produce any effect on the rays of light. Hence, Professor Wright concludes that the light is reflected from matter in the solid state, from innumerable small bodies revolving about the sun in orbits, of which more lie in the neighborhood of the ecliptic than near any other plane passing through the sun. These meteorites, which are in all probability similar in character to those which fall upon the earth, must be either metallic bodies or stony masses. If we accept Zöllner's conclusion, that the gases of the atmosphere must extend through the solar system, though in an extremely tenuous condition in space, the oxidation of metallic meteoroids would be merely a question of time. They would thus become capable of rendering polarized the light reflected from the plane, and the same effect would be produced by those of stony character. In order to ascertain whether the proportion of polarized light, actually observed, approached in any degree what might be expected from stony or earthy masses of a semi-crystaline character, with a granular structure and surfaces more or less rough, a large number of substances were submitted to examination with a polarimeter; and the results showed that, from surfaces of this nature, the light reflected has in general but a low depth of polarization, not greatly different in average from that of the zodiacal light.

The nature of the phenomenon, as discovered by Professor Wright, may therefore be summarized as follows: It is polarized in a plane passing through the sun, to the amount of about 15 per cent. The spectrum is the same as that of sunlight, except in intensity. Its light is derived from the sun reflected on solid matter, which consists of small bodies revolving about the sun in orbits crowded together toward the ecliptic.

A PROPOSED TESTING LABORATORY.

Professor R. H. Thurston, of the Stevens Institute, has suggested a really excellent idea, which will be of great benefit to the entire country. He proposes, in a letter to the trustees of the above named college, a copy of which we have recently received, to establish a department "to be devoted especially to experimental investigations having a direct and practical bearing upon questions arising in the course of regular business." That is, a testing laboratory is to be organized, to which manufacturers, for instance, may send material which they propose to purchase, and have its value, properties, etc., carefully determined; and where officers of railroads may obtain dynamometric determination of the resistance of trains, efficiency of locomotives, and value of fuel and lubricants; and where iron and steel makers may find a recognized authority which will afford them full and accurate knowledge regarding the chemical constitution, physical structure, etc., of their products. These are but a few of the very manifest uses for which such an establishment could be employed by the business community with the greatest benefit, and we doubt not but that the reader will be able from his individual experience to suggest many others.

It is designed to comprise the most powerful testing machines, the most delicate instruments, and the best forms of apparatus, to be under the direct control of a very able body of scientists. Professor Thurston himself, we notice, volunteers to assume the direction, and to carry out the details of the organization. This is decidedly a case of the right man in the right place, and the trustees of the Stevens Institute, in their ready acceptance of Professor Thurston's views and offers, evidently are impressed with the same belief.

These gentlemen, in their reply, promise to accord all necessary space, and to render every assistance in their power. As the originator of the scheme says that there will be no difficulty in securing sufficient capital, from business men to be benefited by it, to purchase the necessary outfit, or even to create such an endowment as would insure the independent support of the laboratory, we may regard the enterprise as an accomplished fact, requiring only the time necessary for its practical establishment to place the community in full possession of its advantages.

HON. DAVID A. WELLS AND THE FRENCH INSTITUTE.

We notice with much gratification the elevation of Hon. David A. Wells to the vacancy in the list of foreign associates of the French Institute, caused by the death of John Stuart Mill. Membership in the Institute is regarded throughout Europe as one of the highest distinctions to be labored for by literary and scientific men, and only a very limited number of persons, who must have become distinguished in science, literature, or art, are admitted to its councils. The honor, in the present instance, is enhanced by the fact of Mr. Wells being chosen as the peer of the great thinker lately deceased; and that it is a well merited one, need not be told to the many who are familiar with his learned and able wriings. The latter have long been held in the greatest esteem by the first political economists in France and England. Of his reports on local taxation, to the legislature of this State, one hundred thousand have been printed in England and distributed throughout Europe. Soon after the German war, the French legislature caused Mr. Wells' report on taxation of 1869 and his New York report of 1870 to be translated and printed as public documents.

FROM CHAOS TO CORAL.

Many of our readers doubtless have noted, perhaps during the study of experimental chemistry, that silver when melted and afterward allowed to solidify in an earthen crucible will, as it cools, assume a brisk effervescence. The mass bubbles and swells; small particles are thrown out of the pot, and, in fact, a miniature volcanic eruption is reproduced: to complete the resemblance to which, the silver, when solid, appears covered with little cones pierced at the center, simulating the form of volcanoes. This phenomenon, however, we can easily account for from the knowledge that gases are absorbed not only by liquids at the ordinary temperature, but by melted bodies. The silver absorbs oxygen, which it abandons on cooling; the more sudden the latter, the greater the disengagement of the gas; while, on the other hand, if the metal be allowed to get cold slowly, the oxygen escapes insensibly and hardly disturbs the surface. Melted litharge also absorbs oxygen, and similarly abandons it. A like absorption takes place in the combustible gases which are found in the furnaces for melting metals, and recent investigations in France have proved that cast iron after cooling retains a notable quantity of gas, especially of carbonic oxide and hydrogen.

While, however, totally melted bodies absorb gases and reject them at the moment of cooling, the same bodies, when simply softened by the action of heat (though absorbing gases as before), retain the gases after becoming cool, and give them off slowly under the influence of a new elevation of temperature and of an almost perfect vacuum. These facts are not only very curious, but are of considerable importance from a geological point of view.

Volcanoes, it is known, when in eruption emit various gases: first hydrochloric acid, sulphuric acid, and hydrosulphuric acid; later, the carburetted hydrogens predominate; and finally appears a disengagement of carbonic acid, which lasts for centuries. The volcanoes of Auvergne, in France, have been extinct for thousands of years, and yet springs charged with carbonic acid are abundant in the vicinity. There are other well known instances, such as the celebrated Dog Grotto, near Naples, so called from the practice of lowering unhappy dogs into its depths to see them overcome by the deleterious gas, and the *Guevo Upas* or poisonous valley of Java, where the atmosphere is so deadly that the soil is said to be covered with the bones of animals and of men who have died from its effects: in both of which the discharge of gas has existed from time immemorial. Humboldt counted 407 volcanoes on the earth, of which 225 only were active. This latter number has since been increased to 270, of which 190 are on the islands or shores of the Pacific. The majority of volcanoes are situated near the great fracture which extends along the coast of the American continents, and is prolonged to Kamschatka, to Japan, and as far as Java and Sumatra; others are located in New Zealand, New Britain, the New Hebrides, New Caledonia, and, in the antarctic regions, Mounts Erebus and Terror. The quantity of carbonic acid disengaged by these vast furnaces is enormous. Boussingault estimates it at 95 per cent of their entire gaseous emission, and this has been verified by Bunsen in investigations upon the emission of Mount Hecla. Here then is an immense and apparently inexhaustible series of reservoirs, which forms the source of a large amount of the carbonic acid in the world. It remains to examine how this supply was generated, and the theory which has been proposed is readily followed.

When the earth cooled down from its molten state, the various substances, which were maintained separate by the excessive temperature, became united according to their respective affinities: hydrogen and oxygen formed water; oxygen and carbon, carbonic acid; chlorine and sodium, sea salt, and so on. The incandescent rocks, however, while still liquid, found themselves in contact with a dense atmosphere containing various gases, which they absorbed in exactly the same manner as we have stated the silver and litharge to act as regards oxygen, and iron, in reference to carbonic oxide and hydrogen. Further, it was possible that these rocks should become charged in a greater degree with carbonic acid than with other gases existing in the atmosphere, through the action of a relative affinity, just as the melted silver absorbs oxygen instead of nitrogen, though both are present in the same atmosphere. As commotions on the surface of the globe were frequent in its transition state, the rocks were perpetually changing places. Vast masses would be engulfed, to be replaced by others rising from the depths, and so an incredible quantity of carbonic acid became occluded in their substance. As these rocks solidified, the carbonic acid slowly escaped; and if, as is proved, with reasonable probability, there still exists in the interior of our globe an incandescent mass which is constantly cooling, here then is the source of the disengagement of the gas which, escaping through the volcanic apertures, mingles with our atmosphere.

It is curious, in thus tracing the part which the extinct volcanoes play in the economy of our globe, to note how perfectly the migration, which the carbonic acid that they evolve may assume, illustrates the truth of the indestructibility of matter. First found in the primitive atmosphere of our earth, it became absorbed by the incandescent rocks, and remains buried in their depths for thousands of years. Little by little, however, as its captors become colder, it makes its way from its subterranean prison, and escapes into our atmosphere. Its liberty is, however, of short duration, for the rain again seizes it and carries it perhaps to the rivers, and the latter to the sea. From the water it is wrested by lime to form a carbonate, which minute animalculæ—the coral insects, working tirelessly century after century—build first into a reef and then into an island, forming perhaps the nucleus of a new continent, to be completed in the ages far in the future.

ART AMONG THE ASHANTEES.

The thousand ounces of gold gathered in such haste by King Koffee, as the first instalment of the indemnity demanded by his English conquerors, furnish many curious and striking illustrations of the artistic development of the native goldsmiths. Their skill in working gold—which appears to be the most common metal of the country—seems, indeed, to be fully equal to that of the best European artists, while their fertility in invention is simply wonderful.

Among the larger articles brought away by the English is a human head of massive gold, nearly five pounds in weight: a ghastly object, apparently representing the head of a victim gagged for sacrifice. Of a more pleasing character, and more to be preferred as works of art, are two heavy golden griffins, said to have been broken from the King's chair of state. There are besides, many badges of office of different styles, some of them massive fibulæ of wrought gold, like those worn by the heralds sent by King Koffee to treat with the English commander, others of various patterns according to the office of the wearer. That of the King's chamberlain, for example, is distinguished by padlock and keys; the butler's, by cups and bowls, all of solid metal, and, for the most part, castings of exquisite design.

In addition to these great badges, each of which contains many ounces of pure gold, there are fetish caps ornamented with gold in *repoussée* work, the golden tops of umbrellas and sticks of office, grotesque lions for the heads of scepters, golden jaw bones, thigh bones, and skulls, a large sacrificial knife with a golden handle, and many indescribable objects which doubtless served their purpose in the fantastic ceremonies of fetish worship.

Smaller in size but not inferior in workmanship is an infinite number and variety of objects of native design, besides numerous imitations of the gold work of other nations and ages: bracelets, some so heavy as to be a burden, others of exceeding lightness and delicacy: necklaces, chains, pendants, brooches, and rings of curious yet beautiful shape.

The imitated articles give a striking indication of the skill with which the native workmen copy everything that comes to them from the outer world. Thus there are golden padlocks, buckles, bells, and even watch keys, whose use must have been unknown. Not the least curious are several copies of reliquaries, left, perhaps, by Roman Catholic missionaries in that benighted land, and reproduced in gold by the native workmen, with a faithfulness and delicacy which a Chinese might envy. Among the brooches, pendants, badges, rings, and so on, there are forms which are almost facsimiles of early Indian ornaments; others approach Egyptian styles: still others, Scandinavian and Anglo Saxon types. The whole world, in fact, has been laid under tribute and the relics hoarded in this out-of-the-way region.

Some of the articles are quite new, and still have clinging to them the fine red loam in which they were cast. Others are old and worn, and bear traces of frequent patchings and solderings. One of the most remarkable of the ancient pieces is a finely chased seal ring, the signet being made of an ancient Coptic coin. Two other rings were evidently copied from early English betrothal rings. Some of the necklaces and chains are formed of beautiful shells reproduced in gold, while others represent seeds and fruit. In every case, the design is individual and the beauty of the workmanship refreshing to see, in contrast with the machine-made jewelry worn by modern civilized belles.

The most noteworthy object in silver brought from Ashantee is an enormous belt or baldrick, to be hung over the neck by a massive chain, crossing the breast diagonally. From the belt depend seven or eight silver sheaths for knives, the use of which it is not difficult to imagine.

BURIAL IN THE SEA.

The disposition of our dead is a problem so important that any contribution towards its solution should be welcomed. Ordinary inhumation is manifestly objectionable on sanitary grounds. The pollution of the air we breath and the water we drink is enough to condemn the practice in densely populated countries. The Italian suggestion of casting the bodies into one common charnel house, hastening decomposition by caustic alkalies, is repulsive; the mingling of the good and the bad, the rich and the poor, offends our moral and social tastes; and then too we fear some one in this utilitarian age would propose, and some agricultural legislature carry out, the idea of using the compost as a fertilizer. The best modification of separate burials in the earth is the use of hydrated oxide of iron to assist the destruction of the body; but even this is not entirely free from the hygienist's objections. In spite of the utmost precautions (which in practice would seldom be carried out), the air and water would be more or less contaminated. The pagan plan of cremation has something in its favor, but much against it. The establishment of furnaces for the conversion of our departed friends into gases and ashes is too infernal to be popular; and we are not so sure that the atmosphere would be any the better for breathing or smelling, should the practice become general.

To those who object to earth burial for the sake of the living, and to the roasting process on other grounds, we now propose a third method, which certainly has the merit of escaping the disadvantages of the other two. We mean burial in the deep sea, which, for the want of a better word, we will call thallataphy. Let a steamer for the purpose—a floating hearse—transport the dead at least a hundred miles from land and commit them to the depths. The coffin, whether of metal or wood, should be perforated with small holes and weighted. Is any one shocked? We doubt if he can tell why. Banish the idea of sharks; they belong to the coast. The deep sea fauna is made up of low and harmless forms of life—sponges, rhizopods, diminutive molluscs, and the like. The dead would never pollute anything of which the living partake. Do you prefer to commit the relics of your departed friends to their "kindred elements?" It is far more appropriate to lay them in the bosom of the ocean than to inter them in the land—dust with dust; for the average man consists of 88 lbs. of water to 66 of solid matter. Nor need any one be troubled about the resurrection; for we are assured that "the sea shall give up its dead." We say then, especially to the great maritime cities like New York and Boston, London and Liverpool, away with patent furnaces and crowded cemeteries, and find rest in the unlimited burial place which Nature has provided. J. O.

REGULATING THE SPEED OF AN ENGINE.

We have received a neat little pamphlet* from the J. C. Hoadley Company, of Lawrence, Mass., giving the results of experiments in regulating the speed of an engine, first by means of a variable cut-off, second, by throttling the steam, controlling mechanism being actuated in each case by the governor. It is scarcely necessary to say that the results are largely in favor of the variable cut-off. It is easy to understand why this should be so.

When a cut-off is employed, steam of nearly the boiler pressure is admitted to the cylinder; and the admission valve being closed before the piston has completed its stroke, only a portion of a cylinder full of steam is used. On the other hand, when the steam is throttled, its pressure is reduced before admission, and a cylinder full of steam is required. In the pamphlet referred to, quite a number of comparisons are given, and statements are made in regard to the amount of coal and water required for horse power per hour in each case. There is no account of the manner in which the experiments were conducted, nor is it stated whether they were made by members of the company or by disinterested experts, both of which facts will tend to lessen their value, in the opinion of many. There is little doubt, however, of the truth of the principal statement, that under ordinary circumstances an engine with a variable cut-off will be more economical than one in which the valve is arranged to cut off at a fixed point, all regulation being effected by throttling the steam.

THE MAGNETIC EQUIVALENT OF HEAT.

There has recently been devised, by M. Cazin, in France, a thermomagnetic differential apparatus, by means of which, it is stated, the absolute quantity of heat engendered by magnetism may be measured; in other words, the magnetic equivalent of heat may by its aid be determined. The investigator, after observing the thermic effects of magnetism on the core of a rectilinear electromagnet, around which the wire is rolled in alternately opposite directions, so as to produce several poles, enunciates the following law: "When the alternate spirals, constructed by the wire, have the same dimensions, and when they divide the magnet into several equal portions (*concamérations*), the quantities of heat created in the iron core at the opening of the voltaic circuit are inversely proportional to the squares of the number of divisions, the other circumstances not changing." For example, four similar bobbins are disposed around a cylindrical iron tube at equal distances apart, the tube extending a short length beyond the outer coils. In establishing the communications, there is obtained, with the same total length of wire and the same total number of points, one, two, or four divisions: the quantities of heat decrease as the numbers, $\frac{1}{4}$, $\frac{1}{16}$.

In order to measure this heat, M. Cazin has constructed a kind of differential air thermometer, in which air reservoirs are used. Two or three thousand interruptions of the electric current produce, with an ordinary battery, a calorific effect very plainly measurable. By dividing the pressure observed by the number of interruptions, and making a small correction analogous to that employed in calorimetry in taking account of the cooling action of adjacent bodies, the thermic effect of the magnetism is obtained.

RECENT BOILER EXPLOSION.—A correspondent in Lexington, Ky., sends us an account of a boiler explosion in that place. Considerable damage was done to the building in which the boiler was situated, and two horses were killed. The boiler was quite old, and the steam gage was very defective, according to our correspondent's statement; so it seems quite probable that the explosion occurred from excessive pressure. A steam gage that shows 45 pounds pressure, when the actual pressure is 100 pounds per square inch, with a so-called safety valve to correspond, and a careless and ignorant man in charge of the boiler, offer very favorable conditions for an explosion.

*Comparative Economy of Regulation, by Variable Cut-Off and by Throttle Valve, as Exemplified by Indicator Diagrams from engines built by the J. C. Hoadley Company, Lawrence, Mass.

DEVICE FOR PREVENTING HORSES FROM CRIBBING.

Cribbing by horses is a peculiar habit, or perhaps disease, which seemingly impels the animal to gnaw its manger, seize hold of objects with its teeth, and, by the action of the larynx, to suck in air until a very uncomfortable as well as unsightly condition is the result. In the invention represented in our engraving, Mr. A. Stillwell, of Dwaar's Kill, N. Y., supplies a mechanical arrangement which, he considers, will prevent the difficulty.

The device is suitably secured to the headstall by a metallic strap, A, on which are formed arms, B and C, at right angles. With the latter connects a bent lever, D, the inner end of which, terminating just forward of the larynx of the animal, is provided with a number of sharp spurs. Attached

to this lever are curved bars, E, the inner extremities of which extend to the same point, and have semicircular flanges which, rising above the spurs, prevent the latter from pricking the horse so long as the animal remains quiet. The moment, however, the cribbing action distends the larynx, the latter, expanding, presses upon a cross, F, which, being pivoted to the curved bar, E, and also to the arm, C, pulls on the short arm of the lever, D, thus lifting the points, which punish the horse until he desists. The machine is made of iron or other suitable material, and weighs some six ounces.

Hints for the Care of Horses.

At a recent meeting of the Farmers' Club of the American Institute in this city, Mr. G. W. Johnston read a paper on "The Horse," in which we find a number of valuable hints regarding the management and care of that most useful of our dumb servants. With reference to balking, the speaker said that horses frequently resist because they fail to understand what is required of them; or it may occur from overloading sore shoulders, or being worked until exhausted. The latter is especially the case in young animals. The vice can only be corrected by kindness and gentle treatment, and it is recommended, when the horse attempts it, to jump out of the wagon, and pat and reassure him by a kind word, carefully examine the harness, and then get in again as if expecting him to go. This will generally prove effectual.

Mr. Johnston says that the French are the best authorities on the dieting of horses, and that they hold that, under all circumstances in the giving of food, age and condition should be taken into consideration. Small fodder is better than hay for old horses, as it is more easily masticated and swallowed. When a horse is working hard, his main food should be oats. If he works but little, hay alone will answer. For a saddle or a light carriage horse, half a peck of good oats and thirteen pounds of hay are sufficient. The hay should be wet with salt water—a teaspoonful of salt to a bucket of water. Oats possess more nutritious matter for making flesh than any other kind of food; but a small quantity of mown grass should always be given in the spring to horses not kept in the pasture. A horse should have river water rather than well or spring water, as the latter is cold and hard, while the former is sweet and comparatively warm. One bucket morning and night, or, what is better, a half bucket at four different times a day, is the proper quantity. If a horse refuses food after drinking, he should be allowed to rest, as the refusal is always evidence of exhaustion.

The stable should always be well drained and sufficiently lighted, because the vapors from a damp, putrid floor, and the sudden change from darkness to light, will almost certainly cause blindness. Let proper openings be made, just under the ceiling, to permit the hot foul air to escape, and free ventilation be allowed, at the bottom of the walls, to admit fresh air, for impure and confined air causes broken wind. The fresh air should enter through a number of small holes, rather than through large ones, such as an open window, as there is less danger from drafts, which cause chills and colds. The temperature of a stable should not be over seventy degrees in summer, nor under forty-five degrees in winter. Extremes of heat or cold are equally bad. Use a hot, close, and foul stable if you wish to kill your horse. By such means glanders, inflammation, incurable cough, or disease of the lungs is sure to follow. Another very important matter for consideration of the farmer is

THE MANNER OF SHOEING HORSES.

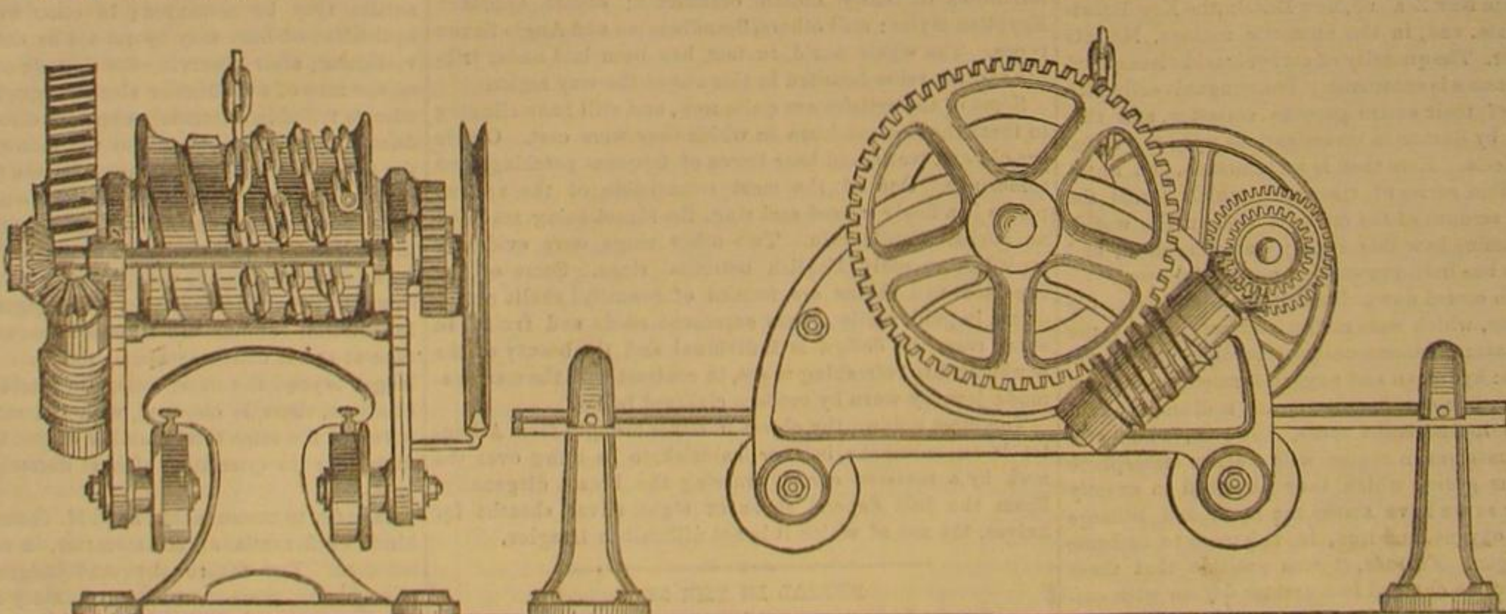
Although this subject has engaged the attention of mankind from the earliest ages, in consequence of its importance, it is wonderful how little we have yet realized in the way of securing a covering for the horse's hoof which shall answer the purposes required. Many scores of different shoes have been designed by persons ready to vouch for their excellence, but they have generally been false in theory. Of the many methods of horse-shoeing, that known as the Goodenough system seems alone to be founded upon correct principles. The frog must be preserved, or eventually the foot will be ruined. The light of reason is beginning, in this respect, to slowly dawn upon the rising generation of blacksmiths. Let us hope, for the horse's sake, that that instrument of torture, the old bar shoe, may soon be brought to mind only with memories of the Inquisition.

Camphor Water.

The Pharmacopœia directs that the camphor, reduced to a pasty mass with alcohol, be rubbed with the carbonate of magnesium and water, and filtered. In making camphor water, I discard the use of alcohol entirely. With a few drops of ether, I reduce the necessary quantity of camphor, in a mortar, to an impalpable powder in a few moments. The ether evaporates instantly and is not open to the same objection as alcohol, that of contaminating the resulting medicated water by its presence. I then rub the powdered camphor with the magnesia and a part of the water, and pour the liquid through a funnel sieve into a bottle of the requisite size, returning to the mortar the lumpy portions that at first refuse to pass through the sieve, and rubbing them with more of the water. If the resulting milky liquid be now thoroughly agitated, and filtered immediately, the camphor water will be found to be decidedly stronger than many specimens, made by the ordinary process, that have stood some time and received occasional agitation before filtering; and if it be allowed to stand in the stock bottle, occasionally agitated, and filtered off when wanted for use, its superiority to that made in the officinal way will be perceived to be unquestionable. In making large quantities of camphor water, the powdered camphor might first be passed through a tolerably fine sieve, dry.—*Franklin T. Hartzell, G. P.*

OVERHEAD TRAVELING CRANE.

We illustrate herewith a very convenient and compact form of traveling crane constructed by the company (at Chemnitz) which succeeded the well known German mechanic Constantin Pfaff, and exhibited by them at the Vienna Exposition. The crane, for the illustration of which we are indebted to *Engineering*, runs upon a pair of light rails, suspended from the roof of the shop. The motion is transferred from the driving pulley through gearing to the bevel wheels, and thence to the worm which actuates the chain drum. The crane is intended to lift and transport weights up to 2½ tuns.



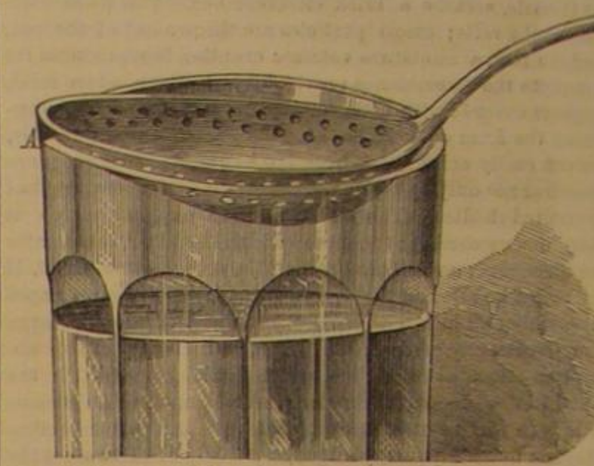
OVERHEAD TRAVELING CRANE.

LINSEED OIL.—Linseed oil is obtained from flaxseed, by grinding the same under heavy stones, set on edge and made to revolve on beds of stone. Attached to the edge stone are scrapers which throw the seed into the circular track of the roller. The ground seed is placed in strong, woven woolen bags, which bags are covered with mats made of horse hair and sole leather, of a proper and sufficient width to protect the bags in the operation of pressing. These mats with their contents are subjected to an immense hydraulic pressure, and the expressed oil flows off into large iron tanks, where it is allowed to settle. What remains in the bags after the pressure is known as oil cake. About 8,000,000 gallons of linseed oil are used annually in the United States.

IMPROVED MIXING SPOON.

If temperance agitations were not so fashionable just at present, we should innocently write that this invention is peculiarly adapted for mixing drinks; but as in some portions of the country, the latter operation, fortunately for the inhabitants, bids fair to become one of the lost arts, we restrict ourselves to the observation that the device is most suitable for combining medicines, compounds less agreeable to take, perhaps, in the beginning, but sometimes—not always—more beneficial in the end.

It is an ordinary good sized spoon, the bowl of which is made with a number of perforations and provided with a projection, A, which catches upon the edge of the vessel in which the mixing is to be done, thus holding the implement



securely in place. The sugar or other material is placed in the bowl, and the medicines or other liquids to be added are dropped or poured in, in succession, percolating down through the perforations. Mr. William S. Clark, of Ishpenning, Marquette county, Mich., patented the device through the Scientific American Patent Agency.

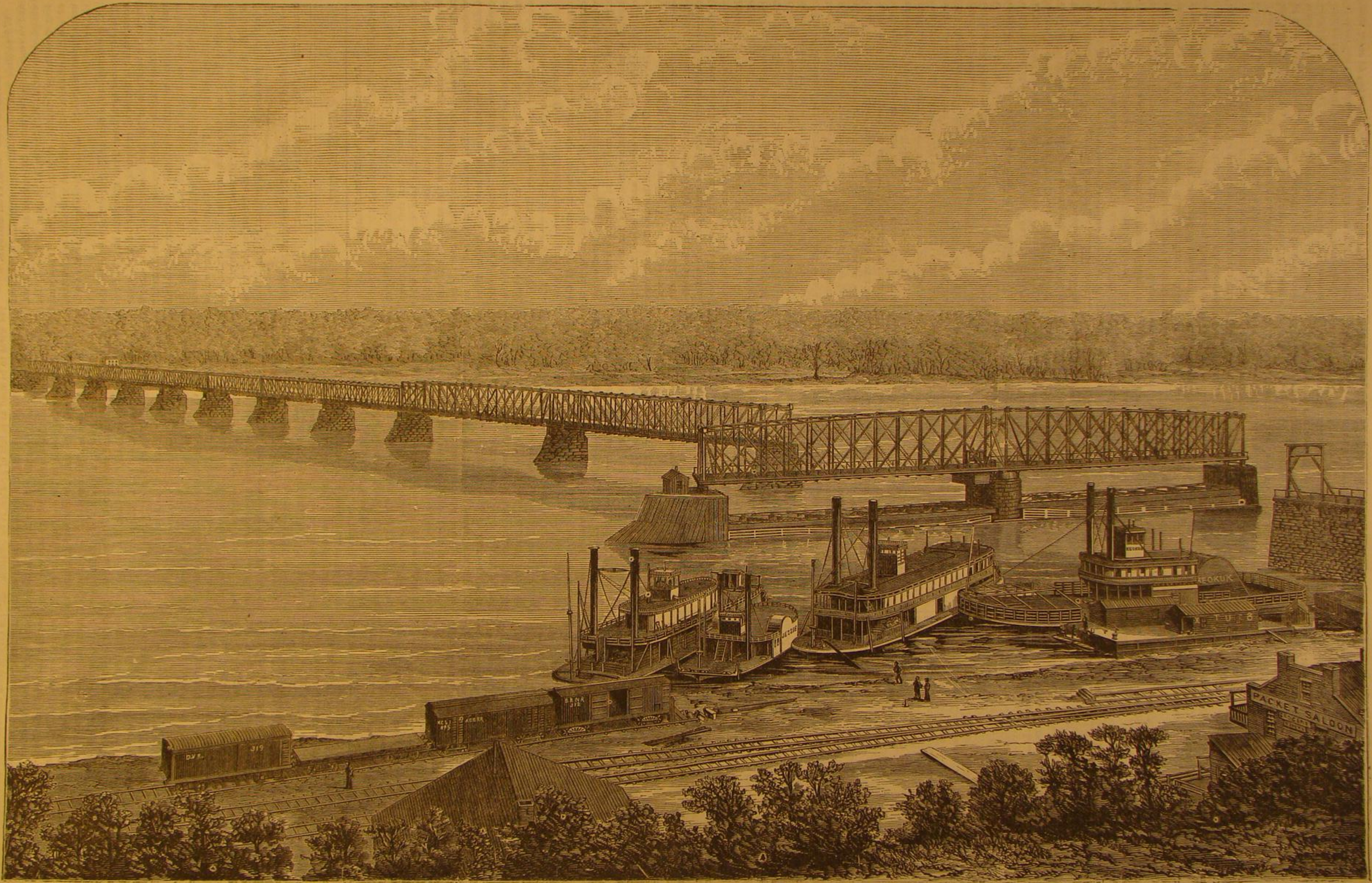
How Thermometers are Made.

L. C. Weldin describes, in the *Polytechnic Bulletin*, the method of making thermometers at the Tower Manufacturing Company's establishment, Chester, Pa.:

The glass tubes, as received, are about a yard long. A boy nicks them with a hard steel knife, and breaks them into the lengths required. The bores, which are flat, are compared, by means of a lens, with those of ten standard sizes, and the tubes assorted accordingly. They are then passed to the blowpipe table. Each glass blower has a foot bellows, and uses an oil lamp. Melting the glass at one end of a tube, he blows it into a bulb by pressing the sides of a hollow india rubber ball attached at the other, proportioning the size of his bulb to the bore of the tube, and ascertaining the size by using a pair of callipers. While the bulb is yet hot, the tube is inverted in mercury, which, as the bulb cools, rises and partially fills it. The tube is then withdrawn and a short india rubber tube attached at its open end. Into this mercury is poured; that in the bulb is boiled to expel the air, which rises up through the mercury in the india rubber tube, and an atmosphere of the vapor of mercury now fills the glass tube and bulb. As this condenses, the mercury in the india rubber tube takes its place, when this tube, with any mercury remaining in it, is removed. The bulb is now warmed, and the open end of the glass tube hermetically sealed.

The bulb and a portion of the tube are immersed in melting ice, and the hight of the mercury marked; they are then transferred to a bath at 62° Fah., and the hight marked; next to a bath at 92° Fah., and the hight again marked. The lengths of the three spaces of thirty degrees each are now carefully measured. If they are exactly equal, the bore of the tube is assumed to be uniform, and the degrees laid off on the brass scale of the thermometer are all made of the same length. If the spaces of thirty degrees each are not found to be exactly equal, then, by means of a highly ingenious dividing engine, the degrees on the scale are made to increase in length as the caliber of the tube diminishes. When the plate has been divided, and the figures and letters punched, it is passed, laterally, between rollers, to remove the burr left by the tools. Were it rolled lengthwise, the accuracy of the dividing would be impaired. The plate is then silvered and lacquered, the glass tube attached, and the whole slidden into the well known japanned tin case. The establishment turns out two hundred dozen thermometers a week.

THE wine crop in the United States is 20,000,000 gallons.



ROAD AND RAILWAY BRIDGE OVER THE MISSISSIPPI, AT KEOKUK, IOWA.

THE KEOKUK AND HAMILTON BRIDGE.

We publish herewith a full page engraving of the road and railway bridge over the Mississippi at Keokuk, Iowa, designed by Mr. J. H. Linville, C. E., and erected by the Keystone Bridge Company, of Pittsburgh, Pa. It is a work of the highest engineering skill and most solid construction, and of great magnitude, as the following dimensions will show:

Commencing at the west or Keokuk end of the bridge, the spans are located as follows: Pivot span, total length of one truss, center to center of end posts, 376 feet 5 inches; opening under each arm of 160 feet measured on the square; 2 spans, 253 feet 6 inches; 8 spans varying in length from 148 feet $4\frac{1}{16}$ inches to 161 feet 7 inches; total length, backwall to backwall on bridge seats, 2,192 feet. It is a through bridge built on a skew of 17° 15', with a distance between the two trusses of 21 feet 6 inches. It carries a single line of railway track and two tramways for local traffic, the track being placed in the center between the tramways. On each side of the bridge, outside of the trusses, are footwalks 5 feet wide protected by light and substantial iron lattice railings.

We are indebted to *Engineering* for the engraving, which is made from photographs taken on the spot.

Correspondence.

Acoustics of Public Buildings.

To the Editor of the Scientific American:

There are few things more provoking than the inability to hear a public speaker distinctly, when that inability arises from the fact that the building has been constructed with little or no regard to good acoustic effect. We are inclined under such circumstances to blame the architect; but unfortunately the architect is often compelled to consult the wishes of those who come not to hear, but to see. In no public buildings are the simplest laws of acoustics more neglected than in our churches. This arises in a great measure from the fact that, at the present day, an effort is made in church building to imitate in architectural effect the large churches of the middle ages. The fact that these grand old structures were not erected to be filled with a single voice, but to raise a monumental pile for great ceremonials, seems to be entirely forgotten; and many of the churches of today are built with a high apsis, in which is placed the speaker's desk instead of the high altar of earlier days. The nave is lofty and, by its groined arches and hooded windows, gives ample opportunity for the sound of the speaker's voice to be echoed and re-echoed from its numerous surfaces until it falls upon the ears of the audience in indistinct and unintelligible sounds. When these great errors in church architecture have been committed, the question arises: Is there any remedy by which the acoustic properties can be improved? Plain and parabolic sounding boards have been introduced, but with very indifferent results. Drapery has been festooned about the sides and bases of the arches with no better (and with very unsightly) effect; and until quite recently, no really successful method has been devised by which the difficulty could be overcome. The Rev. Joseph P. Taylor, formerly rector of St. Paul's Church, Brunswick, Me., ascertaining that his audiences were greatly troubled to hear him distinctly, on account of excessive reverberation, gave the subject careful investigation and study, and conceived the idea of overcoming the difficulty by the introduction of screens of very fine wire beneath the ceiling, at a proper angle and at such a distance from the pulpit as would best intercept the sonorous wave, and thus prevent its striking the reflecting surface with sufficient force to cause echo. The same device was subsequently employed by Mr. Taylor in the Brown Memorial Church, Baltimore, where a very bad echo or reverberation existed; and the testimony of prominent men connected with the church is that the cure is complete. The Asylum Hill Congregational Church, of Hartford, Conn., is a fine gothic structure, built of Portland stone after the style of architecture of the middle ages. It has an apsis of 17 feet depth and 52 feet hight. The point of the arch of the nave or clerestory is 54 feet above the floor of the audience room, and is ornamented with hooded windows. The organ gallery, at the end of the church opposite the apsis, extends over the vestibule to the front of the central tower, and is some 25 feet deep. When this church was completed, its architectural effect was beautiful, but it was found impossible to understand the speaker in some parts of the audience room. A parabolic sounding board was introduced, back of the speaker's desk which was situated in the apsis. The effect of this contrivance was to benefit the hearing directly in front of it, but was of little or no service to those sitting in the side seats. Subsequently an organ was purchased and put in the apsis, nearly filling it, and the speaker's desk was placed on a platform extended some 8 feet in front. The front of the organ gallery at the opposite end of the church; was provided with a skeleton gothic window, that is, one with the frame and tracery, without any glass. (The organ gallery is unoccupied.) This was done to break the column of sound which was found to vibrate in this gallery independently of the great column of sound in the audience room. These changes improved the hearing qualities of the church, but in certain localities the old difficulty remained, and some of what would ordinarily be the best sittings in the house were very undesirable, from the great difficulty of distinctly hearing the words of the speaker. Various devices for overcoming this difficulty have been suggested, and investigation of them has been made. The one which was regarded with most favor by the society's committee was the introduction of wires to be used at points of greatest reverberation. Mr. Taylor was invited to examine the audience room of the church and decide as to the ability of his method to accomplish the end desired. The diagnosis of the case was interesting. A speaker was placed in the desk and the two or three persons composing the audience distributed themselves within the limits of greatest reverberation. The effects of the speaker's voice at different angles and at different elevation was carefully noted, and the source of the reverberatory waves traced out. This having been done, the mode of applying the remedy was decided upon. There is no undeviating rule that can be laid down, but every case must be examined and the remedy introduced in accordance with the peculiar circumstances involved. In some cases, the wires are strung across the groined arches high up in the nave. In others, they are placed across the arches leading to the transepts. In the Asylum Hill Congregational Church, it was found necessary to separate or divide the groined arches and hooded windows of the clerestory from the audience room below. The wires are of very small gage, and do not disfigure the church in the least. A stranger would not notice them unless his attention were particularly directed to them. The result of the experiment is most satisfactory, and the hearing is equally good in all parts of the house, provided that the preacher speak with sufficient strength and distinctness for an audience room so large. Mr. Taylor's patent is entirely different from the plans of some who have made use of wires to overcome acoustic defects. These have usually consisted of wires of large gage, distributed from four to eight feet apart, being very unsightly and producing but indifferent results. His plan is what he terms a "break sound." The wires are so placed as to receive the sound wave before it reaches the reflecting surfaces which cause the reverberation. The sound impinges against the wires; its force is broken, and it has no power to produce an echo or reverberation from the surfaces beyond, nor is the sound reflected back by the wires to the audience. It is simply broken, and its force is taken up by the wires which, by inaudible vibrations, convey it away. If a sounding board or sonorous reflector were placed in the same position, an unpleasant reflection of sound would be the result; and if drapery were used, the sound would be dead and muffled. Having made trials of all these devices, we can say that the wires alone accomplish the end sought, and they are adapted to all kinds of public buildings where difficulty in hearing is experienced. I have given you a full and lengthy account of our experiments because I am aware that there are many public buildings and churches in the country which are beautiful in their architecture, but have acoustic defects that sadly eclipse other attractive features, and I am also aware that the SCIENTIFIC AMERICAN is a paper to which people look for such information.

Hartford, Conn. J. M. ALLEN.

The Relative Attraction of the Earth and the Sun.

To the Editor of the Scientific American:

It appears that I have not been explicit enough in my communication on the above subject, published on page 245 of your current volume, and have used too few words in disposing of Captain Ericsson's iron ball floating in a bath of mercury; consequently he labors under the impression that I do not understand his apparatus. I understand it only too well, so well indeed as to know that even the attraction of the rising or setting moon can never affect such an arrangement, which, according to Captain Ericsson's ideas, it ought to do, if only its sensitiveness were slightly increased. In order to show this, we will take Captain Ericsson's data, given on page 164: Mass of sun$=$314,760, the earth being 1. As the mass of the moon is 0·0125 or the 80th part of that of the earth, the sun's mass surpasses that of the moon: $314,760 \times 80 = 25,180,800$ times; and the force of gravitation being inversely as the square of the distance, and directly as the mass, the sun's attraction is relatively equal to $25,180,800 : 400^2$, nearly 157 times that of the moon. The attractive force on Captain Ericsson's iron ball is, according to his calculation, for the sun equal to 748·6 grains, and thus for the moon $748{\cdot}6 : 157 = 4{\cdot}9$ grains. If, therefore, the arrangement were only a little improved, so that the ball were movable by a little less than 5 grains, in place of 8, the moon would affect it. But that this can never be the case, with any contrivance of this kind, however delicately it may be constructed, even if it could be moved by a single grain, is due to the fact that the circumstances are totally different in the cases, first where the ball and the bath in which it floats are both affected by changes in the direction of gravitation, and second, if the ball alone is acted upon by some mechanical contrivance. The cause of the ball being always balanced under various conditions of gravitation, as I stated on page 245, is that the attractions of the sun and moon act simply in such a way as to shift the center of terrestrial attraction towards them, according to the law of composite forces. This shifting of the center of attraction induces changes in the ocean level, and thus is the cause of the tidal waves. Therefore the rising or setting sun or moon, in shifting the earth's center of attraction eastward or westward, will not only act on the floating iron ball, but change equally the level of the mercury, and so keep the ball at rest; while, according to Captain Ericsson's ideas, it should slide over the unaffected mercurial surface, as down an inclined plane, towards the side on which the sun or moon is situated.

Surely the lunar attraction is not neutralized by centrifugal force, because the earth does not revolve around the moon, and any lunar attraction therefore must manifest itself to its full amount.

That the solar attraction is, for the greater part, neutralized by the centrifugal force of the earth in its yearly orbit, is evident from the fact that, notwithstanding that the attraction of the immense solar mass surpasses that of the moon on our earth's surface 157 times, the solar tidal wave is smaller than the lunar tidal wave; but the existence of the solar tide wave is a better argument in proof of the effects of solar attraction than can be drawn from any such experiment as the one in question.

The amount of this solar attraction, manifested in the solar tidal wave, enters, as is well known, into the calculation of the times and relative hights of the spring and neap tides; it has been laid down on geometrical principles that the change in the moon's gravity, due to the sun's action, is expressed by the formula $\frac{M}{D^3} \times y(1 - 3\cos^2\varphi)$ in which M is the sun's mass, D its distance expressed in the earth's radii, y the distance of the particle from the center of the earth, and φ its elongation from the sun as seen from the earth's center. The same formula is applicable to the moon; and as $y\,(1 - 3\cos^2\varphi)$ may be taken equal for both, we find, if we call the moon's mass and distance m and d, that their attractions, in regard to raising the tidal wave, are as $\frac{M}{D^3} : \frac{m}{d^3}$, showing that the power to raise the tides is in direct proportion to the mass, and inversely as the cubes of the distances. If now we give the quantities the proper values, taking, for simplicity's sake, the moon's distance as unit, we have $\frac{314,760}{400^3} : \frac{0{\cdot}0125}{1^3} = 2\frac{1}{2}$, showing how many times the moon's attraction surpasses that of the sun.

This calculation gives results perfectly in accordance with the observation that the mean hight of the solar tidal wave is to the lunar as 3 : 7, while the whole theory of the tides (aqueous and atmospheric) proves that the solar attraction on our rotating and revolving globe is only neutralized by the centrifugal force when we consider the earth as a whole, but that this is by no means the case for the different particles in its mass, especially not for those near or upon its equatorial surface. P. H. VANDER WEYDE.

New York city.

Solar Attraction and Centrifugal Force.

To the Editor of the Scientific American:

With surprise I read the communication of Captain Ericsson (page 291, current volume), in which he concludes that Dr. Vander Weyde does not understand the principle of his apparatus for showing the neutralization of solar attraction and centrifugal force. Though Captain Ericsson, in his communication of March 14, proved to be master of the subject, he evidently overlooked one point, or else he would not have mentioned the experiment with the iron globe.

Though solar attraction does balance the orbital centrifugal force while the sun is rising, it will not do so three hours afterwards, when a pendulum will be slightly deflected towards the sun, while the floating globe will not move. True, the globe is attracted towards the sun somewhat more than it is repulsed by centrifugal force, and consequently would move towards the sun, if the mercury were not under the influence by virtue of which its surface leaves the true horizontal direction, rising slightly at the side nearest to the sun. If the mercury only were attracted, not the iron, the globe would seek the lowest level and retreat from the sun. These two tendencies upon the globe will perfectly balance each other, and in no position of the sun can any result be obtained by the experiment. To prove my assertion of the inclination of the level of liquids when the sun occupies an angular position, I refer to the solar tidal wave. The water in a straight line with the sun being higher than that at right angles, there must be an inclined level at intermediate points of the ocean.

As the experiment does not show a difference between solar attraction and centrifugal force when it actually exists, it cannot demonstrate a neutralization of those forces.

In addition to what was said on the question, it may be interesting to state that the moon, though much smaller than the sun, by her nearness causes about three times greater variations of gravity during her apparent diurnal motion, than the sun, as may be found by repeating Captain Ericsson's calculation, with reference to the moon.

Philadelphia, Pa. HUGO BILGRAM.

Drying Peat.

To the Editor of the Scientific American:

A kiln of condensed peat has recently been dried by evaporation in forty-eight hours, upon the principle and system for which a patent was obtained through your agency. The heat requisite was carefully noted from a thermometer in constant use during the process, and found to average only 85°. Two other appliances, embraced in my system, could not be used at this time, but, when used, will shorten the time to thirty-six or forty hours only. The important question of artificially drying peat is therefore solved, at the same time preserving economy of labor and fuel, and the system is susceptible, as to quantity, of almost indefinite extension.

Rome, N. Y. W. E. WRIGHT.

TURPENTINE.—Venice turpentine is obtained from the larch, and is said to be contained in peculiar sacs in the upper part of the stem, and to be obtained by puncturing them. It is a ropy liquid, colorless or brownish green, having a somewhat unpleasant odor and bitter taste.

Oil of turpentine is the most plentiful and useful of oils. It is obtained in this country from a species of pine very plentiful in the Carolinas, Georgia and Alabama. The tree is known as the long leaved pine (*pinus Australis*), and is found only where the original forest has not been removed.

USEFUL INFORMATION ON STEAM POWER.

Careful experiments by Favre, Silbermann, and others have shown that a pound of good coal will liberate during complete combustion 14,000 or 15,000 units of heat, each unit being equivalent to 772 foot pounds. The

MECHANICAL EQUIVALENT OF THE HEAT

developed by the combustion of a pound of coal is, therefore, say 14,500 × 772 = over 11,000,000 foot pounds. A horse power is always assumed to be equal to 33,000 foot pounds per minute, or 1,980,000 foot pounds per hour. So the combustion of each pound of coal per hour liberates heat enough to develop 11,000,000 ÷ 1,980,000 = say 5 horse power; and in a perfect steam engine the consumption of coal would be about at the rate of one fifth of a pound per hour for each horse power developed.

The greatest economy obtained in ordinary continuous working may be taken at from 3 to 4 lbs. of coal per indicated horse power with non-condensing engines, and from 2 to 2¼ lbs. with condensing engines. A consumption as little as 1½ or 1¾ lbs. per indicated horse power has been reported in the case of compound condensing engines, and such results are quite possible. But a consumption of 2 lbs. is as little as can yet be counted on with certainty. The manufacturer, in choosing an engine, would do well to look with some little doubt on promises of a better result than this, and he may feel satisfied if the engine he buys shows itself capable of working with that degree of economy. A consumption of 4 lbs. of coal per indicated horse power per hour means a loss of nineteen twentieths; and 2 lbs. per indicated horse-power, a loss of nine tenths of the power theoretically due to the coal. There is, therefore, ample room for improvement, even upon the best of modern steam engines.

The conditions necessary to

ECONOMY IN THE STEAM ENGINE

are: 1st. The complete combustion of the fuel in the furnace 2d. The transfer of all the heat generated to the water in the boiler. 3d. The passage of the steam through the engine without loss of heat, except such as is converted into motive power, and the conservation of the heat remaining in the steam on its leaving the cylinder. 4th. The absence of friction in the working of the engine. Let us see how these conditions are fulfilled in a good modern steam engine.

As to the

COMBUSTION OF THE FUEL,

with the best coal and most careful stoking, a quantity of the coal falls through the fire bars, either as unburnt coal or ashes. Another portion goes up the chimney unconsumed in the form of smoke and soot; and a further quantity, half consumed in the form of carbonic oxide. The loss from the causes may amount to from 2 to 20 per cent. It all arises from wrongly constructed furnaces and bad stoking, and it may nearly all be avoided.

As to the heat generated, most coal contains a greater or less quantity of moisture, and the evaporation of this moisture causes the first loss of heat. Radiation from the furnace causes a further loss. But the great causes of loss are the admission into the furnace of a large quantity of useless air and inert gases, and the escape of these, with the actual products of combustion, up the chimney, at a very much higher temperature than that at which they entered the furnace. Air is composed of about one third oxygen and two-thirds nitrogen. The oxygen only is required to effect the combustion of the fuel, and the useless nitrogen merely abstracts heat from the combustibles, and lowers the temperature of the furnace. About 12 lbs. of air contain sufficient oxygen to effect the combustion of 1 lb. of coal, but owing to the difficulty of bringing the carbon into contact with the oxygen, the quantity actually required to pass through the furnace is from 18 lbs. to 24 lbs. of air per pound of coal burnt. The surplus air passes out unburnt, but its presence in the furnace lowers the temperature subsisting there, and abstracts a portion of the heat generated. And whereas the whole of the air enters the furnace at about 60° Fah., the unconsumed air and the products of combustion leave the flues at from 400° Fah. to 800° Fah. The total loss from these causes is from 20 to 50 per cent. In other works, whereas each pound of good coal burnt is theoretically capable of evaporating about 15 lbs. of water, in good practice it evaporates but 9 or 10 lbs., and in ordinary practice but 6 or 8 lbs. of water.

There are difficulties in the way of abstracting all the heat from the furnace gases: first, because with natural or chimney draft, the gases require to pass into the chimney at not less than 500° Fah., in order to maintain the draft; and secondly, because the transmission of heat from the gases to the water, when the difference of their temperatures is small, is so slow that an enormous extension of the surface in contact with them becomes necessary in order to effect it. But by having energetic combustion and a high temperature in the furnace, the quantity of air actually required may be much reduced; by suitable arrangements for admitting air and feeding coal into the furnace, the proportions of each may be suitably adjusted to each other; and by a liberal allowance of properly disposed heating surface, the temperature of the reduced quantity of furnace gases may be reduced to that simply necessary to produce a draft, in a furnace with natural draft, or to about 400° Fah. or less, in a furnace where the draft is obtained from a steam jet or fan. Under these conditions an evaporation of from 10 to 12 or more lbs. of water, per pound of good coal burnt, may be expected.

As to the heat in the steam amongst the minor causes of loss are radiation from the boiler, steam pipes, and engine (most of which can be prevented by carefully lagging with a good non-conductor of heat), blowing off, and leakage. A greater loss arises from initial condensation in unjacketed cylinders, nearly prevented by using a properly constructed steam jacket. But the great loss arises from the escape of the steam into the atmosphere, with only a portion of its heat utilized. This, of itself, leads to another great loss, of from 40 to 60 per cent.

The use of high pressure steam, high rates of expansion, and of an efficient feed water heater, is conducive to economy, but no practicable means have yet been devised whereby the whole heat may be saved; and the removal of this source of loss in the working of the steam engine offers one of the most promising subject for inventive genius.

In a good modern steam engine, the coal used is thus approximately disposed of:

Lost through bad stoking and incomplete combustion.	10·0
Carried off in the chimney gases	30·0
Carried away in the exhaust steam	50·0
Utilized in motive power (indicated)	10·0
	100·0

ENGINE FRICTION.

A further loss of useful effect ensues from a portion of the motive power actually developed being absorbed in driving the engine itself, and the useful power of the engine is reduced from this cause by from 5 to 25 per cent. The use of equilibrium valves, ample bearing surfaces, careful lubrication, and cleanliness go far to lessen the friction, as well as to increase the working life of a steam engine; but in selecting an engine, it is as well to bear in mind this source of loss, as injudicious improvements, introduced for the attainment of increased economy, may defeat this subject through the excessive power required to drive them.

For engines with cylinders less than 6 or 8 inches in diameter, the simple high pressure non-condensing arrangement should be adhered to, as it makes for small powers the most economical as well as the cheapest engine. The boilers for the smaller powers can be heated by gas instead of by coal, and the cleanliness and convenience of the arrangement quite counterbalance the slight increase of expense. When also the trouble of attending often to the water level is objected to, a boiler of large capacity should be provided. Non condensing engines with cylinders above 8 inches in diameter should always be provided with expansion valves, steam-jacketed cylinders, and feed water heaters; and the exhaust steam of non-condensing engines should always be used to urge the draft. Condensers cannot well be used for portable engines or engines requiring removal; but fixed engines, having cylinders larger than about 10 or 12 inches, should be fitted with either surface or jet condensers. The jet condenser is less costly and nearly as efficient as the surface condenser, under ordinary circumstances; but when the water from which steam is made contains much impurity, surface condensation is to be preferred. For seagoing purposes, engines are now very generally made on the compound system, and some very good results have been obtained from such engines. Their use for land purposes also is becoming very general, and for large powers the compound engine is to be recommended. But it should be borne in mind that, whereas a compound engine must be both designed and constructed with the greatest skill and care, in order that it may work with greater economy that a good ordinary engine, a bad compound engine may easily be much more wasteful than even a bad ordinary engine.

The unmistakable tendency of modern steam engineering is towards much

HIGHER PRESSURES OF STEAM

than those hitherto used. A pressure of over 100 lbs. per inch means the supercession of what may be termed large capacity boilers. High pressures are as safe as low pressures, provided the boilers are suitably designed to withstand them. But the construction of high pressure boilers should be confided to none but competent engineers; and those who intend putting up new boilers should recollect that the boiler maker who uses the best quality of plates and workmanship is not likely to send in the lowest tender. His boiler may, nevertheless, be the cheapest. For land purposes and moderate pressures, the Cornish boiler will continue to be used. For higher pressures, a modification of the French or elephant boiler is better, and the multitubular boiler is also to be preferred. The enormously thick plates found necessary in some modern marine boilers lead to most serious inconvenience, and it becomes essential to stipulate that steam shall not be got up in less than several hours. Many attempts have been made to use tubulous boilers for very high pressures, but as yet without any marked success. A good boiler of the kind, however, is a great desideratum.

The actual, or useful, or

DYNAMOMETRICAL HORSE POWER

is the net power of the engine, after allowing for friction, etc., and this alone is the power with which users of steam engines are concerned. In small engines the useful power can be ascertained accurately by the application of a friction brake or dynamometer. The dynamometer, however, cannot be conveniently applied to large engines, but the indicated power, less an allowance for friction, gives the actual power near enough for most practical purposes.

In comparing the prices of different engine makers, it is very necessary to look at the actual power an engine exerts, not to the nominal power, or to the size alone of the cylinder. A nominal horse power means anything from 1 to 8 actual horse power; and of two engines of the same size and general construction, one may not only develop much more power than the other, but may do so with a less consumption of fuel per actual horse power.

COAL

varies so much in quality that the consumption of a certain weight per horse power is not in itself sufficient to show the economy with which an engine works. When an engine consumes so little as 2 lbs. of coal per horse power, we know that the coal used must be of good quality, and that the engine is an economical one. But the consumption of three or four times that weight of coal per horse power does not necessarily prove the engine to be a bad one, because the coal used may be but one third or one fourth as good. Generally, no doubt, the best coal is also the cheapest; but when an inferior quality as used, and it is desired to test the efficiency of a steam engine, an analysis by a competent chemist will show the relative heating value of the fuel, compared with that of standard quality. The best steam coal is capable of generating sufficient heat to evaporate about fifteen pounds of water, from and at 212° Fah., per pound, properly burnt. The same coal after a long sea voyage or long exposure to weather often loses much of its calorific power, owing to its partial decomposition, pulverization, absorption of moisture, and other causes. Other kinds of coal contain a large percentage of incombustible matter, and knowing its chemical composition will alone enable one to judge of its comparative theoretical efficiency. Anthracite coals give the best result in generating steam, but bituminous coals may be burnt with a high degree of efficiency under suitable arrangements.

After the engineer has done all he can to attain economy, much of the result remains in the hands of the steam user. A reduction of ½ lb., of coal per indicated horse power, under 2 lbs. can only at present be effected by the greatest skill on the part of the engineer, while a careless or unskillful stoker may easily counteract all the engineer's ingenuity. The use of a high class steam engine involves the necessity of employing an intelligent, careful attendant: not that the work is more difficult, at any rate, with good coal, nor is it so laborious, as less coal has to be thrown into the furnace for a given power.

Clean fire bars, an evenly spread grate, preliminary coking on the dead plate, and the exercise of some little intelligence in the admission of air and regulation of the draft, are the main points to be attended to by the stoker, and these cannot be said to involve an unreasonable amount either of labor or vigilance. A self feeding grate is conducive to economy, especially when the coal is small or of inferior quality. Its use lessens the stoker's labor considerably, and it is not easy to find a reason for its comparatively limited adoption.—*Henry Northcott.*

Aversion to Manual Labor.

The practice of educating boys for the professions, which are already overstocked, or for the mercantile business, in which statistics show that ninety-five in a hundred fail of success, is fearfully on the increase in this country. Americans are annually becoming more and more averse to manual labor; and to get a living by one's wits, even at the cost of independence and self-respect, and a fearful wear and tear of conscience, is the ambition of a large proportion of our young men. The result is that the mechanical professions are becoming a monopoly of foreigners, and the ownership of the finest farms, even in New England, is passing from Americans to Irishmen and Germans. Fifty years ago a father was not ashamed to put his children to the plow or to a mechanical trade; but now they are "too feeble" for bodily labor; one has a pain in his side, another a slight cough, another "a very delicate constitution," another is nervous; and so poor Bobby or Billy or Tommy is sent off to the city to measure tape, weigh coffee, or draw molasses.

It seems never to occur to their foolish parents that moderate manual labor in the pure and bracing air of the country is just what these puny, wasp-waisted lads need, and that to send them to the crowded and unhealthy city is to send them to their graves. Let them follow the plow, swing the sledge, or shove the foreplane, and their pinched chests will be expanded, their sunken cheeks plumped out, and their lungs, now "cabined, cribbed, and confined," will have room to play. Their nerves will be invigorated with their muscles; and when they shall have cast off their jackets, instead of being thin, pale, vapid coxcombs, they shall have spread out to the size and configuration of men. A lawyer's office, a counting room, or a grocery is about the last place to which a sickly youth should be sent. The ruin of health is as sure there as in the mines of England. Even of those men in the city who have constitutions of iron, only five per cent succeed, and they only by "living like hermits, and working like horses"; the rest, after years of toil and anxiety, become bankrupt or retire: and having meanwhile acquired a thorough disgust and unfitness for manual labor, bitterly bemoan the day when they forsook the peaceful pursuits of the country for the excitement, care, and sharp competition of city life.—*M., in What Next?*

Artificial Alizarin in Printing.

Hitherto artificial alizarin has been chiefly used as a steam color, but it can also be employed like garancin and *fleurs de garance*. To prepare the dye beck, chalk to the extent of 1 per cent of the alizarin paste to be employed is stirred into the beck, which is heated to 190° Fah. The goods, previously printed with the mordants, aged, dunged, and washed, are unwound into the beck, and heated quickly to a boil. The dyeing is complete in ten minutes. The alizarin in the spent bath, in combination with the excess of chalk, is precipitated with hydrochloric acid, and recovered from the precipitated thus formed. The dyed pieces are washed in warm and cold water, and then three times, using each time ½ lb. soap per piece: the two first soap baths at 145° and the third at 190° Fah. They are then placed in a weak solution of chloride of lime for half an hour at 88° Fah., washed again, dried, and finished. —*Farber Zeitung.*

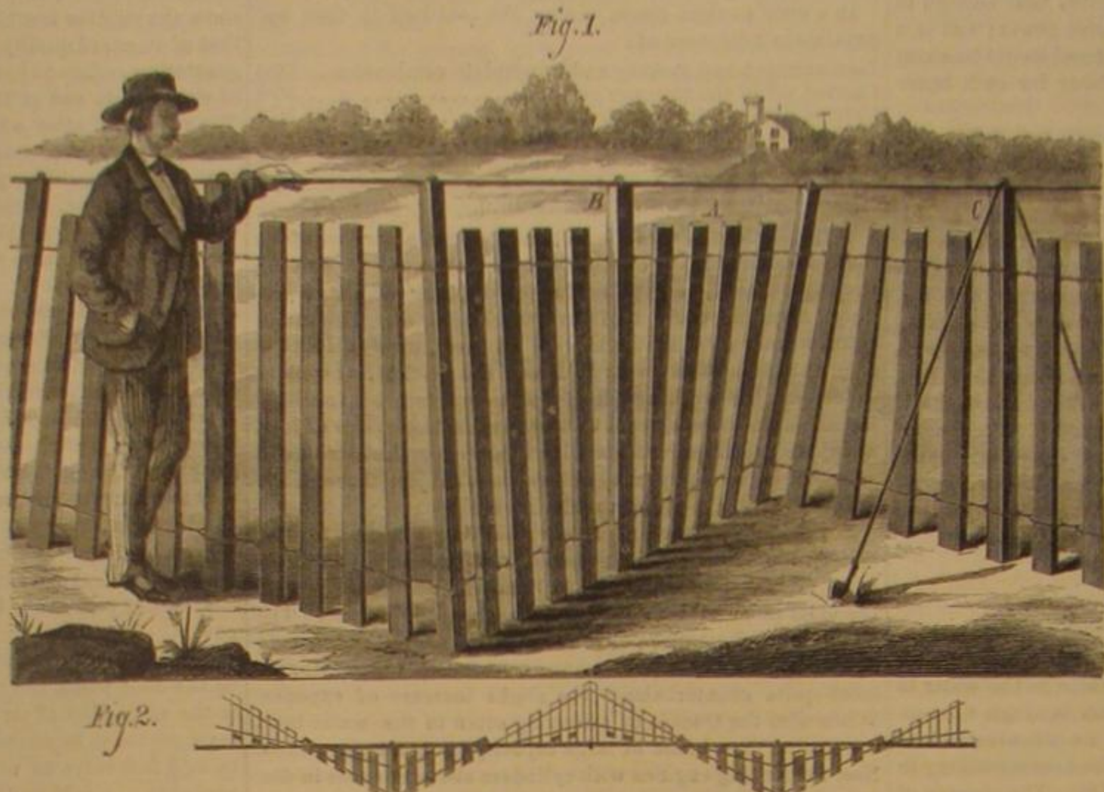
IMPROVED PICKET FENCE.

In many sections of the country, and especially upon the prairies of the West, it is difficult to obtain long fencing timber, and hence the expense of building and maintaining proper fences constitutes no small item in the farmer's expenses.

The invention which is represented in our engraving is a novel construction of fence, which may be made of proper rails, short split timber, small poles, limbs of trees, and similar rough wood, very readily by any one at all skilled in ordinary farming operations. It is composed of two sizes of posts, the shorter ones, A, Fig. 1, resting upon the ground, and the longer ones, B, ranged at intervals, connecting at their upper ends with a straight line of wire. The latter is extended between fixed posts, C, which are driven in or firmly anchored to the ground, as shown in the engraving, and located some fifty yards apart. The posts, long and short, are arranged in panels and connected together by fence wire, woven in between them. They brace in alternate directions, thus giving the fence a zig zag base (Fig. 2) and straight top, the former giving it sufficient stability to resist wind as well as forcing by stock and currents of water.

The inventor proposes to make the longer pickets six feet apart at the top and seven feet apart at the bottom, which will give the fence a proper base when set up, but when stretched flat upon the ground will render it circular in form. The panels may then be rolled into bundles and transported like bales of cotton or similar packed material. One hundred feet of fence, it is stated, will weigh about five hundred pounds. The material suitable for the purpose, we are assured, need not cost over one fourth that of the common rail fence, and the wire is worth about fifty cents per rod.

Patented through the Scientific American Patent Agency, October 14, 1873. For further particulars relative to purchase of rights, etc., address the inventor, Mr. R. H. McGinty, Moulton, Lavaca county, Texas.



McGINTY'S PICKET FENCE.

IMPROVED WORK HOLDER FOR LATHES.

There are few mechanics accustomed to using the lathe who will not recognize at a glance the utility and convenience of the ingenious attachment to that tool, represented in the annexed engravings. Its object is to hold small articles in the lathe while being acted upon by a revolving cutter turning upon centers; and it is secured to the carriage in the same manner as the ordinary cutting instruments. The inventor does not aim to supersede the expensive shaping machines common in use in large shops, but offers an apparatus, the cost of which will be within the means of every mechanic, and which may form a handy substitute for the more cumbersome contrivances devised to perform in a lathe the work of milling machine and planer on a reduced scale. The device is adapted to fluting taps, slabbing studs, nicking screws, and other similar work, in great variety; and by the aid of gear-cutting attachments, gears, circular cutters, and the like may be formed.

The three combinations of the invention are shown in our engraving. In Fig. 1 the work is so held as to extend across the bed of the lathe at right angles to the arbor. In Fig. 2 the cutter acts perpendicularly downwards, as in the case of nicking the screw head shown, while in Fig. 3 the axis of the article under operation is parallel to that of the lathe. A, in all the figures, is the bar, which is clamped in the ordinary manner in the tool post. B is the clamping band which secures the tool. These parts remain the same in all the adjustments of the instrument, the only portion changed being the jaw, C, and its arm, D, in manner and for the purposes below set forth. The bar, A, is provided at one end with a vertical groove, E, Fig. 1, in which slides a tongue formed on the arm, D. The top of the latter is turned over the portion just described, and is provided with a screw, F (all figures), which turns down upon the top of the bar. G is another screw bolt which passes through a slot in the end of the bar, A, and enters the jaw, C, holding the tongue of the latter in the groove, and sliding up and down in its slot. It will be seen that, by loosening the screw, G, the jaw, C, may be set at any desired elevation, and then, by clamping said screw, be nicely adjusted by a screw, F, which also serves to secure it at a given point. The screws are turned by the wrench shown, which fits all the heads. The clamping band, B, also has a screw, H, passing down through its top and pressing upon the jaw, C, so as to draw up the lower inside end of the band toward the under side of the jaw, and hold firmly articles inserted between them while being acted upon by the revolving cutter, as shown in Fig. 1. The extent of the operation is regulated by the movement of the tool carriage, and the sliding arrangement of the jaw, C, upon the bar, A. The lower part of the band, B, is enlarged so as to permit the insertion of larger articles than would the portion sliding upon the jaw, C, and is strengthened by the rib, I.

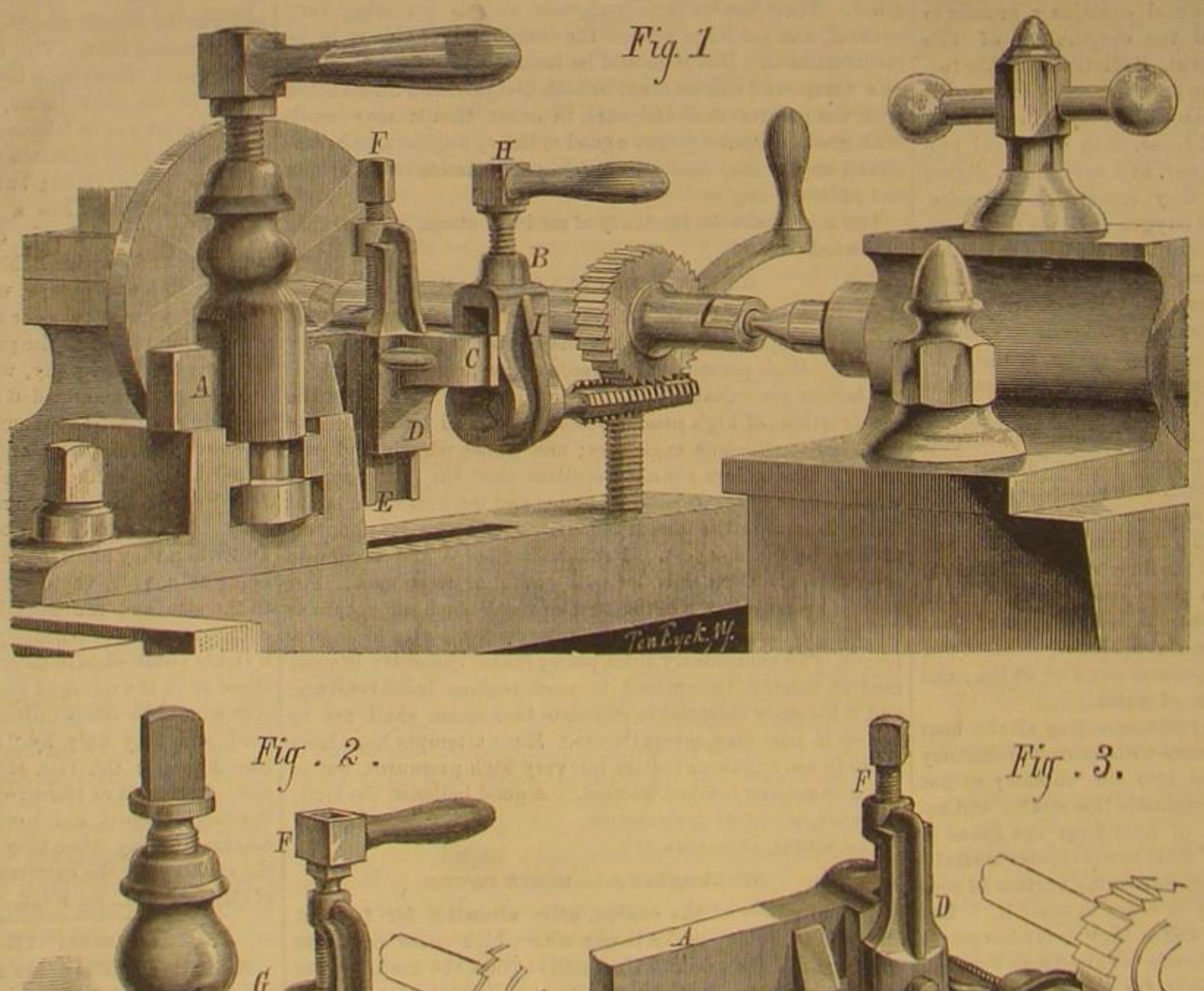
By examining the three engravings, the reader will understand that the difference in the form of the instrument lies simply in the construction of the jaw, C, and arm, D, necessitating three separate pieces, either of which may be used in connection with the bar and clamp, according to the kind of work to be operated upon.

In Fig. 1 a tap is being fluted, in Fig. 2, a screw nicked, and in Fig. 3, a square head formed upon the tap. Any one who has ever attempted to flute taps on a planer is well aware that the tool jumps along from thread to thread, and the result is at best anything but satisfactory. By this device the tap can be turned and then fluted on the same lathe, thus necessitating no interruption of either planer or slabbing machine.

The entire tool consists of seven pieces in all: one bar, three jaws, two bands, and a wrench, and is capable of holding round, flat, square, half round, and three cornered articles, from 3-16 to 1¼ inches in diameter, and of any length. The material is malleable iron, with hardened steel screws.

The tool seems to be a valuable device, and one, from its many and nice adjustments, not only useful to mechanics but to inventors who are working upon the construction of new models. It is quite small in size, and hence occupies but little space, while its cost is but $5. We have examined some specimens of its work, which appear excellently well done. Premiums were awarded to the tool at the American Institute Fair of 1873, the Buffalo Fair, and various other expositions throughout the country.

Patented October 22 and December 31, 1872. For further particulars address the inventor, Mr. William P. Hopkins, Lawrence, Mass.]



IMPROVED WORK HOLDER FOR LATHES.

Iceland's Millenial.

Perhaps no country more uninteresting than Iceland exists in the world. Situated in a high northern latitude, at about 160 miles from the Greenland coast, it is little more than a mass of volcanic rock which natural convulsions have upheaved into mountain ranges. The inhabitants, however, are a cultivated and refined race, and strongly devoted to educational pursuits. Libraries exist in considerable numbers, and are connected with every church.

Just ten centuries have now elapsed since the island was settled by Europeans; and Iceland proposes, during the coming summer, to celebrate her millenial birthday by a grand meeting on the plain of Thingvalla, near Reykjavik, the capital city. The object is not only to commemorate the lapse of a thousand years of national existence, but also the granting of a new constitution by Denmark, in which the independence of the island is guaranteed; and it is intended to devote such proceeds as the affair may yield to the enrichment of the national library. Messrs. Longfellow and George W. Curtis have recently suggested that a gift of books from the American people would be a very appropriate contribution; and it is announced that all who may desire to send volumes can have them transported by the Geographical Society, Cooper Union Building, in this city, or the Pennsylvania Historical Society, Philadelphia, Pa.

A COMPOSITION FOR COVERING HOUSE ROOFS.—Take one measure of fine sand, two of sifted wood ashes, and three of lime, ground up with oil. Mix thoroughly and lay on, with a painter's brush, first a thin coat, and then a thick one. This composition is not only cheap, but it resists fire well.

CURIOUS PLANTS.

There is little to our minds interesting in a garden filled with roses, lilies, fuchsias, heliotropes, and pansies, or any other simple selection of the flowers that every one knows. True, their fragrance is always delicious, and their beautiful colors never pall upon the eye; but while we should perhaps stop for seconds to admire the gorgeous hues of a cluster of tulips or to enjoy the perfume of a bed of violets, we would certainly give minutes, and many of them, to watching the shrinking of the leaves of the sensitive plant or to examining the strange forms of the aloe or cactus.

In the one case we admire a flower which we know is beautiful, doubtless far more so than the odd plant which attracts our closer attention; but with the one we have always been familiar, and the gratification it affords us is simply to the senses of sight and smell; the other presents the charm of that greatest of wonders, a new vagary of Nature, and arouses a deeper and more intellectual interest, which holds us enchained until we have gratified the curiosity which leads us to new stores of knowledge. For this reason, we think that no garden should be without some odd or queer plant, in the growth and development of which new marvels will be daily unfolded. Of course there are hundreds of species well known to the professional floriculturist, but of which the amateur gardener is comparatively ignorant; and from these, selections may be made which will render one's flower beds a museum of strange and beautiful forms, which will make them a constant source of pleasure and interest.

As specimens of these odd freaks of Nature, the annexed engravings represent plants which, we think, will prove something novel even to the skilled gardeners in this country. We extract the illustrations from that excellent periodical, the English *Garden*. In Fig. 1 is shown a noble sub-tropical plant, called the *Wigandia caracasana*. Its broad leaves are of a fresh green color and very luxuriant, rendering it a beautiful ornament for lawns. It rarely flowers, but produces a large scorpioid enflorescence at the top of a thick fleshy stem. The plant grows quickly in warm soils, and attains a hight of from six to seven feet in a single season. It is easily propagated in the spring by means of cuttings; and if the thick roots are cut off in the autumn, a large proportion of them will form young plants when set out in light sandy earth.

In our second figure is represented one of the hardiest of the ferns, the *Dicksonia antarctica*. The trunk varies considerably in thickness, and in its native country, Australia, attains a hight of thirty feet or more, bearing at its summit a magnificent crown of dark green lance-shaped fronds, from six to twenty feet long, beautifully arched and becoming pendulous with age. The crown itself is frequently ten or twelve feet across, and is evergreen.

FIG. 1.—WIGANDIA CARACASANA.

FIG. 2.—DICKSONIA ANTARCTICA.

In Fig. 3 is another queer but very differently appearing plant, coming from high latitudes in Mexico, and called the *mammillaria sulcolanata*. It grows from five to six inches high. At the base of the mammal is a dense forest of white wool which disappears as the plant gets old. Its flowers are yellow, and one inch and a half in width. They have short bell-shaped blossoms, which rarely protrude beyond the spines, and are produced in whorles.

A very curious plant, known as the *ataccia cristata*, shown in Fig. 4, is a native of the islands of the Malayan archipelago. The underground portion consists of a short and conical root stock, marked with the scars of former leaves, and here and there throwing up some small tubers, by the removal of which it is easily multiplied. The actual roots consist of a few coarse fibers. From the crown of the root stock rise three or four handsome and dark green leaves, and in the midst is a stout scape, like that of a hyacinth, twelve to eighteen inches in hight, bearing on the summit a unilateral umbel of from twelve to twenty brownish purple flowers. With these are many more that are abortive, attenuated to a length of at least twelve inches, and hanging down like thin straight hair, a lock upon each side, while back of all stand up two enormous vertical bracts, and two smaller ones, flattened out and of a cadaverous greenish purple hue. The whole thing is so weird and gipsy-like that one almost starts at the supernatural mockery. It is easily propagated from its tubers.

The *echinocactus myriostigma* (Fig. 5) may be described as a civilized cactus, inasmuch as it has laid aside its spines and other asperities, and put on an elegant attire, bespangled with silver. This little gem (from Mexico) has generally five deep angles, though sometimes they number seven or eight; at the apex, on the margins of the angles, are borne a quantity of silky, yellow, star-like, sessile flowers, which open during sunshine, and close about four o'clock in the afternoon. They keep expanding for four or five days in succession, according to the intensity of the sunlight, and they last longest when least exposed: the blossoms begin to open in June and continue expanding, at intervals, until October, during which period a good plant will bear from ten to twenty blossoms, one inch and a half in diameter. The ground color of the plant is dark green, and its whole surface is thickly and regularly beset with white star-like scales, which give it a very beautiful appearance, especially under a microscope. Its culture is in no way different from that under which other *echinocacti* thrive, but it must, says Mr. Croucher, not be subjected to a temperature below 40°, otherwise it will be sure to suffer more or less from cold, and will not flower satisfactorily.

FIG. 3.—MAMMILLARIA SULCOLANATA.

FIG. 4.—ATACCIA CRISTATA

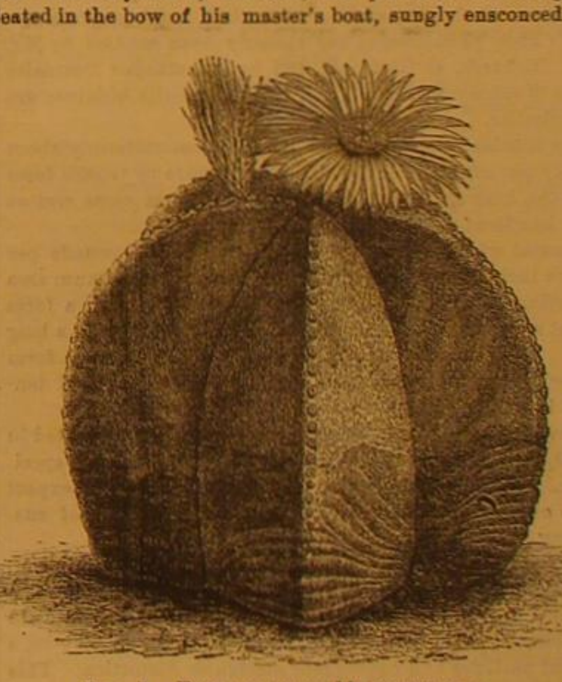


FIG. 5.—ECHINOCACTUS MYRIOSTIGMA.

In a future issue we shall present engravings of several other curious plants and flowers, which will doubtless prove as interesting as those above described.

A Hunter's Parrot.

A correspondent of the Little Rock (Ark.) *Gazette* sends that paper the following account of a common poll parrot, which, it is claimed, has not only been trained to hunt, but which has learned to take a great delight in the chase. The owner and trainer of this hunting parrot is a boatman, who formerly plied between Little Rock and New Orleans, but who some years since gave up the business of boating and has since led the life of a hunter, living in a snug cabin at the junction of Big Mammelle Creek with the Arkansas river. This hunter hermit, whose name is Nathan Lask, brought with him from New Orleans, on making his last trip to that city, a fine young parrot, to which he soon became more attached than any other thing on earth. Seated upon his shoulders, the parrot attended him in all his walks. To train the bird and talk to it was almost his sole occupation. With the careful training of so loving a master, added to its great natural talent for imitating all manner of cries of birds and animals, this bird has become a marvel of cunning and a great wonder in its way. Taken into the hills bordering Big Mammelle Creek, and the signal being given at intervals, it utters the cry of the turkey so perfectly as to deceive the oldest and most astute gobbler that ever strutted. On being answered by a gobbler, the parrot proceeds to lure him to death in the most fiendishly coquettish manner imaginable. Seated on his master's shoulders, charily and coyly the parrot replies. Once he has fully attracted the attention of the vain and anxious gobbler, often allowing him to call in a fretful tone twice or thrice before deigning to answer; he then, in a few low and tender notes, lures the proud bird of the forest within range of the hunter's deadly rifle. Seeing the turkey struggling in the agonies of death fills the parrot with the most fiendish delight, to which he gives utterance in a succession of blood-chilling "ha has," in all manner of diabolical tones and keys. Should the hunter miss his aim, however, the parrot ruffles his feathers, croaks and scolds, pulls his master's hair, and long refuses to be pacified. Duck hunting in Forche and Meto Bayous is, however, the parrot's chief delight. Seated in the bow of his master's boat, sungly ensconced in a patch of tall bullrushes, the parrot bursts forth into such a "quack, quacking," and general duck gabble that there seems to be in the vicinity a whole flock of these birds, all enjoying themselves immensely. Thus are many passing flocks of ducks lured within range of the gun of the hunter. Geese are in the same way called up by the parrot; also many other wild fowl and even deer, as the bird imitates the plaintive bleating of a fawn or doe to a nicety. No money would buy the bird, and Nat. Lask, seen strolling through the woods, gun in hand and with his almost inseparable companion seated on his left shoulder, seems a second Robinson Crusoe. Although so perfect in his imitations of all manner of birds and animals, the parrot is not a great talker; indeed, his vocabulary is limited to a few words and one or two short phrases. He will sometimes sing out: "Nat, you lubber," and when Dan Lanagan (a brother boatman of Nat's, living at the head of Bayou Forche, and almost his only visitor), in his dug out, is seen paddling in toward the mouth of Big Mammelle Creek, the parrot—whose name, we forgot to say, is Bobby—will shout, "Lanago, ahoy! Lanagan, a a hoy!" The moment Bobby sees his master take down his gun, he is in a great utter. He cocks his head on one side, his great red eyes sparkling with delight, and, in a low, inquiring tone, says: "Turkey? turkey?" "No, Bobby," Nat will perhaps say, "not turkey today." Bobby cocks his head the other way and softly says: "Quack, quack, quack?" "Yes, Bobby," says Nat, "quack, quack!" Bobby then bursts into a loud "ha, ha,ha!" and cries, "Nat, you lubber, quack,quack, quack!" Then he ha has till the whole cabin rings again.

THE FLOW OF SOLIDS AND ITS EFFECT UPON THE STRENGTH OF MATERIALS.

BY PROFESSOR R. H. THURSTON.

One of the most important properties of metals is that which has been carefully and skillfully investigated by M. Tresca, the distinguished "*Sous-Drecteuri du Conservatoire des Arts et Métiers*," and by him called the flow of solids. The important modification produced in the strength of materials by this action is not generally recognized, and has not been considered by standard authorities on this subject.

Professor Henry proved long ago that liquids, which were previously regarded by all, and which are still regarded by many, as destitute of all cohesion, are actually endowed with considerable attractive force, their molecules clinging to each other with a tenacity probably nearly, and perhaps quite, equal to that of ice. The total absence of the force of polarity, which gives the property of solidity, and the perfect freedom from true friction, observed in fluids, prevent the casual observer from detecting the existence of this attraction, and it can only be measured by ingenious artifice and skillfully conducted experiment. In solids, the force of polarity prevents the occurrence of such intermolecular movements, and enables cohesive force to be observed and appreciated; but it is evident that, so long as the power of changing interatomic distances by flow remains, the maximum cohesive resistance of the material cannot become a measure of its tenacity.

It has recently been found that any distribution of material which aids polarity in resisting the tendency of particles to slide among each other, under the action of any straining force, causes a power of resisting external forces to become evident, higher than is noted where the form is such as to permit flow. The real resistance to fracture offered by any piece, as a bolt, for example, is determined by the relative and absolute values of cohesive force and polarity, and the form of the piece, and is not, as has been so generally supposed, a simple measure of the cohesive strength of the substance.

It was shown sometime since, in an illustrated article published in the *Railroad Gazette**, that a piece of boiler plate having rivet holes, whether punched or carefully drilled,was actually weaker per square inch of breaking section than when solid. It has long been known to engineers that short specimens of materials, subjected to test in the standard form of testing machine, exhibited higher tenacity than long specimens of the same material with a uniform cross section. This phenomenon has recently been studied by Mr. C. B. Richards, at Hartford†, and by Commander Beardslee at the Washington Navy Yard, and the results obtained are very similar.

The standard short specimen gives,almost uniformly,about twenty per cent higher resistance to fracture by tensile force than the long specimen, which has a uniform cross section for a length of several times its diameter.

A metal which exhibits a tenacity of 60,000 pounds per square inch when tested in the first form, the minimum area occurring at a single point, will usually resist with a force of but about 50,000 pounds when tested in the form of a long bolt. It is therefore very important to know in what form a specimen of metal has been tested when its so-called tenacity is stated.

The majority of experiments hitherto made and quoted in books and periodicals have been made with short specimens. We are consequently very liable to be led to expect more of our materials than they are really capable of sustaining.

It may be inferred, from what is above stated, that, in construction, we should always be careful to design the parts exposed to strain in such manner that their form should aid in giving resisting power by preventing, as far as may be, a flow of particles and consequent stretch or distortion. This is correct when dead loads are to be carried.

Another inference would be that one large piece is less liable to yield under the attacking force than several small ones of equal total section. It is, however,to be remembered that small pieces are usually better worked and are less affected by internal strain than are large pieces. This is particularly the case with iron and steel, which are far more liable to this last kind of fault than are the other metals. Where the piece is to resist blows, or to sustain live loads, it need hardly be said, it should never be given a contracted section if it can possibly be avoided.

Since the damaging effect of a blow is measured by the product obtained by multiplying the weight of the striking body into the hight from which its fall would have given it its striking velocity, and since the resisting power of the piece receiving the blow is measured by the product of the strength of the material into about two thirds the distance it will stretch before breaking, it is seen that the proper method of forming the resisting piece is that which gives it the best opportunity to stretch to a maximum extent before breaking. This is done by making the greatest possible length of uniform section and seeing that all other portions are somewhat larger.

Thus the best bridge builders in this country make the long bolts, which are used as braces, of uniform sectional area from end to end, except at the very extremities, which are upset for a distance equal to the required length of thread to be cut on them, and this enlarged portion at each end is given such size that the diameter at the bottom of the thread, when cut, shall be somewhat greater than that of the body of the rod.

The amount of flow of the metal is determined by the character of the metal. Hard wrought iron and tool steels, for example, exhibit it less, and are consequently more ductile and resilient, than soft iron and low steels, while the latter are weaker metals than the former. Cast iron is both weak and non-resilient, and is therefore not well fitted to sustain either dead or live loads. The harder metals are not less affected by shape, in their power of resisting shock, than are the softer grades, and where it becomes necessary or advisable to make use of them under such circumstances, the same care should be taken to avoid concentrating the straining action on a short portion, or upon a single plane of cross section.

It often happens in designing machinery, that pieces are necessarily made of such shape as to be liable to injury from the cause here considered. Should this danger appear serious, the designer might be justified in changing his whole plan to avoid such risk.

A connecting rod, as usually made, is an illustration of a piece unfitted by its shape to bear a blow. The less the taper of the rod, the less is its liability to yield to shock. To secure in any given case a form of rod that shall best combine power of resisting shock with maximum endurance under heavy strain is often an important problem. The spring of the rod will often take up excessive strains, due to accidental and excessive blows caused by the piston striking upon water in the cylinder or by other exceptional occurrences.

The body of a piston rod being of uniform section, it is well fitted to meet either static or dynamic compressive stress, but it is so seriously weakened at each end by the taper given it in fitting it to piston and crosshead, and by the slots cut through it, that it is usually quite unfit to offer maximum resistance to shock in tension.

To resist perfectly steady strain, therefore, and to carry dead loads, we should always select the strongest material, rather avoiding ductility, and, where the minimum section occurs, make that as short as possible and of such form as shall best resist flow and change of shape.

To resist percussive action and to sustain live loads, we should select that material which is at once the strongest and most ductile, avoid brittleness as certain to produce danger, and make the piece of such form as shall allow the greatest possible stretch before breaking.

Where two materials have products of strength into elongation which have the same magnitude we would select the most tenacious. Where two materials are equal in other respects, we would select that which has least density, since it is less likely to produce a concentration of the effect of the shock near the point at which the blow is struck.

STEVENS INSTITUTE OF TECHNOLOGY.

*Railroad Gazette.

†Trans. Am. Soc. C. E.

Plant Trees.

Mr. Reuben Shelmandine, of Jefferson, N. Y., is evidently a philanthropist, and he proves his love for mankind in general by issuing a proclamation to farmers. Why he should embody a number of very useful hints about transplanting trees in this highly official document, we cannot explain. Suffice it that the writer says that he has had an experience of twenty years on a farm, and "not on a side walk," and that his remarks are practical. Transplant, he says, finest or standard fruit trees, some in the fall and some in the spring, until you have from 10 to 50 trees growing. No tree should stand nearer a building than twenty feet, and the trees should be about twenty feet apart throughout the entire grove or orchard. Establish forest trees along the road and the front yard, and fruit or forest trees on other sides of the house. Sugar maple, commonly named hard maple, is preferable of forest trees, and thrifty, hardy apples or pears, or both, of the standard (not dwarf) kinds.

Ornamental trees should be trimmed during the first few years, leaving the main shoot to form the trunk of the tree, in order to have the branching lower limbs of the final tree from six to seven feet from the ground. The land in such an orchard grove can be cultivated for all ordinary crops, including a garden, by plowing shallow and carefully near the trees.

It is suggested that the first ten trees be planted on the south side of the house, if none be there already.

If a wind break is wanted on the west, northwest, or southwest, plant as near together as possible and have a part of the trees evergreens, to complete the thicket. The forest and fruit trees, arranged about twenty feet apart, as above described, will be estimated by the owner or other persons at the expiration of five years from the time of planting to be worth at least five dollars each, and at the expiration of ten years at ten dollars each, with an increasing value thereafter.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From April 14 to April 16, 1874, inclusive.

BOILER AND FURNACE.—D. Henshaw, Hingham, Mass.
HORSE COLLAR LINING.—D. Curtis *et al.*, Madison, Wis.
LEATHER DRESSING MACHINE.—J. M. Caller, Salem, Mass.
NEEDLE.—W. Trabue, Louisville, Ky.
PUMP.—W. D. Baxter, New York city.
TEMPERING APPARATUS.—G. F. Simonds, *et al.*, Boston, Mass.
WASHING MACHINE, ETC.—E. Marshall, Tola, Kansas.

DECISIONS OF THE COMMISSIONER OF PATENTS.

PATENT TOBACCO BAG.—JAMES D. CULP.—Appeal.

[Appeal from the decision of the Board of Examiners-in-Chief in the matter of the application of James D. Culp, for patent for Improved Tobacco Packages.—Decided April 15, 1874.]

LEGGETT, *Commissioner:*

Applicant claims—

1. The use of elastic knit or loosely woven tobacco sacks, substantially as herein described, for packing tobacco.

2. As a new article of manufacture, elastic tobacco sacks made of knit or loosely woven fabrics, substantially as herein set forth and described.

Heretofore sacks for containing small quantities of granulated tobacco, to be sold at retail in small packages, have been made of woven fabric, pieces being cut out, folded, and sewn at one side and one end to form the sack.

In packaging the tobacco it is pressed into a metallic tube, over the end of which the bag is slipped to receive the tobacco as it is forced out of the tube.

Applicant proposes to knit long tubes of the diameter of a tobacco package and cut them into suitable lengths to form tobacco sacks, and merely sew them across the bottom. The novelty of this plan of making tobacco sacks is admitted, but the Board hold that, as it is common to knit tubular fabric for stockings and purses and cut it into proper lengths and sew up one end, there is no invention in making a tobacco sack in this manner.

The following points are made by the applicant against the soundness of this opinion. He says his sack can be manufactured with less expense than the old sack, because it requires less sewing. But this advantage is due solely to the method employed in its manufacture, which, broadly considered, is old. Laying aside the method, which, although it has never been employed before to make tobacco sacks, has been used to make purses and stockings, and considering the alleged qualities and advantages of the finished article, it is said, first, that on account of its elasticity it will readily fit the metallic tube, even if there is some variation in its size, and thus the waste of misfitting sacks, which occurs in the use of the unyielding woven fabric, is avoided; second, the danger of giving way at the side seam, which is incident to the sacks at present employed, is obviated; third, and more important, the sacks adapt themselves to the size and shape of the packages, requiring nothing but the draw string to smoothly close their mouths for the reception of the revenue stamp, and the ordinary seam across their bottoms to smoothly close them, while the common cloth bags require extra sewing and pressing after the tobacco is put in them.

That the sack, for the use contemplated, is a new and superior one is clear and it is the object of the law to promote the production of new and improved articles for the use of the public.

Very little analogy appears between a stocking or purse and a sack for a tobacco package.

Decision of the Board reserved and a patent allowed to the applicant.

RIGHTS OF EMPLOYERS AND EMPLOYEES TO INVENTIONS.

GILBERT, AND CLARK, BONZANO & GRIFFEN.—INTERFERENCE.—ELEVATED RAILWAY PATENT.

[Appeal from the decision of the Board of Examiners-in-Chief in the matter of the interference between the application of Rufus H. Gilbert, and Clarke, Bonzano & Griffen, for patent for improvement in Elevated Railways.—Decided April 16, 1874.]

LEGGETT, *Commissioner:*

The invention in controversy is an elevated street railway. Such a means of transit in large cities has long been a project of absorbing interest to the applicant, Dr. Gilbert.

With such a scheme more or less developed in his mind, he went to the firm of Clarke, Bonzano & Griffen, at Phœnixville, Pennsylvania, distinguished engineers and bridge builders, to enlist their skill and services in its practical furtherance. It is admitted that the widespread reputation of this firm as engineers and bridge constructors led to those business transactions between the parties from which this controversy sprung. That Dr. Gilbert freely communicated to them his ideas and plans as far as he had perfected them, and that they were prompted to the consideration of the subject by his suggestions, cannot be doubted. How far he had matured the structure of the device in his own mind is somewhat uncertain. It is clear, however, that he had not perfected all the details, and probably could not have done it. But that he had conceived this much, that he must have supporting columns, an arch of some kind properly elevated, and a track bed properly supported and far enough beneath to admit of the passage of steam cars under the arch, all of sufficient strength for the purpose contemplated, is certain. The very conception of the idea of an elevated steam railway over the center of a street, which would not obstruct travel, must have suggested this much, especially when a transition was made from the pneumatic structure which he had already planned and pictured. Fugitive sketches made in the course of conversations were not preserved, but they were not important to establish the existence of the general idea of the structure embodying the invention claimed. There is sufficient proof to carry conviction without them.

Gilbert needed and sought the practical suggestions and instructions of skilled mechanics and engineers. They could and did tell him that a gothic arch would not do. They probably told him, as all other engineers would have told him, that he must provide for expansion and contraction, and without making any invention they could readily suggest how it should be done. They no doubt informed him also with reference to the strength of the material, and how braces and diagonal and vertical tension rods could be advantageously employed. Whether these were suggested by him or by them is immaterial. All this and much more any practical bridge builder would inform an inventor for the furtherance of his general plan, and it is perfectly legitimate for him to invoke such aid.

Mechanical skill and professional knowledge may always be sought without jeopardizing inventions, because, in fact, an inventor can seldom perfect his conceptions without them.

As to what transpired at the interview of Foster and Gilbert with the firm of engineers upon whom they called and whom they consulted, among the somewhat conflicting accounts the following testimony of Foster appears to be a conscientious and reliable summary. He says, in substance, pencil sketches were made to illustrate the requirement of construction by Dr. Gilbert and himself; some were also made by Mr. Bonzano and Mr. Griffen. They were illustrative of detail and arrangement. Illustrative suggestions were made by all the parties present, none of which he could fix upon one or the other. The consultation here indicated was such as would naturally take place at such an interview. It does not go to show that Clarke, Bonzano & Griffen were inventors. The prospect of a contract to build for the Gilbert Railway Company was sufficient to induce them to perform the services sought of them by Dr. Gilbert. That was doubtless the consideration upon which they acted for him at his request. He presented the idea of the invention and they promptly assisted to render it practicable, because of the inducement of ultimate profit to be derived from it as employees in the line of their profession.

The relation of employer and employee was essentially established between the parties. That being the case, admitting all that is claimed to have been suggested by Clarke, Bonzano & Griffen, I cannot see that they have any claim to independent inventorship.

Decision in favor of Gilbert.

DECISIONS OF THE COURTS.

United States Circuit Court--District of Massachusetts.

PATENT ELASTIC FABRIC.—WILLIAM SMITH *vs.* THE GLENDALE ELASTIC FABRICS COMPANY.

[In equity.—Before Shepley, Judge.—Decided February 13, 1874].

The previous production to a limited extent of goods resembling those fabricated by the plaintiff's process, and by means somewhat similar, held to have amounted to no more than abandoned and unsuccessful experiments, and not to impeach the validity of his patent.

SHEPLEY, *J.:*

This is a bill in equity founded on alleged infringement of letters patent reissued to the complainant, numbered, respectively, 2,843 and 2,844.

Ferdinand Doebly and Henry G. Gurney, witnesses in behalf of the defendants, testify to the use of looms with stationary warps before the date of complainant's invention. Neither of them give any drawing or model of the looms to which they testify, nor do the witnesses themselves or any experts in the case testify that the mechanism described by them was substantially like that described by the complainant in his specification. In the case of Gurney only a trifling quantity of the elastic web was made in the loom described by him. It is not easy to determine from the testimony how much of the product which Doebly says was made for his father was made on the loom with a stationary warp. I think they are to be regarded in the light of abandoned, and, judging from the specimens of the work filed as exhibits in the case, as unsuccessful, experiments before the date of complainant's invention. There is considerable testimony in the case tending to show that the elastic webbing can be well made by the use of a rising and falling rubber warp. Machinery operating in that way is open to be used without infringing the complainant's patent. The fact that respondents prefer to use the mechanism patented to complainant is evidence that there is sufficient utility in the invention to support a patent.

Decree for complainant.

[*T. A. Jencks* and *L. Scott*, for complainant.
Benjamin Dean, for defendants.]

United States Circuit Court.---District of Massachusetts.

WADE H. HILL *et al. vs.* G. H. WHITCOMB *et al.*

[In equity.—Before Shepley, Judge.—Decided February 13, 1874.]

The Court held as follows:

Shepley, Judge:

The Allen Manufacturing Company, being the owners of the rights secured by three different letters patent of the United States, for the inventions of Edwin Allen in improvements in printing presses, on the 1st of February, 1871, entered into a certain contract with the complainants. This bill is brought to enforce the rights of the complainants under that contract.

The contract begins with a recital that the Allen Manufacturing Company are the owners of a patent automatic envelope printing press, which they styled a patented automatic envelope printing press, in the organization of which were included the inventions secured. "The exclusive right to use and vend said presses in the county of Worcester and in the State of Rhode Island" is granted to Hill, Devoe & Co., the complainants, the Allen Manufacturing Company reserving for themselves "the exclusive right to manufacture said presses.

The second clause provides that the company shall, within a reasonable time, supply all presses ordered by complainants. The third clause is a covenant to protect and defend the complainants in the exclusive use and enjoyment of the said automatic envelope printing presses in the territory aforesaid.

The fourth clause provides for the payment by complainants of the sum of one thousand dollars for each press ordered and received by them, and of a royalty of one dollar per day on each press on which envelopes can be printed of size No. 6, and corresponding royalties for other sizes" when said parties of the second part shall be protected in the exclusive use and enjoyment of them according to this agreement."

The fifth clause contains provisions concerning the sale by complainants to other parties not material to the subject matter of this inquiry. It is provided in the sixth clause that complainants shall have the exclusive right in said territory to use any and all improvements upon said presses, which shall hereafter be made, and which shall be owned by or under the control of all parties of the first part, and shall have the right to adapt said improvements to all presses purchased by them before the date of said improvements.

The complainants were, therefore, not grantees of an exclusive right under the patents, or any of them, to the whole or any specified part of the United States. They were licensees with the right of using and vending to others to be used, within the specified territory, such presses embodying the patented inventions as they might purchase of the Allen Company, which owned the patents, and having coupled with that license a grant of the exclusive right to use, rent, and vend said presses in the specified territory upon the prescribed conditions, and a covenant for protection in "the exclusive use and enjoyment of said automatic printing presses aforesaid and of the improvements aforesaid."

Such a contract clearly gives the licensee no right of action for an infringement of the patent. To enable the purchaser to sue, the assignment must undoubtedly convey to him the entire and unqualified monopoly which the patentee held in the territory specified, excluding the patentee himself as well as others. Any assignment short of this is a mere license, and the legal right in the monopoly remains in the patentee, and he alone can maintain an action against a third party who commits an infringement upon it.

Even when a suit at law will lie for the infringement of a patent, proceedings in equity may usually be maintained, as affording a more practical and efficient remedy.

No one can maintain a suit for the infringement of a patent except the patentee, or an assignee who owns the entire right in it for a specified territory, exclusive of the patentee himself.

The owner of the exclusive right to use a patented article, and to sell it within a specified territory, but not the right to manufacture it, is a mere licensee, and cannot maintain any action for infringing the patent.

The parties who own the exclusive right to use and sell a patented invention within a specified territory, with a guaranty for its enjoyment from the patentees, cannot maintain a bill for an injunction and for an account against the patentees and parties who, with knowledge of the contract, have purchased the arrangement from them without the territory, and are using it within it.

The federal courts have no jurisdiction over a suit brought to enforce such a contract against the patentees, and the purchasers from them, where all the parties are citizens of the same State.

Bill dismissed.

[*Causten Browne* and *Jabez S. Holmes*, for complainants.
George S. Hillard, James E. Maynadier and *M. F. Dickinson*, for defendants.]

United States Circuit Court---District of California.

PATENT AMALGAMATING PAN.—COOLIDGE vs. MCCONE.—INFRINGEMENT.

[Decided March 5, 1874.]

In a patent for an amalgamating pan, a claim for "constructing and placing the shoes and dies upon upper and nether disks obliquely at about the angle as described, together with the beveled bars B B B," etc., is a claim for the shoes and dies in combination with the bars.

The claim is not infringed by using the shoes and dies without the bars, although it should be shown that the bars are of no use in the combination.

Sawyer, Circuit Judge, delivered the opinion of the court.

We have examined the specifications annexed to the patent very carefully, and it is very plain to our minds that the patent is for a combination of several elements or parts. The petitioner commences by describing the drawings, and then states as follows:

"The nature of my invention consists in the arranging of shoes and dies having grooves or channels cut obliquely from the circumference to the center, terminating in a line or a radius to the center or axis. My invention also relates to beveled bars placed between each die and partially filling the grooves, for the purpose of keeping the ore near the same as they pass each other."

Then he describes how the dies are fixed to the disks, and tells us how other dies have been used in a different arrangement; points out how the beveled bars are arranged in connection with the other parts; describes their operation, and concludes with the claim, which is in the following words:

"I do not claim broadly the use of shoes and dies for the purpose of reducing amalgamating ores, for these are well known and used. What I do claim, however, and desire to secure by letters patent, is constructing and placing the shoes and dies upon upper and nether disks obliquely at about the angle as described, together with the beveled bars B B B, etc., substantially as described, and for the purposes set forth."

There is nothing to show that this combination was made or sold by the defendant, or that he has made portions of it and sold them to other parties, with the knowledge that they were to be used in connection with the "beveled bars" for the purpose of making up a single complete machine.

The court thereupon advised the jury to return a verdict for the defendant, which was accordingly done.

[*Lewis & Deal* and *Beatty*, for plaintiff.
Williams & Bixler, for defendant.]

United States Circuit Court---Southern District of New York.

PAPER BAG MACHINE PATENT.—THE UNION PAPER BAG MACHINE COMPANY *et al.* vs. GEORGE L. NEWELL *et al.*

Blatchford, *Judge*:

By the 61st section of the act of July 8, 1870, (16 U. S. Statutes at Large, 208,) it is provided that in a suit in equity for relief against an alleged infringement of letters patent, certain specified defences may be pleaded and proofs of the same may be given upon certain specified notice in the answer of the defendant, and with a certain specified effect. Among the defences specified in the section are that the patentee was not the original and first inventor or discoverer of any material and substantial part of the thing patented, and "that it had been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public." As to notice in the answer, the section requires that, in giving such notice as to proof of previous invention, knowledge, or use of the thing patented, the defendant shall state in the answer "the names and residences of the persons alleged to have invented or to have had the prior knowledge of the thing patented, and where and by whom it had been used." As to the effect specified, the section provides that "if any one or more of the special matters alleged shall be found for the defendant, judgment shall be rendered for him with costs."

This is a suit in equity for relief against an alleged infringement by the defendants of letters patent of the United States granted to Benjamin L. Binney, assignee of E. W. Goodale, as inventor, September 12, 1865, for a machine for making paper bags. The bill was filed May 13, 1872. The answer was filed July 1, 1872. The replication was filed August 29, 1873. The plaintiffs commenced taking proofs for final hearing by the examination of witnesses, orally, before an examiner, under the 67th rule in equity, as amended, and by the putting in of documentary proof, on the 23d of October, 1873. The plaintiffs rested their case on the 6th of November, 1873. The defendants, so far as appears, have taken no proofs for final hearing. On the 26th of November, 1873, this court, after a full hearing of both parties, granted a preliminary injunction restraining the defendants from infringing the patent by using the invention described and claimed in the first claim thereof.

The answer of the defendants sets up, in general terms, a denial that E. W. Goodale was the original and first inventor of what is claimed in the patent or of any substantial or material part thereof, and a denial "that the same was not known or used before, or that it was not, at the time of the application for letters patent * * * in public use or on sale;" and avers in general terms "that the said alleged invention and improvements contained in said letters patent were in public use and on sale for more than two years prior to the date of the aforesaid application for letters patent therefor, or of any invention of the same by and on the part of said E. W. Goodale." But the answer does not state the name or residence of any person whom it alleges to have previously invented or to have had prior knowledge of the thing patented, nor does it state where or by whom the thing patented had been previously used, nor does it set up any defence of the abandonment of the invention to the public by E. W. Goodale as inventor. Under this state of facts the defendants, not having obtained any leave to amend their answer or any extension of the time for taking proofs, which has expired by the lapse of time, now apply to the court, on affidavits to dissolve the injunction referred to. The affidavits seem to be intended, so far as they relate to defences authorized by the 61st section, to raise the defence that the invention covered by the first claim of the patent was, with the consent and allowance of E. W. Goodale, in public use at Clinton, in Massachusetts, for more than two years before the application for the patent was made, and perhaps the defence that E. W. Goodale was not the original and first inventor or discoverer of what is covered by the first claim of the patent. The plaintiffs take the objection as a bar to the hearing of the application, so far as it rests on said defences, that, inasmuch as the defences attempted to be set up in the affidavits could not be availed of by the defendants in the taking of proofs for final hearing, both because the proofs are closed and the case is ready for final hearing, and because also the defendants have laid no foundation in their answer for putting in any proof to sustain such defences, such defences cannot be availed of to dissolve the injunction granted. This objection must prevail. No ground is shown in any other respect for dissolving the injunction.

In order to avoid any implication that the defences sought to be set up in the affidavits as defences under the 61st section would, on the papers put in on both sides on the application, be regarded as made out to such an extent, at least, as to warrant the dissolving of the injunction or to have required the withholding of the injunction when originally granted, it is proper to say that an examination of such papers has led me to the conclusion that no such result would follow from a consideration of the fact established by such papers.

The motion to dissolve the injunction is denied.

[*George Harding* and *Horace Binney, 3d*, for complainants.
Marcus P. Norton, for defendants.]

United States Circuit Court---District of New Jersey.

WETHERILL *et al.* vs. THE NEW JERSEY ZINC COMPANY.

McKennan, Circuit Judge:

At a final hearing of this cause it was adjudged that the defendants had infringed letters patent granted to Samuel Wetherill, on the 13th of November, 1855, and extended for seven years, for a process for making white oxide of zinc, and they were perpetually enjoined "from the further constructing, using, or selling in any way or manner, directly or indirectly, the said patented improvements or any part or parts thereof." They are now alleged to have violated this injunction, in the use of a process substantially the same as Wetherill's, or at least embracing its essential features, and a motion has been made for an attachment against them for contempt.

The characteristic features of Wetherill's process were stated to consist in the employment of a thin bed fire of chestnut coal and of a superincumbent layer of pulverized ore and pea coal of the approximate thickness of three inches, the enforced passage of atmospheric air in numerous jets through the mass, by which its combustion is maintained, the vaporization of the zinc and its oxidation in the furnace above the charge, when the zinc in the ore is expelled, and the repetition of the process. In the blast furnace—to which alone, as a prior device, it is necessary to refer—the fuel and ore are not comminuted, nor is the charge spread in a thin layer, and when its working is begun it must necessarily be continued without interruption until the furnace is blown out. In all these particulars the Wetherill process is different. The bed fire consists of fuel in a comminuted form; so also does the charge of mingled ore and carbon. This charge is spread in a layer of the maximum depth of eight or nine inches, and through it is diffused a blast of air, not only to keep up combustion, but to supply the vaporized zinc with sufficient oxygen in the furnace chamber to convert it into white oxide, and when the metallic zinc is expelled from the ore, the scoria or slag is removed and the process repeated. It is thus an alternating process, inasmuch as it is susceptible of temporary suspension and repetition, whereby it is distinguishable from the operation of the blast furnace, which is continuous and incapable of interruption.

The process used by the defendants is claimed to differ essentially from Wetherill's, first, in the character of the charges employed, and, second, in the continuity of their treatment; and upon the determination of these facts the result of the present application depends.

The defendants introduce a supplemental blast into the furnace chamber above the charge. No such blast is used in the Wetherill process, and the proof at the final hearing of the cause demonstrated that the results were perfect without it. Now, if the means employed by the defendants to supply the charge with air beneath it operate less efficiently than Wetherill's, although they are identical in function and mode of operation, does it follow that a necessary supplement of air in one case and not in the other renders the processes different? We think clearly not. But in point of fact the oxidation of the zinc fumes is effected by the lower blast in the defendant's method as in Wetherill's. This is the import of Mr. Renwick's testimony, who says that vapors fit to go to the collecting chamber were coming off the charge before the supplemental blast was turned on. But, in view of the preponderating weight of the proofs taken before the final hearing, if the product is not perfect without this additional supply of oxygen, it must be ascribed to the defective application of the lower blast, and not to any essential difference in the character of the method of introducing it.

We are therefore drawn to the conclusion that a preliminary bed fire, or thin charge of comminuted ore and carbonaceous matter, and the enforced passage of the air in numerous jets through the mass, by which its combustion is maintained and vaporization and oxidation of the zinc above the charge, when it is expelled from the ore, are effected, are features common to both Wetherill's and the defendants' methods.

We are satisfied that the method complained of is, in substance and character, the same with the method pursued by the defendants before the injunction, for the use of which they were adjudged to be infringers.

A bailable attachment must, therefore, be awarded against the president of the defendant company, upon whom the injunction was served, and who is shown to have devised and practiced the transgressing process.

Recent American and Foreign Patents.

Improved Gas Regulator.

Joseph Adams, Washington, D. C.—This invention relates to that class of regulators in which the pressure of the gas acts upon a flexible diaphragm to which is attached a valve that opens or closes as the gas is turned on or off from the burner, or as the pressure varies from the street mains; and it consists in a new and improved arrangement, in which the valve is made more sensitive to the pressure of the gas by means of a balloon-like arrangement of thin metal in the diaphragm that opens down through the valve, and, being constantly filled with gas, counteracts, by its buoyancy, the weight of the valve, and hence makes the diaphragm, as connected with the valve, more sensitive to the pressure of the gas.

Improved Hydrant.

John Thomas Davis, Washington, D. C.—This invention is designed to provide novel means calculated to facilitate the operation and manipulation of hydrants, while they are also effectually prevented from freezing in the severest temperature of the winter.

Improved Saw Mill.

John N. Hall, Central City, Col. Ter.—The features of this invention are: An improved apparatus for adjusting the ends of the log as it rests upon the head blocks; for adjusting the log for slabbing; for automatically moving the log laterally toward the saw after each cut, or from the saw when necessary; and for operating the log carriage.

Improved Velocipede.

Friedrich C. Scharff, Chillicothe, O.—This is a perambulator to be used by grown-up persons and children for the conveyance of parcels. The horizontal frame is supported on the crank axle, to which the driving wheels are keyed. The middle part of the frame has a seat. Upward and downward extending standards are cast to form the bearings for crank shafts, by which the motive power is transmitted from hand cranks of the upper shaft to the driving wheel. These shafts, as well as the axle of the driving wheels, are provided with double cranks, one crank on each shaft being under right angles to the other. The crank rods connect the upper driving shaft with the lower crank shaft, and suitable rods connect the lower shaft with the crank axle of the wheels, transmitting thus the driving power to them. The lower shaft is also provided with radial arms and weights, which serve the purpose of a fly wheel, and assist transmission of power. There is also a guide wheel, readily governed.

Improved Portable Feather Renovator.

Abner B. Hutchins, Brooklyn, N. Y.—There is a perforated plate for distributing the steam throughout the mass of feathers contained in a cylinder. A jacket surrounds the cylinder, to confine the steam for drying off the feathers, and there is a flexible tube for discharging the feathers from the cylinder into the sack. The jacket is arranged to form the bottom, sides, and top of the truck body; also a protecting case for the steaming cylinder. The steam pipes are provided with cocks, controlling the steam so as to let it into the cylinder, first for steaming the feathers, and afterward into the jacket for drying them off.

Improved Breech Loading Fire Arm.

Joseph C. Dane, La Crosse, Wis.—This invention relates to means whereby the barrel or barrels of a breechloader may be conveniently locked to and unlocked from the stock, and consists in a slide that forms both a part of the trigger guard and a part of the mechanism for operating the key.

Improved Paper Box Machine.

William Gates, Frankfort, N. Y.—A roll of paper or straw board is placed on a spindle supported by arms, and its end is carried under a slitting cylinder where slits are cut by spring cutters. The paper is carried from the slitting cylinder upward, and under the pasting roller, whence it is carried to the platen, the face of which is provided with small points, which hold the paper in place over the mold ready for the plunger. Each plunger is preceded by a knife, which cuts off the paper for the box. The plunger forces the paper into a recess, and doors are then forced against its sides, forming the box. The parts are then firmly pressed together by suitable mechanism.

Improved Painter's Pail.

Francis C. Landon, Josiah Smith, and James H. Flood, Southold, N. Y.—This is an improved painter's pail, so constructed as to enable the painter to take up the ladder with him paints of different colors, and a large and a small brush for each color, with the same facility that he now takes paint of a single color. It consists of a tray having a cover provided with holes not unlike a table castor, into which two or more paint buckets may be set. Receptacles are provided for brushes, etc., and the whole is suitably suspended.

Improved Car Starter.

William Guilfoyle, New York city.—This invention consists of double drums with central or side ratchet wheels, which are keyed to the axles of the car wheels, and encircled by metallic springs or bands lined with leather, one end of said bands being connected to a heavy elliptic or other shaped spring, the other to a chain which passes over a windlass roller and pulley to the brake shaft. Loose bands or shoes of the drums take off the friction and wear from the connecting bands, and preserve the same thereby.

Improved Device for Cleaning Bottles, Barrels, etc.

John C. G. Hüpfel, New York city.—This invention consists of a tubular standard having a perforated cylindrical extension tube, which is inserted into the bottle or barrel till the projecting stem of a conical valve at the base of the extension tube is carried down by the pressure thereon, opening the valve and forcing the water instantly through the perforations to the inside of the barrel. The pressure of the water closes the valve as soon as the object to be cleansed is raised from the valve stem, and thereby the supply cut off. This is a very ingenious contrivance for accomplishing the object designed for it.

Improved Sewing Machine Table and Cabinet.

Harriet R. Tracy, New York city.—This invention consists in combining with a sewing machine table a set of drawers, which are pivoted at the front corner in such a manner as to enable the same to be turned beneath the body of the table top when not in use, and to be turned in an outward direction therefrom to bring the drawers in prolongation of the end of table, in order to form an extension of the latter for supporting work. The invention further consists in applying, to the bottom of the drawer frame, hinged legs which can be turned down to rest on the floor for relieving the hinges of the drawers from all strain, the bar being also hinged so as to enable the same to be turned up against the drawer frame, in order to enable the latter to clear the base of the table or cabinet and the treadle. At the upper edge of the drawer frame is a hinged bar carrying a hinged leaf, which is adapted to be turned against the edge of the table top for forming a flush surface, and to be turned in an outward direction from the drawers to form an extension leaf. There are two pivot plates for sustaining the leaf of the drawer frame in an extended position, said plates being adjustable vertically.

Improved Device for Burning Hydrocarbons.

George W. Rumrill, Lima, Peru.—This invention consists of an air blower (in combination with a boiler having the oil delivered into the furnace in spray by a steam jet) to be used for producing a jet before steam is raised. The blower is connected with the boiler, or to the steam pipe leading to the injector. This is an apparatus for regulating the delivery of the oil into the furnace, and for shutting it off altogether and letting it on, so arranged that by turning the screw the steam pipe will be shifted forward and back to open or close the annular space between its nozzle and that of the oil pipe. This device for burning hydrocarbons has been in successful operation for some time, and further information may be had concerning it by addressing J. G. Holbrook, Guardian Mutual Life Insurance Company, 251 Broadway, New York city.

Improved Rotary Engine.

Josiah C. Hamilton, Ashtabula, O.—The steam enters alternately from the cut-off valve to sliding abutment valves, and from them to the piston by a top slot on one side and a bottom slot at the other side, and *vice versa* when reversed. This, with the action of a sliding tube which controls the exhaust, causes the effective rotation of the shaft at any point of the piston, and without dead points.

Improved Frame for Cultivators, Scrapers, etc.

John W. Rabb, La Grange, Tex.—This invention consists in so constructing the running gear of a two wheeled vehicle, that it may be conveniently applied to the several purposes. The axle is bent four times at right angles, giving it a crank form, and may be turned down to bring its side parts into a horizontal position, or turned up to bring its side part into a vertical position without changing the position of the cross beam. It may be locked in place, when turned up, by a button, which may be turned over the side part. The plows can be raised and lowered by simply loosening the nuts and bolts. The lower parts of the standards are curved to give any desired pitch to the plows. By attaching a marking plow to each end of the cross beam, two rows, six feet apart, may be marked at a time. By attaching a third plow to the center of the cross beam, three rows three feet apart, may be marked at a time. A scraper plate is bolted to the forward side of the cross beam, and is intended for use in covering cotton, corn, and other seeds, for filling up inequalities in the surface of the ground, to move the soil loosened by the plows in roadmaking, and for other similar uses. By suitable construction, should an obstruction be encountered, a very slight rise of the rear end of the machine will change the line of draft so that the draft upon the machine will raise the axle into a vertical position, raising the plows, harrow, scraper, or whatever may be attached to the cross beam, and enabling them to pass over the obstruction. The machine can be used as a cart without detaching the plows, scraper, or harrow that may be attached to it, by simply raising the axle into a vertical position.

Improved Car Coupling.

Alexander Crocker, La Crosse, Wis.—This invention consists in a novel mode of constructing a two part coupling link so that the two sections cannot come apart (as long as the conjoined cars remain on the track), nor turn on each other; but if one runs off an embankment or bridge and turns over, a wooden pin may be at once broken, one section turned on the other, and the two separated.

Improved Automatic Car Coupling.

Ezra N. Gifford, Cleveland, Ohio.—This invention relates to car couplings that are bifurcated and operated by the pressure of the link, and consists in making enlargements on the coupling pin to prevent it from rising or falling when upheld; in reducing the pin at a certain part to enable it to be reversed; in providing the drawhead with side projections and the buffer head with an incline, to hold up the coupler; and finally, in making a short upward incline on the coupling pin, to receive the advancing link and facilitate the tripping operation.

Improved Jump Seat for Carriages.

John A. Hanna, Bel Air, Md.—This invention consists in the improvement of the ordinary jump seats of carriages, by causing the rear seat that turns forward and backward to be supported in both positions by the same side handle, and to allow said support to set well forward and the bolt to go up through the seat without running into the end panels.

Improved Hand and Foot Power.

John J. Kimball, Naperville, Ill.—This is an ingenious combination of levers, so arranged that the operator, by throwing his weight alternately upon his heels and toes, and, at the same time, alternately pushing and pulling upon the levers, can give a steady and uniform motion to the shaft and through it to the machine to be driven.

Improved Car Coupling.

Jacob F. Burner, Elko, Nevada.—This automatic car coupling consists of a stationary lower jaw with hinged upper spring jaw, which is provided with a pivoted hook and yoke for coupling the slotted arrow or other shaped link, and lifting the same for uncoupling, so as to detach it from the hook ends of the jaws. The pivoted jaw and hook are connected, by a chain, with suitable mechanism to raise them and uncouple the link.

Improved Belt Tightener.

Charles L. Work, Cincinnati, Ohio.—This is a simple and convenient device for tightening belts easily and quickly, and without removing them from the pulleys. A block, which is securely clamped to one extremity of the belt, carries a rack parallel in direction to the latter. On this rack travels (by means of a cog and handle) a second block, which is secured to the other end of the belt. By running the sliding block forward, the two ends are brought together and the belt tightened, when it can, through its portion between the blocks, be cut and released.

Automatic Machine for Retouching Photographic Negatives.

Alfred S. Johnson, Waupun, Wis.—This invention consists of automatic mechanism to be worked by spring power or other means, a pencil holder, a cam or other equivalent device, and one or more springs, so combined and arranged that a reciprocating motion may be imparted to the pencil to cause it to strike blows on the negative with its point in quick succession, for the employment of mechanical means in substitution of the hand process always heretofore employed for this purpose.

Improved Fire Shovel.

John B. Firth, Brooklyn, N. Y.—This is a durable coal shovel, which may be stamped of two parts, in such a manner that not only a stronger connection of handle and shovel is produced, but also the double use of a shovel and stove lid lifter be obtained. The invention consists in so cutting the back of the shovel, and lapping the edges over each other, that a strong connection of two thicknesses, with two rivets only, is obtained.

Improved Lumber Carrier.

Esau Tarrant, Muskegon, Mich.—This invention proposes the construction, in lumber yards, of long tracks, between which are numbers of transverse rollers. The planks are laid upon the latter, and held against them by passing under other rollers, disposed at intervals, held in spring bearings. Each plank passing between the rollers will be pushed against the one ahead of it, and that one against the one ahead of it, and so on to any extent, so that they can be carried by this plan to any distance that may be required.

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Iron Planers, Lathes, Drills, and other Tools, new and second hand. Tully & Wilde, 20 Platt St., N.Y.

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Amateur Astronomers can be furnished with good instruments at reasonable prices. Address L. W. Sutton, Box 218, Jersey City, N. J.

Microscopes, Spy Glasses, Lenses. Price List Free. McAllister, Optician, 49 Nassau St., N. Y.

For Sale—Several Screw Machines of different Sizes, cheap; also, a second hand Press. Write, for particulars, to A. Davis, Lowell, Mass.

Removal—L. & J. W. Feuchtwanger, of 55 Cedar St., have removed to 180 Fulton St., two doors above Church St., New York.

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For Surface Planers, small size, and for Box Corner Grooving Machines, send to A. Davis, Lowell, Mass.

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For best Presses, Dies and Fruit Can Tools, Bliss & Williams, cor. of Plymouth & Jay, Brooklyn, N.Y.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

Brown's Coalyard Quarry & Contractor's Apparatus for hoisting and conveying materials by iron cable. W. D. Andrews & Bro., 414 Water St., New York.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Lathes, Planers, Drills, Milling and Index Machines. Geo. S. Lincoln & Co., Hartford, Conn.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Temples & Oilcans. Draper, Hopedale, Mass.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Peck's Patent Drop Press. For circulars, address Milo, Peck & Co., New Haven, Conn.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Ms.

The French Files of Limet & Co. are pronounced superior to all other brands by all who use them. Decided excellence and moderate cost have made these goods popular. Homer Foot & Co., Sole Agents for America, 20 Platt Street, New York.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement. Andrew's Patent, inside page.

Two 50 H. P. Tubular Boilers for Sale (Miller's patent) very low, if applied for soon. Will be sold separately or together. Complete connections and pump. Holske Machine Co., 279 Cherry Street, New York.

Lovell's Family Washing Machine, Price $5. A perfect success. Warranted for five years. Agents wanted. Address M. N. Lovell, Erie, Pa.

Buy Boult's Paneling, Moulding, and Dovetailing Machine. Send for circular and sample of work. B. C. Mach'y Co., Battle Creek, Mich., Box 227.

Price only three dollars—The Tom Thumb Electric Telegraph. A compact working Telegraph apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 263 Broadway, New York.

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Automatic Wire Rope R. R. conveys Coal Ore, &c., without Trestle Work. No. 61 Broadway, N.Y.

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Rue's "Little Giant" Injectors, Cheapest and Best Boiler Feeder in the market. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1871, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 496.

Dean's Steam Pumps, for all purposes; Engines, Boilers, Iron and Wood Working Machinery of all descriptions. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Steam Fire Engines—Philadelphia Hydraulic Works, Philadelphia, Pa.

Bone Mills and Portable Grist Mills.—Send for Catalogue to Tully & Wilde, 20 Platt St., New York.

For descriptive circulars, and terms to Agents of new and saleable mechanical novelties, address James H. White, Newark, N. J., Manufacturer of Sheet and Cast Metal Small Wares.

Emerson's Patent Inserted Toothed Saws, and Saw Swage. See occasional advertisement on outside page. Send Postal Card for Circular and Price List. Emerson, Ford & Co., Beaver Falls, Pa.

Hand Fire Engines, Life and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

The best Horse Power for the Workshop or Farm—Machines for Threshing, Cleaning Grain, and Sawing Wood. Descriptive circular, price, &c., free. A. W. Gray & Sons, Middletown, Vt.

Protect your Buildings—Fire and Water proof! One coat of Glines' slate roofing paint is equal to four of any other; it fills up all holes in shingle, felt, tin or iron roofs—never cracks nor scales off; stops all leaks, and is only 80c. a gallon ready for use. Roofs examined, painted and warranted. Local Agents wanted. Send for testimonials. N. Y. Slate Roofing Co., No. 6 Cedar St., N. Y.

Millstone Dressing Diamond Machines—Simple, effective, economical and durable, giving universal satisfaction. J. Dickinson, 64 Nassau St., N.Y.

Teleg. Inst's and Elect'l Mach'y—Cheap Outfits for Learners. The best and cheapest Electric Hotel Annunciator—Inst's for Private Lines—Gas Lighting Apparatus, &c. G. W. Stockly, Sey., Cleveland, Ohio.

Hoisting Engines, without brakes or clutches: one lever operates the engine, to hoist, lower, or hold its load; simple, cheap, durable, effective. Two hundred of these Engines now in use, from the little "Ash Hoister," on steamships, raising 300 lbs., up to the Quarry and Mine Hoister, raising from 6,000 to 60,000 lbs. Send, for references and circular, to the Lidgerwood Man'f'g Company, Office 165 Pearl St., New York city.

For Peabody's improved Cotton Seed Hullers, address G. H. Peabody, P. O. Box 5482, N. Y. Pr. $50.

Perpetual Motion Water Wheels; self-supplying and does work. ½ State interests for sale. A. T. Peck, Danbury, Conn.

Iron Roofing—Scott & Co., Cincinnati, Ohio.

Waterproof enameled papers—all colors—for packing Lard and other oily substances, Chloride of Lime and similar chemicals, Cartridges, Shoe Linings, mailing Plants, wrapping Soaps, Smoked or Dried Meats and Desiccated Vegetables, Wall Papers, Shelf Papers, and all applications where absorption is to be resisted. Also, waterproof Tin Substitute for outdoor Show Cards. Samples on application. Crump's Label Press, 75 Fulton Street, New York.

L. L. Gibson, Colorado Springs, Colorado, wishes to purchase a lot of sea shells, for picture frame work.

Keuffel & Esser, largest Importers of Drawing Materials, have removed to 111 Fulton St., N. Y.

Ice Machine Wanted, that can make from 100 to 200 lbs per hour, at a cost of not more than one or two cents per lb. Price of Machine to be less than $2,000. (We have steam power.) Address Wm. C. Brown, Box 28, Tampa, Fla.

Wanted—A Situation as Draughtsman under instructions. No objections as to locality. Address B. Adriance, 88 John Street, New York.

For sale cheap—Patent Right. Lamp Bracket for Sewing Machine. Address Ludwig M. N. Wolf, Collinsville, Conn.

Rights for Sale—Of the most Simple, Durable, and Cheap Thill Coupling. Large Profits. Also, Patent for valuable Iron Bender for Sale, or on Royalty. Address Sam'l Pennock, Kennett Square, Pa.

Portable Engines 2d hand, thoroughly overhauled, at ½ Cost. I. H. Shearman, 45 Cortlandt St., N.Y.

Vertical Tubular Boilers, all sizes. Send for reduced price list to Lovegrove & Co., Phila., Pa.

To Manufacturers—Parties wishing a small article in iron to make, can secure the sole right to an article of real merit, for a small amount, cash. Patent recently granted. Address Lewis Geisler, 410 East 19th Street, New York.

Wanted, by a young man well acquainted with steam engines, a situation where he can get the practice he needs to be an engineer. Address A. M., 142 Nassau St., cigar store, New York.

Partner wanted, with 3 to $5,000, in an old established, paying business, and to build and introduce a newly patented machine for cutting hoops, chair splints, fruit and band box material, &c. Address Goulding & Powers, 123 Main St., Louisville, Ky.

Answers to Correspondents

W. B. C. will find directions for painting outdoor work on p. 227, vol. 26.—H. W. C. Jr. can cement wood to glass by following the directions for aquarium cement on p. 90, vol. 30.—A. R. is informed that polishing shirt bosoms is described on p. 27, vol. 30.—Q. V. will find directions for making gold ink on pp. 43, 58, vol. 30.—J. R. will find instructions for repairing rubber garments on p. 203, vol. 30.—W. B. F. will find the process of japanning castings described on p. 123, vol. 29.—R. E. should apply to a pump manufacturer.—A. F. F. will find simple tests for sirup detailed on p. 171, vol. 30. There is little or no foundation for many of the sensational stories about the manufacture of this article.—A. B. D. will find a recipe for aquarium cement on p. 90, vol. 30. As to blowpipe manipulation, see p. 156, vol. 25.—A. H. M. will find directions for finishing walnut furniture on p. 218, vol. 26.—P. J. H. can tin small castings by following the directions on p. 91, vol. 26.—J. S. P. will find a description of making lamp black (carbon) on p. 21, vol. 28.—M. can use hard tallow for lubricating his paper cutting knives.

J. K. asks: What is coffee, chemically? Are there not chemicals that could be substituted for coffee, that would have the same taste and be cheaper? A. Raw coffee has been analyzed with the following result, in 100 parts: Woody fiber 34, fat and volatile oil 10 to 13, glucose, dextrin, and vegetable acid 15·5, free caffein 0·8, ash 6·7. The caffeic acid, modified by roasting, is supposed by chemists to afford the greater portion of the flavor and peculiar properties of coffee. There are many so-called substitutes for coffee, but nothing like the genuine article.

J. K. asks: 1. Is there a stone that will draw the poison from the bite of a mad dog, and thus cure or prevent hydrophobia? A. No. 2. What is the medicinal virtue of the so-called bloodstone (*lapis hæmatitis*)? A. An unfounded superstition. 3. What are the principal differences between the austral and boreal poles of a compass needle, and how can the peculiar properties of each pole be made manifest? A. The principal difference is that they are attracted by the poles of the earth which have the opposite polarities.

C. D. F. asks: Why is it that, to a magnet which has become weakened, weights may be added until its full power is reached? A. It is probably due to the molecules becoming more highly polarized under the influence of the directive force.

E. G. A. asks: 1. What is the color of gold dust, as discovered in the sand of a river? A. Yellow. 2. What is the color of platinum when discovered in sand? A. Silver white. 3. What is the most simple and effectual way of separating gold from sand? A. By washing away the sand and earth in a pan. The fine particles of gold settle at the bottom. 4. Is the valley of the Allegheny river considered as a part of the coal regions of Pennsylvania? A. It is considered as belonging to the lower coal series.

C. R. asks: 1. Can the alkali of the great beds of Nevada and California be used as a fertilizer to advantage? A. Some of these deposits might be experimented on with advantage. 2. How can I get a small quantity forwarded to New York? A. Apply to Agricultural Bureau, Washington, D. C.

E. C. T. asks: 1. How can I construct a battery (Smee's pattern) of zinc and carbon? A. Smee's battery consists of a thin plate of platinised silver, suspended between two plates, or one plate bent double, of amalgamated zinc, and the whole immersed in dilute sulphuric acid. Bunsen's battery consists of a cylinder of compact coke immersed in strong nitric acid, contained in a porous vessel, and another cylinder of amalgamated zinc immersed in dilute sulphuric acid, exterior to the porous vessel, and the whole contained in a strong glass vessel. 2. Will a 2 inch object glass of 36 inches focus show the colors on the planet Mars? A. It probably would, but you could not use the full aperture unless the glass were achromatic. 3. What are the distances between object glasses and eye pieces from twenty-four inches focus up to eighty inches? A. The distance of the eye piece from the object glass is equal to the sum of the focal distances of the two. 4. What is the value of a pound in English money compared with currency of the United States? A. About $5.58. 5. What are the duties on scientific instruments, such as microscopes, etc.? A. It depends upon the materials of which they are constructed.

F. G. N. asks: What is the best kind of varnish for covering the inside of a silver plating vat? A. Use copal varnish dissolved in turpentine.

J. W. asks: 1. How are porous cells made? A. Porous cells are made of unglazed earthenware. 2. How is the thing that you pull out of an electric machine for giving shocks, to regulate it, constructed? A. By two rods running to a point at one end and terminated by balls at the other. They slide through holes in brass caps, which are fastened on the tops of insulating columns, the caps being provided with clamping screws to fix the rods at any desired distance.

W. H. S. asks: What acids are said to mix with water and linseed oil, so that they will not separate? A. Probably muriatic and nitric acids. We cannot tell the quantities unless we know for what this mixture is used.

M. S. J. asks: How is carmine made? What is the meaning of the numbers No. 12, No. 20, No. 40, by which the quality is known? Is there any better than No. 40, or poorer than No. 12? Where are they made? A. Carmine is a beautiful red pigment prepared from the cochineal insect. The insects are found upon the cactuses of Mexico and Africa, and when matured are brushed off the plants and dried by artificial heat. There are many processes for the preparation of carmine, but success principally depends upon the use of the purest materials and the exercise of care, skill, and patience. The following is an English process: Cochineal 1 lb. and carbonate of potash ½ oz. are boiled in 7 gallons of water for 15 minutes. The vessel is then removed from the fire and 1 oz. powdered alum added. The liquor is then well agitated and allowed to settle for 15 minutes. The clear liquor is then decanted into a clean vessel and isinglass ½ oz. dissolved in water 1 pint (and strained) added. As soon as a coagulum forms on the surface the heat is removed, the liquor strongly agitated with a bone or silver spatula, and then allowed to repose for 20 or 30 minutes. The deposited carmine must be drained and dried. Carmine is made in Europe. The numbers refer to the different qualities, from the best or that of the richest and brightest hue to those of inferior shades.

J. E. G. asks: How can I separate very fine float gold from quicksilver without using a retort? A. You can remove the mercury after amalgamation by digesting it in an excess of cold dilute nitric acid. The gold will remain unaffected. The mercury, however, will be lost.

N. N. asks: 1. What kinds of wood are used in the manufacture of paper? Can pine, spruce, hemlock, oak, chestnut, and white wood be used? A. All soft woods are used for paper making, such as the trembling poplar, linden, aspen, fir, etc.; the pine is of too resinous a nature to be of much value. 2. What is the process of reducing the wood to pulp? A. See p. 272, vol. 20. 3. Can it be made into white paper? A. The finest woods are used for writing paper. 4. If so, what is the process of bleaching? A. A jet of chlorine water under pressure.

S. H. B. asks: How can a polish be given to Iceland spar or selenite, perfect enough for optical purposes? A. With oxide of tin used wet, on a bed of white wax.

C. R. A. says: Is the bismuth of commerce a metal much used? A. It is largely used for type and stereotype metal. Newton's fusible alloy, which is used as a soft solder by pewterers, consists of bismuth 2 parts, lead 1 part, and tin 1 part.

R. J. H. asks: 1. Does electricity occupy space? A. It does not occupy space. 2. Is lightning fire produced by electricity, or is it electricity itself? A. It is the particles of the air rendered luminous by the passage of the electric fluid. 3. Does it take a smaller charge of electricity to send a dispatch across the Atlantic cable than it would to send one 25 miles on land? A. No. 4. Would a battery of six guns send the noise any farther than one gun? A. There would be a greater probability of the noise being unquenched by obstacles and disturbing causes in the case of six guns. 5. Does the noise travel any faster from the six guns than it does from one? A. No. 6. Will not a too heavy charge of electricity going through the cable generate a gas and cause it to burst? A. No. 7. Is electricity a gas, or do vibrations of the wire send the message? A. It is a motion transmitted from particle to particle of the wire.

H. C. H. asks: Can you give me a rule for finding the velocity with which water will flow through a hole in a vessel submerged to any given depth? A. See article on "Friction of Water in Pipes," p. 48, vol. 29. The effective head will be the difference between the hight of water above the orifice, within and without the discharging vessel.

P. D. R. asks: 1. What are three or four of the best conductors and non-conductors of heat? What metal will transmit heat and cold the quickest? A. Silver will conduct most readily, and then gold, copper, zinc, iron, and tin, in the order mentioned. Feathers, powdered charcoal, sawdust, woolen goods, sulphur, are among the best non-conductors. 2. Why is it that a spoon in a glass jar or tumbler prevents its being cracked or broken when hot water is poured therein? A. Any effect it might exert is due to the rapid absorbing and conducting power for heat, which would diminish the amount of heat which could operate upon the containing vessel.

F. asks: How can I clean very hot brass? I have some brass pipes (with live steam in them) that have to be polished. What is the best way to clean brass, warm or cold, so that it will keep its polish for some time? A. It will be difficult to clean the brass work in such a manner that it will continue bright for any length of time, unless it is covered with a lacker.

E. E. M. asks: Can you give me a recipe for making a wash that will kill sheep ticks in lambs and not be injurious to the lambs? A. Try powdered sulphur.

S. L. says: I have a few gallons of lubricating oil. What can I mix with it to make axle grease? A. Try adding tallow or lard to it, until it thickens sufficiently for use.

E. T. H. asks: What alkali and acid (used to inflate the bags for raising wrecks) is spoken of in "Scientific and Practical Information," in No. 16? A. Carbonate of soda and muriatic acid. 2. What is glass etching, and how is it done? A. By mixing powdered fluor spar and strong oil of vitriol to a thick paste in a leaden vessel, and allowing the vapor arising from the mixture to come in contact with the glass where it is left unprotected by a thin coating of beeswax.

C. B. L. asks: 1. What causes the report of a gun? One friend says that it is the air rushing back into the gun barrel after the discharge, and another says that, when the gun is fired off, the force of the powder cleaves the air, and, coming together with the great force which it possesses, causes the report. A. Sound being propagated by waves, any cause which puts the air in vibration gives rise to a sound, more or less loud according to the intensity of the disturbing force. The report of a gun is due to concussion, a sudden striking of the air, as it were, and the propagation of sound waves. 2. What causes thunder? A. Thunder is the report from a flash of lightning, and is accounted for in the same way as above. Your specimen seems to be a thin film of oxydized oil or gelatin colored with Prussian blue.

C. K. asks: Is not a car wheel by which the difficulty of running on curves may be obviated a desideratum? A. If you mean a wheel so constructed that the train will experience no greater resistance on a curve than on a straight track, we answer: Yes.

W. J. E. asks: 1. What is the best method of keeping steam boilers clean and preventing scale within the boiler? A. See p. 116, vol. 30. 2. Will the cut-off valve, cutting off the steam at ½ stroke, afford the same power as the flat valve engine, the dimensions of both engines being the same? A. For that point of cut-off, it is hardly necessary to have a separate cut-off valve.

H. C. asks: 1. What should be the diameter, width of blade, and pitch of a three bladed propeller for a boat 25 feet long and of 6 feet beam, to get a speed of 6 miles an hour? The engine is of 2 horse power. A. The engine is not large enough for that speed. 2. Can a propeller be made of boiler iron? A. Yes.

R. C. M. says: I have a 2 horse power vertical boiler, of which I want to take out the flues and clean out the shell; how can I do it without damaging them? A. If you mean without spoiling them for use in the same boiler, we do not think that it can be done.

N. L. asks: 1. Does wood shrink endwise? A friend says that boards on a fence, if put on green, would shrink endwise so as to draw them off the posts. A. The shrinkage, if any, is exceedingly slight. 2. How should a pulley be turned to keep the belt straight, with an angular or a curved face? A. Make the axes of the two pulleys parallel. 3. I lately had occasion to repair a cupola fan with four half diamond paddles. After it was done, we tried it, closed up the holes so that no air could pass out of the fan, gave it the regular speed, and opened the pipe so that the fan threw out the wind. To our surprise, the speed decreased nearly one half. Why was it? A. It had more work to do in the latter case.

I. asks: 1. Please give a brief description of the Gunther's scale (2 feet long), and tell the signification of the legends "Lea," "Rum," "Cho," "Sin," "Tan," "S*t," etc. A. On one side is a scale of 24 inches, divided into tenths of an inch. Below this, on the left, is a scale of inches and half inches, divided into hundredths. On the right are scales for laying out a vessel's track by departure and distance. They are used with small quadrants, which can be drawn by the navigator, with a radius of two or three inches. The scales for these quadrants are in the middle. On the left is the scale for the 2 inch quadrant, which has the rhumbs (or chords for the compass divided into parts of 11¼° each), chords, sines, tangents, and semi tangents. On the right is a scale for the 3 inch quadrant, with leagues (20 to an inch) rhumbs, middle latitudes, and chords. On the other side are logarithmic scales for the sines and tangents of rhumbs; numbers, sines, versed sines, and tangents of degrees; and lastly, scales of meridional and even parts, for a chart on Mercator's projection. The use of the scale is described very fully in Bowditch's "Navigation." 2. In a globe or sphere revolving on its axis, is there not a line of particles, however minute, that is in itself immovable, while all the other particles revolve around it? A. Yes, if you can conceive the line of particles to have a single dimension. 3. Would a railroad bridge across the Atlantic be possible and practicable? A. It has been proposed by some engineers. Past experience would not justify a positive opinion for or against the project.

W. F. McD. asks: Should the bed of a vertical drill stand perfectly level? If the drill stands at an angle of 15°, will it make as true a hole as if it were level? Does the rule applying to the vertical drill also apply to the horizontal drill, lathe, and planer? A. If all the moving parts are truly fitted, the tools may stand in any position.

L. D. B. asks: With what sort of tools are screws made on the softer woods? I have no trouble in chasing a screw by hand on boxwood, but a many-toothed chaser does not do for soft woods. A. Try an ordinary tool and use with high speed.

L. D. H. says: 1. I have heard that salt water will not freeze, and that ice in salt water is perfectly fresh. A. It will freeze if the water is motionless and the cold is sufficiently intense. 2. How does the salt separate? A. In freezing, water crystallizes; and the crystals of ice, in forming, reject the particles of dirt and impurities. As to transmission of power by belts, see p. 389, vol. 28.

D. H. W. asks: 1. Is there any process by which I can plate steel springs without removing the blue coloring? A. Try rubbing with weak muriatic acid, and then wiping clean with water and drying. 2. What is the best way of taking the coloring off? Is there any way of covering them with copper (without a battery), so that I can plate them with silver? A. Immerse the steel springs, after being freshly cleaned as above, in a bath of solution of blue vitriol.

D. P. W. asks: Does ice sink in the spring? Pilots on the Mississippi say that it does not break up and float away, but that it sinks out of sight. I think that water forms or falls on the surface of the ice, thus making it appear to sink. A. Your explanation is correct.

P. H. C. says: It is a popular belief among the mass of farmers that the influence of the moon has an important bearing upon various young plants as they happen to come forth either in her light, as full moon, etc., or in her wane. This idea is ridiculed and entirely disbelieved by what are called the most intelligent and scientific farmers. Is it not a fact that the light of the full moon on a young plant just come forth would have some effect on it, different from the darkness which prevails in the moon's absence, and do not these tender plants require extra sleep, as an infant does? And in the absence of it, does it not essentially change their character and production? A. When the moon is shining, the clouds are wholly or in great part absent, and the effect of the absence of clouds becomes very evident when a thermometer is placed in the focus of a silvered mirror and turned towards the unclouded sky. The thermometer falls with great rapidity, its heat being radiated out into the abysses of space, which are estimated to have a temperature vastly below the zero of our thermometric scale. When a cloud passes between the mirror and the sky, the thermometer rises rapidly, the loss of heat being interrupted. The cloud acts like a woolen blanket, preventing the escape of heat. Now what the thermometer is in this experiment, so in nature is the plant. On a moonlight (cloudless or partly clouded) night, it may radiate so much heat that injury may arise to its tender organization. The Earl of Rosse's great telescope has detected the heat radiated by the moon, but it is an incredibly minute quantity, and can have no effect on vegetation.

E. L. S. asks: How can I construct a blowpipe? Illuminating gas is not to be used, and the atmospheric air is to be supplied by some arrangement worked with the foot. A. A small blacksmith's bellows may be used, and fastened between the legs of a table, with weights on the upper chamber, and a treadle playing against the lower chamber, so as to give the requisite pressure. A pipe leading from the nozzle of the bellows, through the table top, is made to end in a tapered jet, so mounted that its direction may be altered at pleasure. The jet plays a short distance above the wick of an ordinary lard lamp.

Y. M. C. A. asks: What are the chemical ingredients and proportions of the same in what is known as slag, the kind that runs from a wrought iron puddling or heating furnace? A. Composition in 100 parts of samples from puddling furnace: Iron 51·33, oxygen 16·87, silica 8·32, phosphoric acid 7·29, sulphuret of iron 7·07, lime 4·70, oxide of manganese 0·78, magnesia 0·26. Total 99·62.

W. H. N. asks: 1. What is type metal composed of, and what are the proportions? A. Type metal is composed of lead with ¼ or ⅓ of its weight of antimony, or: lead 2 parts, tin 1 part, antimony 1 part, or: lead 15 parts, tin 1 part, antimony 4 parts. 2. Can you give me a recipe for an ink that shows plainly when written with, but fades entirely away a short time afterward? A. A solution of chloride of cobalt.

B. & J. say: In trying to make a zinc casting in a plaster mold, on pouring in the zinc it spluttered so that it would not stay in the mold. Then we tried a wooden mold, but found it to be full of air holes. Next we tried a sand mold, but this also was full of air holes; and lastly we tried another plaster mold, and, after standing over the stove all day, we found that the zinc spluttered same as before. We thought all the dampness had been dried out, but there was something wrong. In looking at some zinc castings, we found they looked very smooth. We melted scrap zinc. Will you inform me what was the matter, and how to cast zinc? A. The difficulty has been that the plaster molds have given off moisture, even the warmth of the stove has not prevented it. The wooden molds of course formed gases in contact with the molten metal. The sand has not been dry enough. We have never experienced any difficulty. Molders' sand, just moist enough to work, is used. Castings, as bright as silver, may be obtained in this way, even with common scrap zinc. To be more sure, vent holes may be punched with a wire, and the mold may be still further dried, but these precautions are hardly necessary.

J. A. W. says: In running printing power presses on highly calendered, dry paper, we are at times very much troubled by the paper becoming charged with electricity in its passage through the press. Can we get rid of it, or prevent said paper from becoming so charged? A. In the *Times* newspaper office in this city they obviate similar trouble from electricity by attaching lightning rods to the printing press. The rods extend down into the earth.

H. B. S. asks: Why does ice form upon the bottoms of rivers, where the water passes at three or four miles per hour? The ice seems to form in clear cold weather, and can be seen to rise during the day, bringing with it gravel stones of considerable size. A. It will be found, we think, that in these cases the temperature of the water is below the freezing point, and that if the motion of the water were arrested it would speedily become covered with a thick sheet of ice. Now ice is formed by the union of innumerable small detached crystals, which unite together, and, being lighter than water, float upon the surface and are carried off, while those crystals, which in the process of formation freeze fast to the stones at the bottom, and form points of attachment for still other crystals, remain there until the buoyancy of a large mass of them eventually carries them up to the surface.

W. T. R. asks: 1. What are the acids used in Daniell's battery, and what is the proportion of acid and water? A. Saturate as much water as will fill the cells with powdered blue vitriol, and add one eighth, of the bulk of this liquid, of oil of vitriol. 2. How many cells should I use for plating small articles, such as spoons, etc? A. Two are amply sufficient. 3. How can I tell when the current is passing? Should it be strong enough to be felt by holding the wire? A. By the fact that metal is being deposited upon the mold to be electroplated. 4. Is there a liquid blue vitriol, or must it be made by dissolving the crystals in water? A. By dissolving the crystals.

T. A. says: 1. I read of a new material called Parkesine (from the inventor, Mr. Parkes), composed chiefly of collodion, castor oil, and chloride of sulphur. Was this material patented? A. Yes. 2. How is the chloride of sulphur prepared? A. By passing chlorine gas, properly dried, over sulphur heated in a retort, and condensing the volatile chloride of sulphur thus formed.

E. R. asks: 1. How is the double sulphate of nickel and ammonia used for a bath? A. See p. 91, vol. 29. 2. Are the two salts mixed with distilled water? Will the nickel dissolve in the bath? A. The double sulphate of nickel and ammonia is one salt, not two. Use enough to make a strong solution in the distilled water. The nickel plates will dissolve. 3. How long after mixing is it till it is ready for plating? A. At once.

J. D. M. says: Professor Silliman, in his "Principles of Philosophy," p. 292, gives Faraday's third law of electrolysis as follows: "The oxidation of an atom of zinc in the battery generates exactly so much electricity as is required to resolve an atom of water into its elements. Thus 8·45 grains of zinc dissolved in the battery occasions the electrolysis of 2·35 grains of water. But these numbers are in the ratio of 32·5:9, the equivalents of zinc and of water." 1. Now does this mean that the dissolution of 8·45 grains of zinc in each cell or couple of the battery is required to occasion the electrolysis of 2·35 grains of water, or does it mean the sum of the several amounts of zinc dissolved in each cell or couple of the battery (making in all 8·45 grains) causes the electrolysis of 2·35 grains of water? A. For every 8·45 grains of zinc dissolved in the battery, whatever the number of cells, 2·35 grains of water are electrolyzed; so that the amount of water decomposed is found by adding the amount of zinc consumed in all the cells together and dividing by $\frac{8{\cdot}45}{2{\cdot}35}$. 2. In the electrolysis of water with a Grove's oxygen and hydrogen gas battery, of 10 cells, are the quantities of oxygen and hydrogen liberated by the current equal to the respective amounts absorbed by the act of combination in each cell of the battery, or are they equal to the whole amount absorbed in the 10 cells collectively? A. The quantity of oxygen and hydrogen liberated by the electrolysis of water is proportional to the whole amount of zinc consumed in the battery, whatever the number of cells.

W. D. S. asks: Will ripe fruit keep in a vacuum or partial vacuum, such as can be obtained with an air pump, without preparation of the fruit or putting anything in to preserve it? If it will keep, what is the reason that fruit is not put up in this manner? A. Fruit contains germs of decay, which must first be destroyed, otherwise the formation of a vacuum about them will not suffice to preserve the fruit.

S. G. N. asks: 1. Will it be cheaper for me to make my own pure silver anodes for silver plating from coin silver, or to buy them from a silversmith? A. It will probably be cheaper to purchase it. 2. How is the quantity of electricity measured, and how the intensity? A. They are determined by the galvanometer. The intensity of a current is directly proportional to the tangent of the angle of deflection, provided the dimensions of the needle are sufficiently small as compared with the diameter of the circuit. The relation between the intensity and the quantity is that the former is the quantity of electricity which in any unit of time flows through a section of the circuit. 3. How large must a copper wire be for a Bunsen battery, consisting of two 1 gallon cells? A. A wire the 1-10th of an inch diameter is sufficiently large. 4. Are Daniell's batteries suitable for silver plating? A. They can be employed. 5. Should melted zinc be stirred while on the fire? A. There is no advantage in so doing.

J. F. W. asks: What will remove champagne stains and grease spots from a black velveteen coat? A. Rub the stains first with ammonia and afterwards with benzine.

J. H. P. says: My hydrogen lamp does not quite meet my expectation. The gas has no effect upon the sponge till I blow upon it with my mouth, when in a second or two the sponge turns red and ignites the gas. A. The platinum sponge causes the union of the hydrogen with the oxygen of the air by what is known as "contact action," or the power which a clean surface of platinum has of condensing gases upon its surface, and thus bringing them within the range of their mutual attraction, and causing combination or combustion. By exposure to the air the surfaces become dirty. Heating for a moment with the tip of a flame is the best mode of restoring the activity.

A. S. B. says: Please give me the process of calcining gypsum, and state the required heat. A. Gypsum is calcined in an oven or kiln. It is built of walls of strong masonry, spanned by a flat arch. In this room is placed the gypsum only, the fire being lighted in a series of small chambers in the lower part of the room; brushwood is the best fuel. Or the kiln may be divided unequally by an arch about one foot from the floor, the gypsum being introduced into the upper part. The under part is in connection with the flue of a furnace, the flames from which, driven by a draft, are carried to play upon the lower part of the arch, the hot air and gases passing into the upper rooms. The aqueous vapor escapes through the roof of the kiln.

S. T. W. says, in reply to correspondents who ask how to season wood and to prevent its warping: Strip off bark, and bury about one foot deep in the spring, leaving in the ground for six months, and you will find no difficulty. This was the only way by which we could season the sapadillo or mountain mahogany in the Sierra Nevada, it being one of the hardest and most brittle kinds of wood known. I have two canes now of this wood, nearly as heavy as iron. In company with three others I cut them on July 4, 1873. The tree was cut at an elevation of 10,000 feet; it grows very slowly, and seldom to over four inches diameter and 10 or 12 feet hight. It flowers in June, usually, in favorable localities, having a small, pale pink and fragrant flower.

W. R. A. R. says, in reply to W. W., who asked for a recipe for gilding without a battery: Dissolve 20 grains chloride of gold in a solution of cyanide of potassium, 1 oz. to 1 pint pure water. Put the solution of cyanide of gold in a glass or porcelain jar; place in it the articles to be gilded in contact with a piece of bright zinc, in the solution near them; the process will be hastened by a gentle warmth. If the gold is deposited on the zinc, rub a little shellac varnish on it. The chloride of gold may be prepared by dissolving gold in *aqua regia* in the proportions of 16 grains gold to 1 oz acids.

D. M. says, in reply to C. L. C.'s enquiry for a cheap instrument to foretel a storm by pressure: The baroscope of Babinet will answer your needs; it may be constructed thus: Take any bottle; pour colored water into it, about one fourth of the quantity the bottle will hold: insert in it a glass tube, from three to four feet long and passing airtight through the stopper, which must also be airtight. Let a paper index, divided according to any scale of division, say into inches and fractions of an inch, be glued to the glass tube. Blow into the glass tube, so as to cause the water to ascend the tube a few inches, say 10 inches, and the instrument is constructed. The bottle must be placed in another vessel, and protected by sawdust, or some other material, from the influence of changes in the temperature of the atmosphere. This very sensible instrument records faithfully any change in the density of the external air, and the approach of a storm will infallibly be indicated by a sudden rise of the water in the glass tube.

G. L. W. says, in answer to M. B. A., who asked how to remove tallow and white lead from machinery: Use turpentine, and rub it in well.

G. H. M. says, in reply to several correspondents who ask how to cut glass jars: Fill the jar with lard oil to where you want to cut the jar; then heat an iron rod or bar to red heat, immerse it in the oil; the unequal expansion will check the jar all round at the surface of the oil, and you can lift off the top part.

J. A. O. says: Allow me to add to the list of railway bridges across the Mississippi river, given by you on p. 252 in reply to J. M., the following: Louisiana, Mo., St. Paul, St. Cloud, and Brainard, Minn., making a total of fifteen.

C. B. L. says, in reply to several correspondents who asked how to remove tattoo marks from the skin: Blister the part with a plaster a little larger than the mark; then keep the place open for a week with an ointment; finally, dress it to get well. As the new skin grows, the tattoo marks will disappear.

S. P. N. says, in explanation of the excrescence on the plank, and the means by which it was produced: "I am a farmer, and sometimes have occasion for a tight trough. In making it, I joint up the plank and then, with a wide punch, set down a groove about 1-16 inch deep the whole length; then take off two or three shavings more, and put the trough together. When the wet gets into that joint the groove swells out again just the thickness it was at first, and of course two or three shavings thicker than the plank, and so closes all up tight. Wood can also be ornamented by punching down carefully in patterns, planing off a little, and then wetting; the parts punched down show in relief above the planed surface and make quite a puzzle."

M. S. T. says, in answer to M. B. A., who asks how to remove tallow and white lead that has been applied to polished parts of machinery to prevent rust: Try a concentrated solution of caustic potash, scrubbing with an old scrubbing brush. It answered in a case somewhat similar to yours.

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

Y. N.—It is yellow hematite, and contains about 85 per cent of oxide of iron.

E. G. A.—The grains are mica, and the rock is granite.

J. E.—Both are pyrites, and are not valuable.

C. S.—A very beautiful specimen of galena, or sulphuret of lead.

W. F. H.—Your specimen is impure crystallized limestone. It may be used in making caustic lime.

J. W. H.—The mineral is sulphide of iron. If a small percentage of nickel is present, it will require a more extended examination than could be given in a preliminary analysis, to determine it.

A. L. asks: Can you give me a recipe for making artificial honey?—J. T. asks: What kind of paint should I apply to terra cotta window caps, etc., to protect them from the weather?—W. D. M. asks: How can I harden the brains and other organs of animals, so that I can take plaster casts of them?—A. J. F. asks: Is it possible to make an alloy by fusing glass and a metal together?—A. F. asks: What can I put on paper muslin to prevent the paint spreading?—J. H. asks: How can I make chewing gum and stencil paste?—D. H. S. Jr. proposes to put bolting cloth on a reel in strips, tacking the upper edge to the outside face of a rib, and the lower edge to the inside face of the next rib below; so that the flour shall not slide against the rib and be carried up thereby, but shall slide off the edge of one piece of cloth and on to the next, falling the thickness of a rib only. Will this plan work well?—J. W. T. S. asks: What will cure chickens affected with a disease called the chicken cholera, and what will prevent them from catching the disorder?—C. H. R. says: You credit James Bogardus with the invention of the "ring flyer." Can you inform me when and where the invention was made, and give me any details of when the first ring spinning frame was put in operation, and if it is in existence now?—E. T. C. says: Some wagon makers boil their hubs till soft and drive the spokes while the hubs are hot; others boil the spokes; others have both as dry as possible. What is the best method?

COMMUNICATIONS RECEIVED.

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

On a Column for Boys. By D. W. H.

On the Mississippi Overflow. By H. S.

Also enquiries and answers from the following:

P. H. B.—M. J. T.—S. M.

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.

Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

April 21, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Acid, making sulphuric, H. Sprengel	150,095
Air in cotton factories, moistening, H. Bone	149,980
Alarm, burglar, G. A. Beaver	149 910
Alarm, electric fire, etc., G. S. Shute	150,090
Alarm, electric steam boiler, W. C. Baker	149,907
Annealing box, C. A. McNish	149 875
Auger bits, twisting, W. Tucker	150,107
Augers, earth, W. W. Jilz	150,051, 150,052
Auger, hollow, M. C. Buffington	149,885
Auricle, Dimock & Wetherill	149,844
Bale tie, cotton, A. J. Nellis	149,949
Bale tie, cotton, E. H. Stafford	150,096
Bath, vapor, Miller & Cole	149,915
Beehive, J. and W. Barnes	149,973
Beehive, C. D. Biggs	149,882
Binder, temporary, A. A. Goldsmith	150,025
Bit stock, J. Uhl	150,108
Blind slat holder, I. H. Smith	150,092
Boat, life, A. G. and A. T. Sterling	149,891
Boats, sliding seat for row, J. Blakey	149.913
Boiler, agricultural, H. G. Bulkley	149,915
Boiler attachment, wash, J. Haskins	149,858
Boiler cleaner, G. Hicks	150,128
Boilers, deflector for flue, Harwood *et al.*	150,035
Bolt, V. Lapham	150,060
Boot and shoe burnisher, S. W. Chamberlin	149,989
Boot heels, burnishing, O. G. Critchet	149,922
Boot last, J. H. Livingston	149,871
Boot lasts, head block for, H. Rose	149,883
Bracelets, Baker *et al*	149,823, 149,824, 149,825
Bracelet, Murphy & Poolman	149,879
Brick machine, A. H. Keay	149,866
Brick machine, H. Martin	150,065
Brick mold, tile, J. Shreffler	149,957
Bridges, girder for iron, C. W. Wheeler	149,965
Bronzing machine, D. Heston	150,057
Brush, whitewash, E. D. Van Horn	150.110
Brushes, manufacture of, E. Clinton	149,992
Buckle, L. Messer	150,071
Buckle, E. F. Russell	150,084
Burner, revolving gas, J. O. Belknap	149,976
Butter, curb for packing, S. F. Spaulding	149,890
Can and box, fruit, etc., E. Teyssonneau	149,893
Can, oil, G. Dryden	150,006
Car brake, M. G. Pickett	149,881
Car brake, G. Westinghouse, Jr.	149,902
Car coupling, W. H. Hammond	150,031
Car coupling, M. A. Keller	149,934
Car coupling, J. Leith	149,937
Car coupling, J. McMurtry	150,069
Car coupling, L. Recht	150,080
Car, freight, R. Eaton	150,009
Car, propelling street, G. S. Grier	150,026
Car spring, W. Palmer	149,951
Car spring, J. C. Pickles	150,077
Car starter, E. G. Goddard	150,023
Car starter, E. Günther	150,029
Car wheel, N. Thomas	149,891
Car cinder fender, D. E. Detrow	149,846
Cars, flexible pipe for, W. S. Deeds	149,842
Carpets, etc., matching, J. Short	149,956
Carriage axle, Noyes & Stratton	149,950
Carriage, child's, J. L. Cortelyou	149,838
Carriage, child's, P. Gendron	150,022
Carriages, lighting and heating, S. Edwards	150.010
Carriage running gear, Seeley & Brownlow	150,089
Casting metal, J. L. Jackson	150,049
Cattle, gangway for transferring, E. L. Foreman	150,014
Chair, dentist's or barber's, F. J. Coats	149,919
Chair, folding, A. W. Stewart	150,099
Cigar mouthpiece, J. D. Dale	150,000
Clapboard machine, Johnson & Ansell	149,864
Clothes pounder, Bailey & Dean	149,970
Clutch, friction, E. D. Hubbard	150 041
Clutch, friction, T. Symonds	150,103
Coating fabrics with fluids, A. Man	149,874
Coffin plate, G. Brabrook	149,982
Coke from ovens, drawing, J. H. Connelly	149,836
Combing machine, Mirfield & Scott	150,073
Compass, solar, H. O. Cook	149,837
Cooler, beer, C. Reif	150,082
Cooler, water, K. Goddard	149,852
Copy holder, J. B. Harper	150,033
Cotton scraper and thinner, C. T. Dollahon	149 923
Corkscrew, J. A. Bragaw	149,983
Cow milker, C. W. Thompson	150,106
Cultivator, S. Luney	149,938
Currycomb, C. B. Bristol (r)	5,840
Curtain cord retainer, H. Holcroft	149,861
Cut-off, rain water, G. Strasser	150,101
Dentist's gold foil, R. S. Williams (r)	5,846
Doll heads, etc., hollow, W. E. Brock	149,831
Door hanger, J. Collins	149.994
Dough kneader and cutter, F. Möckli	149,946
Dress elevator, M. H. Bergen	149,911
Drill chuck, W. Knight	149,935
Druggist's measure, W. Vom Hofe	150,113
Earth boring machine, Blair & Paul	149,927
Elevators, driving gear for, F. P. Canfield	149,835
Engine, rotary, A. C. Gallahue	150,019
Equalizer, draft, Terry *et al.*	150,105
Fare box, J. T. Moses	149,947
Fence, iron, W. C. Groff	150,028
Fence, iron, T. Rogers	150,083
Fence, portable, J. L. Griffin	149,927
Fertilizer distributor, M. Hockman	149,860
Fire arm, magazine, Swingle *et al*	150,102
Fire arm, revolving, B. H. Williams	150,120
Fire extinguisher, H. L. McAvoy	150,066
Fire kindler, W. Laramy	150,061
Fish scales for art use, E. and J. Huebner	150,043
Flour, manufacturing, W. F. Cochrane (r)	5,841
Flower stand, J. C. Kelley	150,055
Flue cap, R. N. Harlan	150,032
Furnace, etc., petroleum, C. Hilbert	149.931
Furnace bottom, E. W. Wolfe	149,905
Gage, pressure, P. Hugon	150,045
Gas, illuminating, L. Bois, fils	149,978
Gas machine, A. C. Rand	150,078
Gas retort, closing, A. Thomson	149,895
Gas into oxygen, atmospheric, C. M. T. Du Motay	150,007
Gate, automatic, G. R. Mease	150,070
Gate, farm, D. Kaufman	150,054
Grain binder, C. Jewell	150,050
Grain dryer, W. J. Demuth	150,002
Grate, G. W. Gardiner	150,020
Grates, blower for fire, W. D. Guseman	14',854
Grinding wheel, J. T. Henry	149,929
Hammer, C. Bilharz	149.912
Harness saddle, J. Maclure	149,873
Harvester, Webster *et al*	150,114
Heating drum, E. R. Weston	149,903
Hide for belting, H. Royer	149,904
Hinge, butt, R. Hoadley (r)	5,843
Hoe, B. D. Sanders	149,885
Horse power, H. W. Barlow	149,977
Horses, hoof boot for, J. B. Higgins	149,930
Horse shoe, D. L. Corbin	149,998
Horseshoe blanks, roll for rolling, J. Russell	150,085
Insect bellows, E. Cook	149,995
Iron, refining, W. W. Hubbell	150,042
Jack, lifting, J. T. Guthrie	149,855
Journal bearing, J. McCaffrey	150,0.7
Knife and pepper box, R. W. Brown *et al.*	149,828
Knitting machine, A. Angst	149,968
Ladder, folding, J. B. Johnson	150,053
Ladder, step, C. F. Barnard	149,909
Lamp trimmer and extinguisher, W. Walton	149,964
Lamp wick, W. C. Pettijohn	149,880
Lantern, W. Burns	149 916
Lantern, signal, J. O. Belknap	149,825

Lantern, signal, J. C. McMullin 149,942
Latch, reversible knob, W. Griffith 150,077
Lathe chuck, metal, P. J. Clever 149,991
Lathe, metal turning, J. E. Spencer 150,094
Leather rolling machine, J. and A. E. Whitney 149,906
Lock, J. Gwynn 149,856
Lock, combination, J. W. H. Doubler 150,004
Locomotive cab window, H. Fuller 150,016
Locomotive head light, Van Wie et al. 149,897
Locomotives, conveying sparks from, E. A. C. Fox 150,015
Loom, pile fabric, Eickemeyer et al. 150,011
Lubricating compound, Cook et al. 149,996
Lubricator, Cook & Pulver 149,997
Lubricator, Galvin & Lynch 149,955
Map exhibiter, E. F. Russell 149,884
Medical compound, D. Grim 149,853
Medical compound, J. Halpen 149,857
Medical compounds, etc., mixing, J. H. Doerr 149,845
Millstones, gage staff for, R. Lytle 150,063
Mop head, W. H. Curtis 149,999
Musical sound boards, F. Niederheitmann 150,074
Nail machine, cut, M. Thibault 149,961
Nail plate feeder, W. H. Field 149,924
Neck tie fastener, S. C. Stetson 150,098
Offal, making gas from, J. Turner (r) 5,845
Ordnance, K. Goddard 150,024
Organ case, L. K. Fuller 150,017
Organ case, L. K. Fuller 150,018
Oyster culture, O. Cook 149,921
Packing, etc., metallic, Gilmore & Carter 149,851
Pan, bake, Kelleher & Ashley 149,867
Paper box, F. W. Smith 149,889
Paper for artificial flowers, P. E. Vacquerel 149,963
Paper pulp, wood, Voelter & Meyh 150,111
Pavement, F. F. Boudrye 149,828
Photographic plate holder, S. T. Stein 150,097
Pianoforte insulator, C. Vigneron 150,112
Pitcher, metal lined ice, J. D. & J. H. Dale 150,001
Plating with cobalt, electro, G. W. Beardslee 149,974
Plow, J. W. Lowe 150,062
Plow, sulky, J. D. Harrison 150,034
Plowshare, J. C. F. Scheuck 150,087
Plumber's joint, I. F. Van Duzen 150,109
Press, J. Gramelspacher 149,936
Press, B. G. Martin 150,064
Press, cotton, W. H. Burgess 149,988
Press, hay and cotton, M. Mickelson 149,943
Press, tobacco, McGraw & Davis 150,068
Presses, hydraulic cotton, S. Hughes 150,044
Press pressure gage, Weston & Dennis 150,115
Printing press, A. E. Lazell 149,870
Propeller, screw, M. B. Atkinson 149,969
Pruning implement, R. E. Farrington 149,848
Pulley block, F. C. D. McKay 149,941
Pump, J. H. Crocker 149,841
Pump, G. W. Robaugh 149,953
Pumps, bucket for chain, N. D. Bennett 149,977
Purifier, flour and middlings, L. Lacroix 149,869
Purifier, middlings, J. Brown 149,832
Purifier, middlings, J. Gathmann 149,850
Rack, clothes and towel, J. M. Keep 149,868
Railway signal apparatus, T. S. Hall 150,030
Railway switch, J. M. Clem 149,290
Rectum instrument, W. D. Ludlow 149,872
Rein holder, J. H. Byers 149,917
Rein holder, Reed & Andrews 150,081
Roof, slate, A. S. Kimball 150,056
Salt box separator, F. G. Merriam 149,876
Sand molds, forming, W. J. Reagan 150,079
Sash balance, F. C. D. McKay 149,940
Sash holder, A. B. King 149,935
Sash line, metallic, G. Hookham 150,040
Saw, circular, I. Hogeland 149,932
Saw table, scroll, G. H. Patullo 149,952
Scaffold, A. S. Drisko 150,005
Scoop, N. Smith 150,093
Scraper, box, T. B. Weston 150,117
Screw blank heads, shaving, W. Aiken 149,967
Screw blanks, pointing, W. Aiken 149,966
Seeds, treating, E. Waugaman 149,898
Seesaw, N. J. Eaton 149,847
Separator, grain, J. J. Bradner 149,829
Sewer basin, E. L. Meyer 150,072
Sewing machine, A. D. Horr 149,862
Sewing machine braider, V. Lapham 150,059
Sewing machine quilter, M. Dewey 150,003
Sharpening machine, G. Sanford 150,086
Shaving mug, W. Sawyer 149,887
Shoemaker's awl haft, G. W. Hutchins 150,046
Shoemaker's edge plane, J. H. Sanford 149,886
Shutter fastener, T. B. Weston 149,904
Siphon, P. Murphy 149,948
Skirt, S. E. Foster 149,849
Slippers, adjustable insole, Cole & Cundiff 149,993
Snow plow, A. S. Kimball 150,057
Soda and potassa, sulphates of, Hargreaves et al. 149,859
Speaking tube, T. Niele 150,075
Spinning bolster, O. Pearl 150,078
Sponge, hook for suspending, J. H. Hubbard 149,863
Steel, Bessemer, W. R. Jones 149,865
Steel, homogeneous, O. Bolton, Jr. 149,979
Still and hand planter, E. I. Fisk 150,013
Stocking supporter attachment, C. Weston 150,116
Stone, splitting, P. Crogan (r) 5,824
Stove, cooking, J. R. Hyde 150,047
Stove, cooking, J. R. Hyde 150,048
Stove, cooking, J. H. Wentworth 149,900
Stove grate, S. Smyth 149,959
Stove pipe, D. Boyd 149,814
Stove pipe elbow, Beckman & Gibson 149,975
Stove pipe elbow, S. Smith 149,958
Stove pipe thimble, J. A. Burgess 149,987
Stove, reservoir cooking, J. F. Quimby (r) 5,844
Stove, grate for heating, J. Q. C. Searle 150,084
Straw cutter, H. E. Moon 149,877
Sugar, centrifugally draining, A. Fesca 150,012
Table, dining and ironing, J. F. Martin 149,939
Target, flying, E. Brehm 149,830
Thill coupling, E. G. Smith 150,091
Thrashing machine, J. H. Booz 149,981
Ticket, size and quality, H. Van Geasen 149,896
Tile machine, S. E. Todd 149,962
Tobacco plug, D. Eaton 150,008
Toy, C. E. Baldwin 149,908
Trap, animal and roach, I. S. Clough 149,918
Trunk, P. & H. Schmit 149,888
Truss hoop, contracting, I. Hogeland 149,933
Tube welding device, S. P. M. Tasker 149,892
Tube welding machine, S. P. M. Tasker 150,104
Valve for fluid brake pipes, G. Westinghouse, Jr. 149,901
Valves, bushing for grinding globe, J. Bates 149,971
Vault cover, J. M. Wilbur 150,119
Vault light, J. M. Wilbur 150,118
Vehicle dash board, J. M. Munson 149,878
Vehicle wheel, P. Gendron 150,021
Violin bow rosiner, T. H. Hathway 149,928
Wagon body, extension, A. E. Helst 150,036
Wagon brake, B. G. Steward 150,100
Watch case spring, I. C. Cowles 149,839
Watch case spring, L. Stone 149,960
Water wheel, N. Conner 149,920
Wheelwright machine, M. C. Buffington 149,984
Wheelwright machine, M. C. Buffington 149,986
Whiffletree, F. M. Caldwell 149,834
Windmill, D. G. Webster 149,899
Window screen, G. F. Sarles 149,955
Wire cloth, painting, J. H. DeWitt 149,843
Wood panel templet, L. M. Hills 150,039
Wrench, W. H. Crittenden 149,840
Wrench and cutter, pipe, W. W. Micks 149,944
Yarn, sizing and dressing, Lancaster & Bullough 150,058

APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

29,728.—Mowing Machine.—A. B. Allen. July 8.
29,229.—School Globe.—J. R. Agnew. July 8.
29,300.—Stove Grate.—D. H. Nation. July 8.
29,319.—Flour Chest.—I. R. Shank. July 8.
29,333.—Water Wheel.—J. W. Truax. July 8.
29,335.—Grain Separator.—A. J. Vandegrift. July 8.
29,338.—Cable Reliever.—J. Bingham. July 8.
29,374.—Thrashing Machine.—I. Hart. July 15.
29,534.—Lathe.—B. D. Whitney. July 22.
29,593.—Reaper and Mower.—A. A. Henderson. July 29.
29,594.—Reaper, Rake and Mower.—A. A. Henderson July 29.

EXTENSIONS GRANTED.

27,973.—Printing Press.—F. O. Degener.
28,004.—Railroad Car Axle.—J. Montgomery.
28,027.—Metal Cutting Machine.—J. Waugh.
28,043.—Temple.—J. H. Woodward.

DISCLAIMER.

27,973.—Printing Press.—F. O. Degener.

DESIGNS PATENTED.

7,382 to 7,385.—Cutlery Handles.—C. L. Butler, Greenfield, Mass.
7,386.—Drawer Pull.—J. Girard, New Britain, Conn.
7,387.—Billiard Table.—F. E. Held, Chicago, Ill.
7,388.—Vault Covers.—W. O. Hickok, Jr., Harrisburg, Pa.
7,389.—Tea Caddies.—A. R. Linn et al., Detroit, Mich.
7,390 & 7,391.—Oil Cloths.—C. T. Meyer et al., Bergen, N. J.
7,392.—Vehicle Hub Band.—R. Rowe, Brentwood, N. H.
7,393.—Handle Sockets.—W. M. Smith, W. Meriden, Ct.

TRADE MARKS REGISTERED.

1,727.—Bitters.—S. E. Clapp, Boston, Mass.
1,728.—Condition Powders.—B. Doble, Philadelphia, Pa.
1,729 & 1,730.—Isinglass.—Howe & French, Boston, Mass.
1,731.—Toilet Articles, etc.—Lazell et al., N. Y. city.
1,732.—Shirt Studs, etc.—C. L. Potter, Providence, R. I.
1,733.—Saws.—Wheeler & Co. M'f'g Co., Middletown, N. Y.
1,734.—Minced Meat.—Van Camp & Son, Indianapolis, Ind.
1,735 & 1,736.—Canned Edibles.—Van Camp & Son, Indianapolis, Ind.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application for Design (14 years)	$30

CANADIAN PATENTS.

List of Patents Granted in Canada.

April 17 to April 27, 1874.

3,329.—R. Barclay, Paris, Brant county, Ont. Improvements on escapements for clocks and watches, called "Barclay's Clock and Watch Escapement." April 17 1874.

3,330.—W. Perry, Jr., Montreal, Can. Combined chemical and water fire engine, called "Perry's Hand Chemical and Water Fire Engine." April 17, 1874.

3,331.—I. C. Tallman, Montreal, Can.—Improvements on beer and milk refrigerators, called "Tallman's Beer and Milk Refrigerator." April 18, 1874.

3,332.—I. C. Tallman, Montreal, Can. Improvements on churns, called "Tallman's Churn." April 18, 1874.

3,333.—I. C. Tallman, Montreal, Can. Improvements on Milk Safes, called "Tallman's Milk Safe." April 18, 1874.

3,334.—C. E. and Z. B. Grandy, Stafford Spring, Folland county, Conn., U. S.—Improvement on saw sets, called "Grundy's Saw Set." April 24, 1874.

3,335.—T. Houlding, Ipswich, Essex county, Mass., U. S. Improvements in combined hay rake and spreader, called "Houlding's Improved Hay Rake and Spreader." April 24, 1874.

3,336.—R. H. Thurston, Hoboken, Hudson county, N. J., U. S. Improvement in automatic testing machines called "Thurston's Autographic Testing Machine." April 24, 1874.

3,337.—J. Kirkpatrick, Hamilton, Ont., assignee of A. Paraf, New York city, U. S. Improvements on purifying and separating fats, called "An Improvement in Purifying and Separating Fats." April 24, 1874.

3,338.—N. A. Asselstine, Earnestown, united counties of Lennox and Addington, Ont. Improvements on portable fences, called "Asselstine's Portable Fence." April 24, 1874.

3,339.—G. Payzant, Chicago, Cook county, Ill. Improvements on table leaf supporters, called "Payzant's Table Leaf Support." April 24, 1874.

3,340.—G. A. Martin, Bolton Center, Broome county, P. Q. Improvements on machine for cutting veneer, called "Martin's Veneer Cutting Machine." April 24, 1874.

3,341.—P. Keen, Upper Wharf, Shad Thames, Surrey county, Eng., and J. Dence, London, Eng. Improvements on machinery or apparatus for raising or elevating corn, mineral, coal, gravel, sand, or other materials, applicable for discharging or loading vessels, dredging, pumping, and other similar purposes, called "Keen & Dence's Improved Radial Elevator." April 24, 1874.

3,342.—I. A. Blake, New Haven, New Haven county, Conn., U. S.—Improvements in stone crushers, called "Blake's Improvement in Jaw Plates." April 24, 1874.

3,343.—I. A. Blake, New Haven, New Haven county, Conn., U. S., and S. L. Marsden, same place. Improvements on a machine for breaking stone, called "Blake & Marsden's Improvement in Stone Crusher." April 24, 1874.

3,344.—D. A. Johnson, Boston, Suffolk county, Mass. Improvement on devices for preventing horses from straying or running away, to be used as a substitute for a weight or hitch strap, called "Johnson's Device for Preventing Horses from Straying or Running Away." April 24, 1874.

3,345.—L. H. Dietrich, Galt, Waterloo county, Ont. Improvement on saw handles, called "Dietrich's Combination Saw Handle." April 27, 1874.

3,346.—A. Bingham, Hamilton, Wentworth county, Ont. Improvement in machine for cutting circular pieces out of tin, sheet metal, and other materials, called "Bingham's Adjustable Circular Chisel." April 27, 1874.

3,347.—C. B. Leckie, Hamilton, Wentworth county, Ont. Composition of matter to be used for washing purposes, called "Leckie's Washing Crystal." April 27, 1874.

3,348.—T. De Ceu, Houghton, Norfolk county, Ont. Machine for washing and cleansing soiled clothing, called De Ceu's Suction Washing Machine." April 27, 1874.

3,349.—W. Wade, Morpeth, Kent county, Ont. Improvement on self car couplers for coupling and uncoupling cars, called "Wade's Improved Self Car Coupler." April 27, 1874.

3,350.—T. Leonard, Cleveland, Cuyahoga county, O., U. S. Improvements on a machine for making railway car coupling pins, called "Leonard's Machine for Making Railway Car Coupling Pins." April 27, 1874.

3,351.—W. Heston and J. W. Sabin, Akron, O., U. S. Improvements on rubber packing for piston rods, valve stems, pumps, and presses, called "Heston's Concave Rubber Packing." April 27, 1874.

3,352.—E. R. Shorey, Mapanee, Lennox and Addington counties, Ont., and R. A. Shorey, same place, assignees of A. O'Dell, Boumanville, Durham county, Ont. Improvements on washing machines, called "The Royal Canadian Washer." April 27, 1874.

3,353.—T. B. Worrell, Philadelphia, Philadelphia county, Pa., U. S.—Improvements on bank locks, called "Worrell's Bank Lock." April 27, 1874.

3,354.—T. B. Farr, Woodbridge, York county, Ont. Improvements on the "Raymond" and similarly constructed sewing machines, called "Farr's Improved Raymond Shuttle Sewing Machine." April 27, 1874.

3,355.—W. T. Bunnell, Ottawa, Carleton county, Ont. Improvements on washing machines, called "Bunnell's Improved Washing Machine." April 27, 1874.

3,356.—T. A. McMartin, Montreal, Montreal Dist., P. Q. Improvement on apparatus for raising water, excavated earth, or ore, or other goods or materials, called "McMartin's Single Stroke Lever Elevator." April 27, 1874.

3,357.—C. Parker and D. W. Parker, Meriden, New Haven county, Conn., U. S. Improvements on claw hammers, called "Parker's Hammers." April 27, 1874.

3,358.—T. W. Strange, Bangor, Penobscot county, Me., U. S. Improvements on churns, called "Strange's Dominion Churn." April 27, 1874.

3,359.—H. S. Davis, Camden, Camden county, N. J., U. S. and S. Pancost, Hamilton, Wentworth county, Ont. An improved guard for interfering horses, called "Davis' Improved Guard for Interfering Horses." April 27, 1874.

3,360.—T. Good, Toronto, York county, Ont. Improvements in street culverts and waste water drains, called "Good's Improved Culvert and Drain." April 27, 1874.

3,361.—T. W. Davis, San Francisco, San Francisco county, Cal., U. S.—Improvements on fastening seams, called "I. W. Davis' Fastening for Seams." April 27, 1874.

3,362.—J. Desmond and A. L. McMillan, Chatham, Kent county, Ont. Improvement in steam engine pistons, called "Desmond & McMillan's Improved Piston." April 27, 1874.

3,363.—W. Elliot, Sullivan, Grey county, Ont. Improvements in millstone running gears, called "Elliot's Millstone Gear." April 27, 1874.

3,364.—H. P. Manley, Potsdam, St. Lawrence county, New York city, U. S. Improvements on machines for renovating feathers, called "Manley's Feather Renovator." April 27, 1874.

3,365.—D. H. Iseminger, Heyworth, McLean county, Ill., U. S. Improvements on saw sharpening machines, called "Iseminger's Saw Sharpening Machine." April 27, 1874.

3,366.—G. F. Simonds and J. A. Forson, Fitchburg, Worcester county, Mass., U. S. Improvements on tempering saws, etc., called "Simonds' & Forson's Improved Method of Tempering to Form." April 27, 1874.

3,367.—E. J. Devens and H. M. Jones, Coldwater, Branch county, Mich., U. S., assignees of D. Duesler, same place. Improvements on grain cradles, called "Duesler's Grain Cradle." April 27, 1874.

3,368.—H. Carter and D. Stewart, Aylmer, Elgin county, Ont. Improvements on fly traps, called "Carter's Fly Trap." April 27, 1874.

3,369.—H. R. Barnes, Rock Stream, Yates county, N. Y. U. S. Improvement on hoes, called "The Barnes Hoe." April 27, 1874.

3,370.—A. D. Cole, Toronto, York county, Ont. Improvement in turbine water wheels, called "Cole's Improved Dominion Turbine." April 27, 1874.

3,371.—W. Ellwood, Hamburg, N. Y., U. S. Tyre upsetter, called "Bowden's Tyre Upsetter." April 27, 1874.

3,372.—D. Perrin, McGregor, Clayton county, Iowa, U. S., Improvement on cutters for tonguing and grooving lumber, called "Perrin's Cutter for Tonguing and Grooving Lumber." April 27, 1874.

3,373.—T. Hall, Keene, Cheshire county, N. H., U. S. Improvement on steam boilers, called "Hall's Improved Steam Boiler." April 27, 1874.

3,374.—G. Bradford, Toronto, York county, Ont. Improvements in oil bearings, called "Bradford's Improved Self Oiling Bearing." April 27, 1874.

3,375.—W. G. Rawbone, Toronto, York county, Ont. Improvements on breech loading cartridge creasers." April 27, 1874.

3,376.—J. M. Dick, Buffalo, Erie county, N. Y., U. S. Improvement on wool drying machines, called "Dick's Wool Drying Machine." April 27, 1874.

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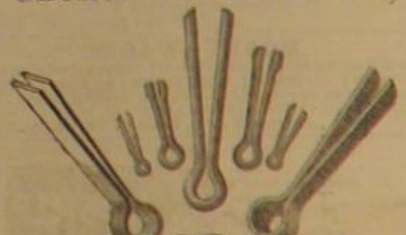

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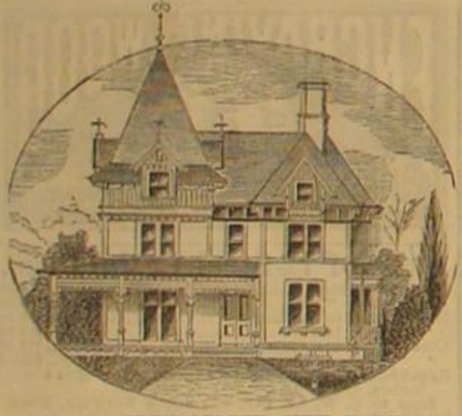

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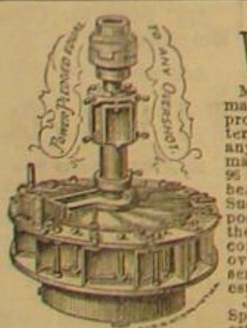

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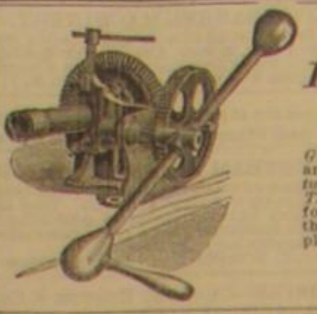

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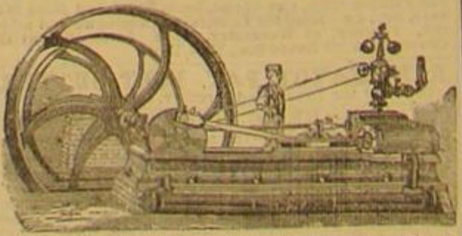

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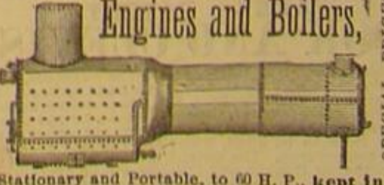

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