

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

## IMPROVED VARIABLE CUT-OFF

It is hardly necessary for us to call the attention of engi neers to the advantages gained by being able to close sooner or later the steam valve of an engine while the same is in operation. Instead of closing the throttle in order to prevent the machine working off steam faster than it can be generated, in cases where the fullest power is required, and thereby losing much of the elastic force by wire-drawing the steam into the cylinders, that valve can be thrown open. Then, by means of the variable cut-off, the full energy of the team can be utilized, while the extreme pressure allowed is pressure allowed is maintained in the boiltrary if , on the conrary, if steam is made faster than the engines can work it off with a fixed cut-off, instead of holding up the levers by hand (as is sometimes the case) the variable cut-off again affords a means of employing the full capacity of the generators. The cut-off herewith illustrated is especially adapted to poppet valve adapte side lever enalve or side lever engines, such as are in general use on high pre
river steamers.
Fig. 1 is the desig used on double engines, such as are in general use on stern wheel boats. •Fig. 2 represents an enlarged view of the poppet head, A, Fig. 1, showing more clearly the operation of sliding blocks, C, and roller, D. Th, C, and roler, The poppet heads, A, Fig. 1, have each a long slot or mortise through which a lever, B, passes. The sliding blocks, C, Fig. 2, are arranged on the top of the lever, B , and under the roller, D, Fig. 2, immediately above the mortise pin, E, Fig. 2. The latter is fastened on the lever, B, works in a slot in the poppet head, and acts as a guide. The blocks, C , are connected by the rods, F, Fig. 1, to the $T$ headed lever, $G$, which is pivoted to the upper end of the arm, H , that turns on the rock shaft, I. The arm is connected by the rod, J, with an eccentric on the main shaft. This eccentric moves
the block, C , in an opposite direction to the piston head. The free end of lever, $G$, is connected by the rod, K , to the adjusting lever, L , which stands midway between the two engines. The semicircles between which the lever works are notched to correspond with minute divisions of the stroke. By changing the lever in the notcbes the lever G, is raised or lowered thereby, and the blocks, C, are drawn nearer together or moved further apart. The steam is thus cut off sooner or later according to the position of the lever, L, which, as represented in our engraving, indicates that the steam is cut off at three tenths of the stroke. It will also be noticed that the inclined end of the block, $C$, at the right hand, has moved from under the roller, $D$, allowing the valve to be closed by means of the spring, M, acting on the bar, N .
This cut-off, it is clain ed, greatly facilitates the handling of the engine, as, the cutting off being varied at will, the engineer need not leave the throttle when reversing the en
gines. Fig. 3 shows the device as applied to a side wheel or single engine, as used on side wheel boats, where each en gine is handled independently of the other. The eccentric rod is connected to the right and left screw rod, 0 , at the swivel joint, P. The sliding blocks, C, are connected to the rod, O, by the nuts, $Q$, so that by means of the crank, $R$, at the hand of the engineer, the sliding blocks, C , are drawn near er together or moved further apart by turning the rod, O
Thus the cutting off can be varied at will when
has also been in use two years on the steamer Petaluma from the apparatus on which Fig. 3 was drawn), giving the ame results as on the Chin-Du-Wan. The Petaluma has wo 22 inch cylinders and 6 feet stroke, with single valves, and is owned by the Contra Costa Steamboat Company. The device is also in use on other steamers with like results, and n various land engines.
For further particulars regarding rights to manufacture
tc., address the patentee, Mr. Wm. B. Cross, Sacramento
 ry 14 and August 8 1871, through the Sci entific A merican Pat ent Agency.

A Possible Moses The reader of " Put Yourself in His Place" will remem ber the charming pic ber the charming pic ture which the novel ist draws of a child found floating in his cradle the day afte the bursting of the Hillsboro' reservoir Washed from some unknown home a mong the hundreds destroyed by the piti less flood, this young navigator had some how escaped the fat of his kinsfolk; and in happyunconscious ness of danger, wa discovered drifting along, kicking up his heels and crowing at the unfamiliar bright ness of the sky, and the pretty colors of the birds and butter flies that hovered a round.

A sunken Ohio riv er steamboat afforded, the other day, a still more remarkable and affecting case of in fant preservation The steamer ran on snag in the night, and sank in deep water drowning several pas sengers, among them a number of children One of the parents was a Mrs. King, who was, with the rest of the passengers saved sent on to Shawnee town, Ill., mourning her son as lost. The next morning, the ext horing, cover the bodies of the drowned discov ered a mattress float in the cabin, which was filled with wate to the ceiling. Peace fully sleeping on thi
is in motion, to any part of the stroke required, as readily as dangerous bed lay a little boy, who had been upborne al he throttle can be opened or closed. This variation, it is night by the water-soaked yet still buoyant mattress. The tated, is made without wire-drawing the steam or pounding the value seat so as to cause any extra wear or additional expense for repairs. On the contrary the steam valve is uided in its motion. Its velocity, when closing, has been determined by the use of the steam indicator, and hence the angle of the sliding blocks, C. The exhaust valves are not in any way effected by the cutting off.
The invention has been in use for three years on the stern wheel steamer Chin-Du-Wan, in the form shown in Fig. 1, giving, as we understand, entire satisfaction, and this without costing one dollar for repairs. The steam valves, by their positive and accurate motion in closing, have been kept rom leaking during the whole three years, while the exhaus is owned by the California Pacific Railroad Company, and has two cylinders 18 inches by 5 feet stroke. The cut-off
pasm of hope aroused in the hearts of the bereaved moth ers when news came of the miraculous escape of somebody' hild, the joy of one and the agony of the rest when th child, the joy one and the agony of the rest when the ved was The effect on the mother's future cannot be small. Will it have any influence on the boy's life? Time alone can tell Certain it is that, if he turns out to be a king indeed, leader of his fellow men for good, his followers will have a pretty tale to tell of providential interposition to prove the divinity of his calling.

Scoresby and other arctic voyagers and whale hunter have observed that whales have some means of communicating with one another at great distances. It is probable that the animals bellow in a tone too grave for the human ear but quite within the range of the cetacean ear.

## Situtifir American.

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## THE FINANCIAL CRISIS

One of the incomprehensible financial tempests, which oc asionally rage with more or less fierceness in the monetary world, has appeared among the brokers and banking institutions of this city; and although now, it may be hoped, it has nearly passed over, it has left a path marked with victims, in the shape of several of the most prominent houses in a state of either failure or suspension. Why such a violent commotion should have arisen at a period when the business and industries of the country are flourishing, when there is no reasson for a dearth of funds in circulation, and to what cause it may be justly ascribed, are questions difficult to answer. It seems as if people suddenly concluded not to lend or expend money or accommodate each other on any terms. Not only on railroad but on every other species of bonds, was it almost impossible to obtain funds; even gov ernments could not be sold until the Sub-Treasury opened its doors for their redemption; and the banking houses not only declined to advance to their customers, even upon the deposit of unusually large collaterals, but in some instances refused to pay out the amounts of open accounts other than by certified checks.
The savings banks, sharing in the general grab, called in all funds due to them, demanding immediate cash payment; while they themselves, taking advantage of the law, refused to meet the drafts of their depositors until the thirty or sixty day notice had expired. This stringency, or rather emptiness, of the money market (for currency was thus completely locked up) created a panic; and, as usual,frantic appeals to the Government for aid, by placing in circulation the reserve fund in the United States Treasury, were made. This, being illegal, was justly refused by the President, so thet the financial men of the community, among whom the storm arose and to whom it has been almost entirely confined, are left,with such aid as the redemption of the United States bonds (now ceased) may afford them, to return as best they can to their normal though never quiescent condition.
It has been the general impression that the effects of the panic would be felt by few other than the dealers in money and its equivalent; but it is to be feared that, although mercantile and manufacturing houses have not partaken mate rially in the disaster thus far, the result of the tightness of the money market will be seriously detrimental to the fall trade and the export of grain and cotton.
DISCOVERY OF AN OLD BOOT AND SHOE SEWING MACHINE PATENT.
The discovery is announced of an old English patent, grant ed July 17,1790 , to Thomas Saint, for a " Machine for Sewing Boots, Shoes, etc.," which is alleged to contain substantially the same mechanism as that which forms the basis of exist ing American machines.
We have looked over the drawings and specification of this old patent, and find them rather defective; still it is possible that the machine could be made to work. It make the loop stitch, contains an awl for punching the hole for the needle, apparently employs the eye-pointed needle, and has a
horizontal feed. But if anybody expects by the production of horizontal feed. But if anylody expects by the production of
this contrivance in court to invalidate any of our existing patents for shoe machinery, we think they are destined to disappointment. The Saint machine, while it is interesting as an old curiosity, could not possibly be substituted for the effective devices employed in this country. The Saint invention bears about the same relation to modern sewing machines that the The first, indeed, exhibited the revolving principle, but practically were good for nothing. So of the early attempts at
sewing machinery, including that of Saint; they may show the eye-pointed needle, the loop stitch, and a feed, but still are, practically, useless. The ideas of American inventors had to be adopted before sewing machines were made useful to the world.

## HOW PIANOS ARE INJURED.

According to a prominent manufacturer, there are more pianos injured by improper tuning than by legitimate use and the consequent natural wear of the instruments. The frame of a good piano, fully strung and tuned, is made to relaxes as the strings recede from pitch, but is renewed when the piano is tuned; and it is frequently discovered, as a result of this repeated process, that the frame is bent or bellied; and at the hands of an ignorant tuner or one le.ck ing good judgment, an instrument at this stage is soon injured . With reasonable use, a piano is expected makers will so guarantre ther seven yeas, and the best makers will so guarantee their instruments; but the incom-
petence and malpractice of certain so-called tuners sets the petence and malpractice of certain so-called tuners sets the
seal of destruction on thousands of instruments in from two to five years.
In tuning a piano, the correct method is to begin in the center of the instrument, on what is called middle C. Yet many tuners, when leaving middle C , instead of going down the scale and tuving the lower notes and heavier and longer
strings first-thus immediately bringing the greatest tension strings first-thus immediately bringing the greatest tension foundation upon which to operate,-will go up the scale, beginning with the shorter and lighter wires and higher notes, leaving the bass strings until the last, with the invariable result that, when the tuning of the lower portion of the piano is completed, the upper octaves are found to be decidedly away from pitch. Every time a piano is tuned in this manner, it increases the liability of bending the frame and renders the instrument more difficult to tune and keep in
tune. The apparent physical effect may be so infinitesimal as to be im possible of measurement, yet a change in the out line of the frame equal to but the thickness of a sheet of tissue paper will produce a difference of nearly a half tone in the sound of any given note. If the lighter strings are tuned first, they relax when the greater strain is brought to bear in keeping the heavier wires up to pitch, with the effect referred to above.
Many tuners do not carefully note the condition of the frame of a piano, and adapt their treatment to the circumstances of the case, with full knowledge that a bent, weakened, or very old frame will not stand the extreme tension or sustain the strings at the high pitch which can be put upon and borne by a frame and wires which have never been injured through ignorance or neglect, and bear no special marks of time or
use. There are very few pianos, and those of the best deuse. There are very few pianos, and those of the best description, that will stand at concert pitch. The piano manufacturers advise purchasers to have their instruments tuned by representatives of the respective factories from which
the pianos are sent, as they are aware of the terrible ordeal through which the instruments must pass at the hands of tuners of every degree of intelligence and ability. It is but a fair presumption that the maker of an instrument ought to know hew to tune it properly and without injury to its most important parts ; yet there are, comparatively, very few persons who profit by the well meant advice, an impression prevailing in some minds that the suggestion is not entirely disinterested, as the makers charge $\$ 2$ for tuning, while professional tuners and the music stores ask but $\$ 1.50$, and some of the Bohemians but $\$ 1$. But were the matter fully
and generally understood by the owners of pianos, they would consider it greatly to their interest, even in the light of an investment, to have their instruments tuned by parties in whose hands there is the least possibility of accident or injury.

## AND AND MUD BATHS.

Baths of sand or mud have had a reputation, more or less deserved, for centuries; and at the present day are employed to a considerable extent in different parts of the world. By the former, the inhabitants of the eastern shores of the Mediterranean expect to cure their rheumatic and scrofulou troubles. The process of taking this "cure" is very simple the patient buries himself almost completely in the hot dry sand, and remains thus, some time after a profuse perspira tion has broken out; the perspiration is soon followed by rash upon the skin, which subsides in a few days.
The little benefit arising from this cure is due in the main to the sweating, which freestheblood from impurities through the pores of the skin, which latter is locally irritated and excited to greater action by direct contact of the sand
But the latter, the mud baths, so popular on the continen of Europe, among which those of Salzburg, Franzenbad, and Marienbad in Germany have the highest reputation, are really more beneficial. They are prepared in the following manner: Bog mud is thoroughly dried and sifted, then satu rated with mineral water, the mixture being made so sof that the body can sink into it; the temperature is raised to about $112^{\circ}$ Fahr., and the bath is ready. The baths may be either partial or complete, according to the part of the body to be treated; but in either case, the duration of a single bath is from thirty to fifty minutes; after which the body is
cleansed by a warm water douche. They are taken daily cleansed by a warm water douche. They are taken daily
early in the morning, until relief is obtained. The disease to which they are particularly suitable are some kinds of paralysis, muscular rheumatism, and the dull nervous pain which follow severe bruises and which are called weathe
pains. In former times, their efficacy was thought to de pend upon the large amount of iron and salts contalned in
them, and which were absorbed into the blood through the or the skin. It was even supposed that there existed uns tion is simply at present, the general belier to the en tire surface of the body the hat moisture which we ap ply to a sore finger in the bread and milk.
Any one who lives near a bog swamp can extemporize a bath, almost as efficient as those of the celebrated watering places, if he have the time and patience to make it; but in. stead of mineral water, he can use ordinary boiling water or water in which is dissolved a quarter of a pound of green vitriol and half a pound of rock salt. As the heat and moisture are considered the principal parts of this cure, other substances than mud may be used, which, although more expensive, are yet more cleanly ; as, for instance, a fine sand or bran, orany material which will mix well with wa ter and retain the heat for some time.

## THE MECHANICS OF THE BRAIN

"There is a just criticism,"' considers Dr. Edward Fournié in a paper on the human brain, recently read by him before the French Academy of Sciences, " which may be ap. plied to the efforts of Gall and of those who have followed his teachings in endeavoring to divide, classify, and localize all the manifestations of the human mind. It is that, in place of determining the seat and functional part of the elements which corduce to cerebral activity, a research which constitutes the physiology of the organ, the localizers have attempted to place a mass of manifestations resulting from the working of the brain without pretending to explain the working itself. In other words, they have replaced true cerebral physiology by a synthetic expression of a certain number of phenomena which they have associated with this or that portion of the brain; or, to illustrate, we are told that the faculty of articulate language has its seat in the anterior lobes, while we are left in darkness as to by what mysterious means the idea of speech is formed.
In the living body, three orders of organs may be recog. nized, the operations of which may be referred either to the laws of physiology or of chemistry. The liver, for example, furnishes a chemical product. A muscle is governed by mechanical laws; it is a motor; while the brain is referred to the laws of molecular dynamics. Like the electric battery, it is the seat of a movement which escapes our observa tions; but while the pile acts upon apparatus submitted to its influence, the brain manifests itself by its effect upon the muscular system. It is by the movements of the lat ter that we know that the brain acts, and the full value of this assertion will be better apprehended in considering that the speech (parole) with which we think was primitively a muscular movement provoked by cerebral activity, and that we repeat tacitly while we think. Now the essential pro perty of the brain is to feel that which provokes its opera tion, as well as the act resulting from the latter: Tbe liver does not feel the blood which it modifies, or even that it makes bile; the muscle has no knowledge of the nervous in fluence which contracts it, or of the displacement which it provokes in the parts, and the electric battery cannot feel that it is in activity and causing motion. Herein the brain stands alone; and in its facult special properties of the organ

There are two rival methods of studying the brain-the experimental and the psychological. The latter classifies the manifestacions of the mind, bat does not explain its func tional mechanism. The former, or phrenological system, but demonstrates the material substances through which the efforts of the mind receive a stable, permanent, and sensible form. The one refers to results, the other to physical means It is only by using both methods, the boundaries between which have been but dimly defined, that our author believe he determines the seat of the anatomic elements which lead to the mechanism of cerebral functions.
The accompanying figure will render clearer the problem which Dr. Fournié sets himself to solve. In the region marked 1 are the nerves of impression, that is to say, the nerves which carry toward the brain the result of an impres sion received, and which occupy the posterior part of the medulla. These nerves end in region 2, known under the name of optic couches, and are composed largely of nervous cellules. Fibers leading from this center, under form of radii, place it in communication on one side with region 3 composed of cellules, and called the cortical couch of th brain; on the other, with region 4, similarly formed of cel lules, and known as striated body. From this last portion lead the nerves which occupy region 5, the anterior part of the medulla. These five regions represent the principal lo calizations determined by science. It remains to determine their functional rôles.
Resembling, in this particular, all living organs, the brain, in order to operate, requires the intervention of an especial excitant. This is an impression received at the peripheric extremity of an impressing nerve. Its effect is to modify the vitality of the nerve, nearer and nearer, until the optic couches are reached, and there the nerve, in its turn, act upon the cellule in which it ends. The result of this last modification of the cellule is the wonderful phenomenon nown as simple perception. This faculty, then, has its sea in the optic couches, a fact capable of experimental demon stration, for if that region be destroyed in a living dog, the animal is insensible to any impression; for example, he can not smell or see; in a word, he lives but does not feel. In man, when the optic couches are impressed, he simply feels -simple perception and no more. To feel with knowledge is, however, a different matter; it is simple perception plus something else. What that something else is, is the object of our investigation.

It has been already stated that a motion of the cellules of the optic couches is provoked by the nerves. This movement does not expend itself, however, in that particular region, for the couches are not isolated; hence it continues over the fibers of the white nucleus to end in the cellules which form the peripheric layer of the brain. These cellules are thereby, in turn, modified, and experiments upon living animals and pathologic observations enable the determination of phenomena corresponding to such influence. It has been known for a long time that, in the case of lunatics, the cortical couch of the brain is softened or more or less injured. If that region (3 in the engraving) be destroyed in dogs, a sor If that region (3 in the engraving) be destroyed ins senss, a sons, as
of foolishness ensues. The animal has all his sensations. of foolishness ensues. The anim9l has all his sensations, as
hvae lunatics, but he is without knowledge or m$m$ mory.


Hence, while in the optic couches lies simple perception, in the region above alluded to live the reasoning powers just named.
In order to trace the connection which, therefore, must exist between them, let it be supposed that a brain, free from any impression whatever, is submitted to the influence of an odorous body. The movement of the olfactory nerves is transmitted to cellule, $\mathrm{A}^{\prime}$, of the optic center, and the per son recognizes an odor. The vibration continues its course to cellule, A, of the cortical couch, and modifies that region. If, now, the exciting body be removed, the man returns to his former negative condition - perceives nothing. Then, by any means, let the cellule, A, be supposed to be impressed with its proper movement, ane thus to be rransmitted back ward this time to cellule $A^{\prime}$, which re-awakens to its special activity. The latter, however, corresponds to a perception of an odor and, consequently, the man wili again perceive the same, although the object capable of provoking such a sensation is totally absent. Such is the first condition of memory. But this is merely an elementary fact; in order to remember, a relation must be established between what is and what has been felt-a link formed between past and present. Suppose that the odorous body is an orange, and that the senses of sight and smell are both provoked there by. The visual impression will awaken the center, $\mathrm{B}^{\prime}$, a the same time as the odorous impression excites $\mathrm{A}^{\prime}$; the for
mer will then provoke cellule B , and the latter cellule A , as mer will then provoke cellule B, and the latter cellule A, as
already shown. The person perceives in two ways, that is already shown. The person perceives in two ways, that is
all. Now, after withdrawing the orange, suppose it to be all. Now, after withdrawing the orange, suppose it to be
submitted to a single sense; let it be held so that the person can see but not smell it. The cellule, B, is excited to activi ty as before, from the optic couches at $\mathrm{B}^{\prime}$; and moreover, being united by its prolongation to cellule A, it will determine in the last the special activity pertaining thereto. This, as already described, is reflected back to $\mathrm{A}^{\prime}$, and the perception of an odor is awakened. Here, then, although the man is too far removed from the orange to smell it, that sense is nevertheless excited, and he will remember that the orange is an odorous body of such a perfume. Not only, therefore, will simple perception be excited, but perception with knowledge.

The cellules of the cortical couch of the brain represent, under form of dynamic modality in posse, all acquired ideas, and it is to the anatomic connections which unite these cel lules to the optic couches that they borrow the possibility of awakening successively the center of perception to give birth to the phenomena of memory. A dream is nothing but the awakening of this center of perception, by the activity of the cellules of the cortical couch, while this same center is shut off from exterior influence. All the cellules of that couch are united among themselves, and they can mutually awaken their respective activities. It is enough if one operates to cause the rest to follow. The classification and admirable ordering of our knowledge is the work of us the canvas and we fill in the stitches in designs more or us the canv.
less grand.
Thus far we have referred to but a portion of the cerebral functions, the functional excitant and the functional matter. The duty of the organ does not consist merely in collecting determined elements; it is supposed to work with some object, to attain an end which is not within the brain itself but outside. There must then be particular motions which the organ projects withoutitself, and these are termed functional movements.
The path we have just assigned to the impressing movement or vibration of the sensitive nerves to theoptic couches and thence to the cortical cellules is now the only route followed by such motion. The optic couches are united by special filaments to another nucleus of cellules called the striated body. Here end all the fibers of the motive nerves placed in the antero-lateral part of the medulla. There is a
presumption already indicat:ng the function of the striated body, which however is transformed into a certainty when,
on destroying such portion of the organ in living dogs, the total cessation of physical movement succeeds. Reasoning from this we can explain the functional mechanism of voluntary and involuntary motion.
Involuntary movements take place when the impressing cause, a danger for example, is sufficiently sudden to awaken instantly the activity of the striated body and as quickly provoke, through the intermediation of the motor nerves, a determined motion of the muscles. The movements of the body are voluntary when the impressing cause acts slowly enough for the perception to travel to the cortical couches and arouse the activity of the cellules. It is not until after the examination of the impression, in conncction with ac quired knowledge, that the movement takes place. In inquired knowledge, that the movement takes place. In in-
voluntary motion, the effect is a start, a sudden withdrawal voluntary motion, the effect is a start, a sudden withdrawal
of a member, an inarticulate exclamation, etc. In voluntary movement, the previous examination causes a dominant impression to prevail in the optic couches which gives to the effort a motion as if it had been considered and reasoned upon. To the last belong the movements incidental to speech.

## scientific and practical information.

## religious electricity.

Recently in New York city, at the dedication of the new and splendid Jewish synagogue, corner of Lexington avenue and 53 d street, a portion of the first chapter of Genesis was sung by the choir; and as the words "Let there be light and ther's was light", were uttered with a grand burst of melody ther's was light" were uttered with a grand burst of melody,
the whole church was instantaneously lighted up by electhe whole church was instantaneously lighted up by elec
tricity. Thus it is that modern science lends her aid to give tricity. Thus it is that modern science
effect to the solemnities of her servants.
restoration of oil paintings.
It appears that the brilliancy of the colors in oil paintings is due to the optical properties of the substance, contained in the oil, known as linoline. By exposure to the air this sub stance, at first liquid, absorbs oxygen, becomes solid and transparent, firmly enclosing the particles of color. Linseed oil contains 80 per cent of this linoline. By lapse of time and physical and chemical changes, the linoline loses in some degree its transparency and the picture fades, those colors
containing the least oil changing most. containing the least oil changing most.
Pettenkofer has discovered that the vapor of alcohol wil renew the qualities of the linoline, and he restores old oil paintings by placing them over a tight box, in the bottom of which is a flannel cloth, which has been dampened with al cohol of 80 per cent strength. The arrangement should be such that every part of the picture will be exposed to the al coholic vapor.
the fair of the american institute.
The exhibition building is now filling up quite rapidly and nearly double the number of articles are in place that was the case at the time of our last visit. There seems to
be an improvement in the arrangement of tables and space be an improvement in the arrangement of tables and space
which admits of a much better display and at the same time which admits of a much better display and at the same time
economizes much room heretofore wasted in needless passaeconomizes much room heretofore wasted in need less passa
ges. Two wooden extensions are in process of construction beside the main building, in one of which will be a Camp bell printing press, and in the other a huge saw mill. The excellent and instructive plan of exhibiting an industry by its processes in actual operation, we are pleased to note, is in some cases being carried out. A shoemaking firm enable the visitor to trace the entire manufacture of the shoe from its first cutting from the hides down to the finishing polish. The workmen are seated around the enclosed space, and the shoe passes from hand to hand, each man adding to or per
fecting some portion. The extent of the crowd that constantly presses against the railing, eagerly watching the various manipulations, is a convincing proof of the interest taken by the public in such displays. In the same portion
of the hall, a number of tailors are at work, cutting out, of the hall, a number of tailors are at work, cutting out,
basting, sewing and pressing men's clothes; and about midbasting, sewing and pressing men's clothes; and about mid way along one of the side aisles, an ivory turner makes bil
liard balls, chessmen, handles, etc., from the crude material while another workman engraves monograms and designs on the finished articles. The display of fruit this year is ex ceptionally large and fine. There are some gigantic grapes and pears from Nebraska, and innumerable plates of apples, of excellent appearance, from various points of the West The floral exhibit is as yet rather slim, but probably will be augmented when the Fair becomes completely organized Evidences of improved management are plain; especially in the absence of the vendors of grease compounds and sim ilar nostrums, who made their surroundings hideous with their yells, and provoked the ire, of every exhibitor in thei vicinity, during the exhibition of last year.
We resume our brief notices of such inventions as have attracted our attention, from their novelty or especial utility during recent visits. M. T. Boult's
machine for carving,
paneling, molding and dovetailing in wood, is an excellently constructed and apparently very efficient device. It is four machines combined in one. The dovetail arrangement is a separate attachment connected with the table, which makes both tenons and mortises at once, so that it only remains to
fit the portions together. The paneler is a revolving cutter, fit the portions together. The paneler is a revolving cutter,
working upwards on a vertical shaft under the table. The pattern is fastened on the opposite or upper face of the plank while the lower side of the latter is pressed against the cute examined the operation of the machine quite a length, and found much to admire both in the sim plicity of
its mechanism and the beauty of the work turned out. Young's

## DIAMOND SAW

at work in the machinery department, in the form of a neatly built iron model, one fifth the size of the more cum brous wooden apparatus. The blade, it will be remembered, cuts through the stone by means of carbons or black diamonds which are securely set along its edge. There is an ingeni ous feed motion for moving the saw, and another device to lift the latter, consisting of an eccentric on the crank pin communicating with a knuckle joint and levers, so that it is allowed to cut only in drawing. The small machine exhib ited, we were told, penetrated brown stone at the rate of 14 inches and marble at 7 inches per hour. A novelty about this invention is its application to the cutting of window moldings. Bevels are made by suitably turning the stone, and rounded edges by gradually moving the latter under the saw. The work exhibited to us was very smoothly cut, and especially noticeable for its clean and sharp angles. The apparatus, the inventor thinks, does the labor, in molding, of from 12 to 14 stonecutters. Lyall's

CORSET LOOM
is a most remarkable combination of the Jacquard card with the well known positive motion loom. The cards are hung in an endjess chain in a frame work in the upper part of the machine, above the two rows of beams. These communi cate with the harness, by the usual mechanism, so as to lift certain portions of the warp at certain times. Four strips or webs of corset are woven at once. To give a clear idea of the operation of the machine is hardly possible in mer words. If the reader, however, will imagine that half the warp in an ordinary loom, for instance, be pushed out of the way, and that the shuttle travels a dozen or so times through the portion left, then that the whole warp be allowed to come into action and the weaving go on as usual, it will perhaps be understood that there will be a gusset in the cloth formed by the half action, so to speak, of the filling This, though crudely expressed, is about the operation of the Lyall loom. The Jacquard cards govern the quantity of warp to be kept in action, and this quantity is so graduated as to form the requisite gussets, welts, and gores. The shuttle consists of a box enclosing the bobbin, the thread from which passes around and through extended springs. from which passes around and through extended springs.
By this ingenious arrangement the slack loop, which would result from the shuttle not passing through all the warp, in forming gussets as above described, is taken up and the thread kept taut. The winding of the finished web brings in another very ingenious though simple arrangement for taking up the irregular portions. There is an endless rub ber belt pressing against the cloth from above. Below the latter is a strip of wood filled with needle point projections. The needles, while the whole warp is being filled, catch the entire web and, by the action of the rubber belt, pass it along. But when, however, only a portion of the width is being woven, the needles hook the inoperative part and hold it while they allow the part which is being increased to pass
$\qquad$ The entire invention, which we have thus necessarily only faintly outlined, is of great ingenuity and may justly rank as one of the most important of modern improvements in the trade to which it relates

## a wire brush machine

which puts us very much in mind of a pin-making apparatus, is at work in the main hall. It makes hair brushes, or in fact brushes for any purpose, out of fine tinned wire instead of bristles. The wire is led from the coil up to the back of a long strip of india rubber, and is moistened with camphene so as to penetrate the same with readiness. On setting the macbine in motion, an awl first makes a hole in the band then the wire is brought up, cut by a blade, and dies hold it while a little swedge forms a head upon its end. Then a pusher drives it into the awl hole and through the band, where it remains. The number of pieces in each row is regulated by an ingenious cam device, which causes them to take the elliptical figure peculiar to hair brushes. It only remains to cut the band into suitable lengths and attach it to back and handle to complete the brush.
Near the apparatus just described is an
envelope making machine.
The paper, previously cut into proper shape, is placed under an angularly shaped plunger, kept covered with gum. This pushes the piece down through a correspondingly shaped slot and at the same time pastes the lower edges. Two arms then swing around and push the paper under another plung.
er, of different shape, which carriesthe piece through a square er, of different shape, which carriesthe piece through a square
hole of the size the envelope is to be. The edges are next hole of the size the envelope is to be. The edges are next doubled over by swinging meral plates, arranged on the sides of the slot, and the envelope remains in its place until another arrives, when it falls into a suitable receptacle.
There is a peculiar horizontal steam pump, Eickemeyer's, in a corner of the machinery department. At the middle of the piston is a short arm which, by a ball and socket joint connects with a yoke on the fly wheel shaft. The piston has thus a partial rotation on its axis, and so forms a self-operat ing valve for both pump and steam cylinder.
A rather queer invention is the
STEAM BOOT BLACKER,
which consists of brushes which rub the sides and top of the boot and another made in shape to conform to the heel. There are attachments for a supply of water, and other brushes for removing mud, etc. The mechanism is quit simple, and agitates the brushes at a rate which might carry dismay to any one who is afflicted with corns, bunions, or tender feet.

## IMPROVED BORING MACHINE

One mechanical difficulty that has presented itself in the construction of boring machines with vertical spindles has been to change the driving motion from the horizontal shafts to the spindles. To this end rough wheels have been used, but these, in addition to that of the limited speed at which they can be driven, are open to the objections of wearing out the bearings and creating noise. The lateral strain upon shafts being as their distances from the center at which the power is applied, it is evident that the strain upon the bearings of boring or drilling spindles, when small wheels are employed, is almost as great as it is upon the teeth of gearing.

Although the operation of wood boring is a light one, so far as the mere cutting is concerned, yet the supporting and adjustment of the timber requires a strong machine. Boring, as a rule, is performed on the heavier class of lumber, such as is joined or framed by means of bolts, instead by means of bolts, instead and the appliances for hand and the appliances for handling the same are therefore necessarily of substantial
construction. construction.
We publish herewith engravings of a new machine by Richards, London, and Kelley, of Philadelphia, that combines several improvements, and is claimed to meet most of the objections that we have pointed out. The spindles, three in number, are driven by one belt that is carried around the pulleys so as to give the greatest tractive power; and no gearing, except a single pair of spur wheels, is used. These wheels are engine cut, and may run at any speed required. The spindles are
moved across the lumber by means of the moved across the lumber by means of the hand wheel seen in front, and have a boring range of 18 inches. The several spindles can be fitted with augers of various sizes, so that all the boring may be performed at one operation when there are not more than three sizes of holes to make in each piece. The table, or carriage, is very strong, arranged with a diagonal clamp and pivoted so that angular holes can be bored. All the movable joints are fitted by scraping, and the whole seems well adapted to the severe use that boring machines receive in öur large railway carriage and other woodworking establishments.
We are informed that patents on these improvements will soon be applied for.

CHECKER LOZENGE PACKAGE.
There is probably no one of our readers who, while traveling in a railroad car, has not had packages of gum drops or prize candy unceremoniously tossed into his lap and left in his charge during the peregrinations of their somewhat


Fig.2.

grimy vendor through the train. The advantages of this plan of selling sweetmeats need not here be pointed out; the disadvantages consist in that the purchaser, after he has absorbed the candy, is without further employment than that to be obtained from the perusal of the wrapper or from dismal forebodings of the probable effect of his repast on his teeth and digestive organs.

The merit of the novel idea which is represented in our engravings will therefore be fully appreciated, particularly as it combines in a single package not ouly a quantity of candy, but the necessary articles for playing a game of \&rafts or checkers, thus affording an agreeable means of whiling away the hours cif a tedious journey. The box is about the size of the ordinary twenty-five cent packages. Its contents consist of twenty-four lozenges-twelve white and twelve printed in squares. The divisions af of a sheet of paper


## WOOD BORING MACHINE

being dead black and white, are formed by printing advertisements in alternate squares, so that the player, while meditating over his moves, has directly under his eyes the announcements of various business houses. The advertise, ments are either "set up solid" or "displayed," as shown in Fig. 2, and, besides occupying the squares, extend around the edges of the sheet.
The device seems quite novel and should prove a saleable article in confectionery stores as well as to travelers. The candy is, we are assured, pure and free from all deleterious ingredients, and is made by machinery at the rate of two tuns weight per day. The advertising sheet will doubtless commend itself to enterprizing firms as an ingenious mode of bringing their business to public attention
Patented through the Scientific American Patent Agency June 18, 1872, by Mr. H. W. Booth, corner of Don and River streets, Toronto, Ontario, Canada, by addressing whom further particulars regarding sale of patent may be obtained.

## American Scientific Schools.

We of Young America, like other good children, feel a natural exultation in commendation which comes from fa-ther-land or mothercountry ; and thus we Scientific Americans may take pardonable pride in such praise of one of our American schools of science as is contained in the following extract, from the Chemical Newos of August 29, just received:
Programm der Königlichen Rheinisch-Westphälischen Polytechnischen Schule zu Aachen fur den Cursus 1873-74.
Announcement of the Stevens Institute of Technology, School of Mechanical Engineering founded by Edward A. Stevens. Hoboken, N. J., U. S. A. 1873.
We owe, to the courtesy of the directors of the establish ments just alluded, to the opportunity of calling attention ments just alluded, to the opportunity of calling attention
to two excellent schools established, the one by the care of to two excellent schools established, the one by the care of
the Prussian Government, the other by the munificence the Prussian Government, the other by the munificence
of a late eminent citizen of the great Transatlantic Republic.
In the programme of the Polytechnic school at Aachen (Aix. la-Chapelle) we meet with a very clear and succinct review of polytechnic science in all its bearings and its applications, as taught by a staff of some forty teachers, while the headings of the various subjects in which instruction is given amount to about one hundred. The school is now attended by about four hundred pupils, many of whom are natives of nonGerman countries.
Although an institution due to private munificence, the Stevens Institute of Technology can worthily vie with the now already celebrated School at Aachen. The Stevens Institute is just as much a high polytechnic school as the German one, and to the eminent President of the American school, Dr. H. Morton, high credit is due for the manner in which he has assisted the trustees of this foundation to carry out the will of the late Mr. E. A. Stevens.
Our space does not permit us to enter into a detailed review of the two volumes, the titles of which are recorded above. Both books have a permanent value, and the American contains, aided by woodcuts, a description of some of the
most prominent portions of the contents of the museums and collections of apparatus for illustrating lectures on physical, chemical, and engineering sciences. While calling attention to these institutions, we cannot but express our great regret that in this country nothing exists which even approaches either of the two establishments of which the programmes have been courteously sent to us.
$\qquad$ D SASH LOCK, SA WEATHER STRIP.
SPRAGUE'S COMBINED SASH LOCK, SASH HOLDER, AND The chilly evenings and mornings of the present month will be a reminder that cold weather is not far distant, and consequently that it is time to take the necessary precautions for keeping the warm air in as well as the chilly blasts out of our dwellings. With chinks open around the windows, a comfortable house is hardly a possibility, so that we presume there are few who will not avail themselves of some form of the well of some form of the well known "weather strip." The invention which we illustrate in our engraving may, therefore, perhaps prove a welcome device to many, particularly as it is especially adapted to windows which are minus cords, pulleys, or proper locks, a state of affairs frequently the case in country houses.
The arrangement consists of a strip, A, resting alongside the sash, B, Fig. 2, on springs, C, placed to receive it, and secured by screws, D, with theirheads against shouldered sockets, so that the movement of the piece, as regards sash and frame, may be regulated. The strip, A, is covered on its face with leather, so that it forms a tight weather strip, and by its elastic movement permits the sash to be held up at any desired point.
A section of this batten, E , forms the locking bolt, and is constantly pushed outward by a spiral spring, F. When opposite the recess in the window frame, as shown in Fig. 1, the action of the spring forces the pivoted section therein, thus firmly locking down the sash. When it is desired to raise the latter, it is only necessary to pull down the hook lever, G, which contracts the spring and withdraws the locking piece. The section, E , is faced and forms a continuation of the weather strip; and by jointing it to the lower end of the piece, A, the device is rendered suitable for the upper the pie
sash.
Patented by Mr. E. J. Sprague, July 22, 1873. For fur-

ther particulars concerning the sale of rights, etc., address the proprietors, Sprague \& Miller, P. O. Box No. 17, Youngstown, Mahoning county, Ohio.
The Brazilian cable expedition is at Madeira, and the line connecting that island with Portugal has been successfully laid.

## THE EVAPORATION OF WATER BY PLANTS.

 In order to measure with precision the quantity of water necessary to maintain a plant constantly in a proper condition of moisture, it is necessary to determine the enormous amounts of liquid which the vegetable evaporates. The method of obtaining such result is quite imperfect, for since metallic plates are arranged over the plant and pot so as to cover completely the earth, and it is impossible to hinder an evaporation from the surface of the soil, it is manifestly difficult to affirm that all the fluid employed in the watering hicult to affirm. that allhas traversed the plant.
M. Deherain communicates to La Nature, to which jour nal we are indebted for our illustrations, records of his investigations in the subject, which have extended over several years. In order to collect the water evaporated, he fixes a leaf of the plant in an ordinary test tube by means of a split cork. The tube is held by a support so as to retain the leaf in its normal position (Fig. 1). When the apparatus thus arranged is placed in the sun, dew quickly appears on the interior of the cylinder, and augments rapidly until, at the end of an hour, a quantity of water may be collected, often equal to, and sometimes of twice the weight of, the leaf. In several examples given by the author, we note that of a leaf of wheat, weighing $36 \cdot 1$ grains, yielding, in the above period, $30 \cdot 1$ grains of water, equal to $88 \cdot 2$ per cent of the weight of the leaf. A more striking instance is that of corn leaves gathered after a prolonged drought, giving 229, 187, 179 and 178 per cent of their weight in water, the largest proportions yet determined.
In order to obtain from the leaves such excessive quantities of fluid, it is necessary to expose them to the sun for a time: for if they be submitted merely to diifuse light, evaporation diminishes perceptibly, while it ceases almost entirely in darkness. A wheat leaf exposed to the sun gave, as above noted, 88.2 per cent of its weight of water; in diffuse light this propor tion was reduced to 17.7 per cent, and in darkness to $1 \cdot 1$ per cent. These experiments are very
simple and easy, and any one interested in the subject can repeat them for himself with little trouble.
It appears difficult, from the above results, to avoid the ad mission that light has a decisive influence on the phenome non. In order, however, to render certain the fact that the abundant transpiration in the tube was not due to a warming of the confined air by the sun's rays, during the entire experiment the leaves were kept aí a low temperature, eithe
to be easily drawn off and replaced, when necessary, by other liquids. The leaf is then caused to be illuminated by variously tinted lights, and it is found that the efficacy of the rays in determining evaporation ranges in the following order: yellows, reds, blues, and greens. When the outside vessel contains a yellow solution, a quantity of water double that given off by the leaf when submitted to a green light is collected.

* Analogous results are obtained by using the solar spec trum obtained through a glass prism. The light (Fig. 4) is reflected by a heliostat to the prism, undergoing separation and the tubes are arranged in various parts of the refracted
daily 5,648 cubic feet of water. The result is that, thus treated, the earth yields crudeproducts to the value of from four to six hundred dollars per 2.4 acres instead of from one to one hundred and fifty dollars, as would be the case in extended agriculture


## Floors of Mortar in Mexico

General T. G. Ellis describes, from personal observation, he following method used in Mexico
The limestone used was a hard, compact, blue material in some places sufficiently hard to strike fire on the drills used in running a drift through it for mining purposes. It often contains iron pyrites in small proportion This was calcined in kilns cut out of a very sof limestone, that likewise is found in that section of country, and which, on account of its whiteness and softness, is called cal leche
After calcination the lime was removed from the kilns, and slaked as soon as cool. Some of it was used within a day or two, and some re mained a month or more in barrels. Allthe work made with it seemed to be equally good.
In making the floors, a layer of broken limestone, three or four inches thick, was firs laid evenly over the surface of the ground, the stone being about the usual size for macadamizing roads. Over this a mortar of about two parts of sand to one of lime was carefully and evenly spread to the thickness of $1 \frac{1}{2}$ or 2 inches this was allowed to remain for about twenty four hours, or until the surface had become quit dry. It would probably take longer in this cli mate, where the air possesses a greater amoun of moisture than in Mexico.
The floor was then thoroughly pounded all over with a tool composed of a block of wood about 1 foot square and 3 inches thick, having a handle rising from the middle, so that a man could stand while using it. The whole surface was beaten down with this ram until it wa again as soft and moist as when first laid. This operation of ramming brought the water in th mortar to the surface so as to form a layer of semi-fluid substance on top.
The floor was again allowed to dry, and again beaten ove each day for about a week, when the operation brought only a slight amount of moisture to the surface
Immediately after the last pounding the whole surface was powdered with a thiu layer of red ocher, evenly sifted on, and then polished as follows :


Fig. 3.-Apparatus for distinguishing the effects of variously colored rays.
A smooth, nearly flat, water-worn stone, a little large than the fist, was selected from the bed of the stream which ran through the place, and with this the whole floor was laboriously gone over, rubbing down, and leaving the surface of the lime as smooth as a piece of polished stone, th red of the ocher rendering it of a rich brown color.
In less than a week the floors made in this way were suff ciently hard to bear the weight of a horse with out indentation. Roofs were made in the same manner, without the coloring matter, which wa added only to give the floors a better tint than the gray of the mortar. These roofs were per fectly waterproof, and were unaffected by sun or rain.
In the city of Monterey, sidewalks in the prin cipal streets are made in the same manner, and some of them have lasted for years, wearin through like a block of stone.
The great durability and strength of these floors and roofs are entirely owing to the pound ing operation above described, as the same ma terials were tried in the ordinary way without success.
The writer has not had occasion to make use of this process in this climate, but gives a de scription, hoping that it may be of value to others who may have occasion to lay floors of lime in architectural or engineering works. He has never heard of this method being employed in this country ; although it seems singular that it should be used so generally by a neighboring nation, and be wholly unknown to our builders."

Our readers will perceive that this method of
using mortar is analagous to the French mixture known at Coignet's $b$ éton, which, when thoroughly rammed as above described, forms artificial stone of greatis trength impervious ted by the Mexican builders.

## Currespmutence.

## The Manifestation of Energy

If we would ignore the assumed existence of the hypothetic ether, and look upon every particle of matter as being the center of a ubiquitous sphere of static energy or influence, natural phenomena could receive a better explanation. From our knowledge of matter we say that it is indestructible; and as every portion manifestly influences in its motion every other, we may say that its energy is practically ubi. quitous, and continually exercised for the attainment and maintenance of equilibrium. Faraday supposed the exist ence of "physical lines of force;" and both Thomson and Maxwell show that this hypothesis gives a more correct view of electro-magnetic action than the usual mathematical expression. As then all that we know of Nature is summed up in matter and energy, we may fairly assume the physical existence of both, while looking upon the essential nature of either as beyond the reach of speculation. By this means we rid ourselves of unwarrantable hypotheses. Space becomes neither a vacuum nor filled with one or more impossible ethers. Electric or magnetic phenomena are not action at a ethers. Electric or magnetic phenomena are not action at a
distance, but action along unbroken lines of induced force within a body's sphere of energy, the transversal vibrations of such lines when broken into an advancing wave constituting heat and light.
The constitution of every cosmic system proves the physical existence of energy. Static potency is inversely as the distance from the center of exerted power, as shown by the lever or balance. The centripetal force varies inversely as the square of the distance, the centrifugal as the cube. This makes the revolving force to vary inversely as the distance, when both tendencies are produced from the same center, as in the common illustration of a sling-constraint and outward motion acting along the same connecting line But the physical connecting line is necessary. Now we find, in every cosmic system, the energy of motion (velocity squared) of every revolving body to be inversely as its distance from the united balancing center.
The solar system, say, represents a certain amount of energy-that of the matter composing it-and is formed in the universal tendency to equilibration, by the matter blending its energies into one common concentric sphere for the mutual balance of the various bodies. The laws of Kepler, in regard to which there has been so much speculation, become inevitable. Equal areas are moved over by each body in equal times. As the force of motion is inversely as the length of radii in the concentric spheres encircled in revolution, the linear length defines the time occupied in motion by each body. The radii squared give the respective areas swept over in revolution. The areas (radii, or times squared) therefore, desicribed by the different bodies, must be to each other as the volumes of energy in the concentric spheres of which they are great circles. The squares of the radii for areas are to each other as the cubes of the same for the vol ume of energy, which gives the areas to be moved over.
The blending of energies into one common center of bal ance explains the law of gravitation. For matter must approach until stable equilibrium is attained by the proportional masses, at the necessary distance from the united center of gravity. But by the principle of the conservation of energy, when the bodies have attained balancing distance in free space, the force of approach necessarily becomes trans formed into revolutionary motion. Of this deviating force, the Newtonian law renders no account. But the ascription of physical energy to matter, with its universal tendency to equilibrium, not only explains but shows the necessity of
the conservation of both centripetal and tangential tendencies. The theorems of La Grange and La Place are necessitated also by the physical reality. For that definite amount of energy which centered itself for the equilibrated motion of bodies cannot otherwise than conserve what it formed, local action being continuously neutralized by counter. strain.
My conclusion, then, is, that matter and energy are physical realities, because they constitute all that we know of Nature. The energy of every particle of matter we look upon as universal because it acts upon all others. The energy of every body is exercised in maintaining or in striving to attain equilibrium with all others, and may act either attract ively or repulsively, according to the most powerful enforce ment or solicitation; we find that Nature teaches this also.
To this variation of action, according to molecular constitution, must be ascribed cometary eccentricities. In apparent defiance to the gravitating law, cases of division and permanent separation of parts have been witnessed. Static poten cy is inversely as the distance from the center of balance; as we see that a small body will, by a nearer approach to the center of the earth, raise a much larger, if only at a greater
distance from the balancing center, although both originally were at the same distance from the earth's center, and the larger body attracting according to its mass. Radiant action, or vibration from the center of a body's sphere of energy, outwards, must vary with the square of the distance, and also tractive potency if acting in all directions. Such variations of potentiality bring about all natural charges amidst all tendencies to equilibrium; and the amount of energy in the universe is measured by its matter. The energy of the atom is no less universal than indestfuctible.
Philadelphia, Pa.

## The Milllon Dollar Tel or of the Scientific American:

## To the Editor of the Scientific American

Much has been said about this proposed instrument, and everal plans given. I have another plan that, if it be not too visionary, will be far less expensive than and fully equal in its results to any other. I have read somewhere, or else I dreamed it, that if a plate of glass be placed over a circular opening and the air exhausted from behind it, the glass is bent back by the pressure of the atmosphere, and it may be made to retain this concavo-convex form. If this be
true, why may not the lens be made in this way and filled with true, why may not the lens be made in this way and filled with
bisulphide of carbon? I see no reason why tit may not, for all the glasses needed may be made of any convexity required Some genius can certainly work this out.

It has been proposed that the telescope be erected at Philadelphia, and that, during the exhibition of 1876, people be allowed to look through it at so much per head. This might do to raise money, and many would take the look just for the name of it, though very few would appreciate the sight. It requires a knowledge of such things and a taste for them to appreciate them properly. I have shown persons objects of the lesser world through the microscope; and though they considered themselves cultivated, they no more appreciated those beauties than would Lo, the poor Indian. There are many people, too, who are very fond of pictures; but after all, they do not appreciate them: they lack the knowledge of and taste for art. One may admire, and yet not appreciate. Thus it would be with the great telescope. While many might, from curiosity, want to gaze at the stars, the instrument would be doing mean service. Far better that it be placed at some point favorable for observation, and some experienced observer appointed to use it, and then we may expect it to do something worthy of so great an instrument.
I would willingly forego a look through it, much as might desire it, that it might be used to better purpose. It is just the thing that I have thought of for years ; if I were worth the million, I would have constructed it at my own expense for the benefit of science; but as I am worth less, I
will have to stand back and wait awhile. Still, I hope the project will be carried out in some form
Sans Souci, Ohio.
X. Perry Mentor.


The largest city on the largest river in the world, and the sole commercial outlet of a region equal to the United States east of the Mississippi but really more fertile: such is Pará.
It is a city of strange contrasts. Founded two hundred and fifty years ago and having an unparalleled position, it has to-day but thirty-five thousand inhabitants, a slow growth, due mainly to revolutions, yellow fever, and absurd legislation. Standing seventy miles from the ocean, it is nevertheless approachable by the largest steamers. Ttis built Venice, seated on the sea, with beautiful rocinhas nestling in gardens along the shore, and every variety of craft, from frigate to canoe, on the water; hemmed in between the river Guajará and a perpetual forest thatstubbornly disputes every inch of ground; with picturesque avenues of mongubas, graceful palms, and superb bananas in elegant luxuriance with unpaved streets, neglected plazas, dilapidated houses, sombre churches with grass and shrubs growing on their tiled roofs; with screaming parrots and toothsome vultures, yel-
low dogs and chattering monkeys; with wealthy Brazilians in spotless white, noisy Portuguese porters, idle soldiers, merry negresses with trays or,water jars on their heads, sober Indian women with naked children astride on their hips or rolling in the street; with a mongrel population of amalgamated Portuguese, Indian, and Negro blood-mulattos, Mamelucos, Cafuzos, Curibocos, and Xibaros; everywhere the signs of human indolence and Nature's thrift, of filth and poverty alongside of overpowering beauty and wealth of vegetation, yet altogether leaving a pleasing impression on the mind which can never fade
Pará (officially called Belém-the Portuguese for Bethle hem), is justly celebrated for the almost perfect equilibrium of its climate. The temperature ranges from $73^{\circ}$ to $93^{\circ}$, the mean of the year being $81^{\circ}$. The heat is never so oppressiv as in New York, being tempered by strong sea breezes and afternoon showers. Were it not for the imported diseases, Para would be the paradise of invalids. In 1819 the smal in 1855, cholera. The natives suffer most from the first epi demic, and foreigners from the second. At the present time (July), the small pox is at work, notonly in Pará, but also in Manáos, a thousand miles up the river. As
agriculture
is at a low ebb and import duties high, living is dear in comparison with former rates or with what we might expect in a city on the edge of an empire of exhaustless fertility Luxuries are exorbitant. Hotels charge $\$ 2.50$,gold, per day trade in rubber and cacao. But there is progress toward a better state of things. We notice many changes since our visit in 1867. The passport system was abolished last year. The State religion is more tolerant (the Jews have a syna gogue), and religious holidays, which once seriously inter
fered with trade and industry, have been reduced in num ber. Among the new public buildings are the President's Palace and the Grand Opera House, The latter will cost
$\$ 500,000$, and contain a theater accommodating 1,600 person and a saloon holding 1,200 , in every respect out of all pro portion to the wealth and size of the city. There are two banks, with a joint capital of $\$ 6,000,000$. The city is light ed by a London company, the gas costing four dollars pe nd rolling stock consists of five locomotives, fourteen passen ger and eight freight cars.
There are very few Germans, French, English, and Amer cans in Pará; but of Portuguese there are about 5,000, all busily coining money as shopkeepers, artizans, carmen, boatmen, etc. The native Brazilians are exceedingly jealous of them. They complain that these foreigners are monopo lizing the trade of the country; but instead of vigorously competing with them, they threaten to drive them back to Portugal. While agriculture, such as it is, is carried on by the Tupuyos or civilized Indians, the mechanical arts ar mainly in the hands of the Portuguese. Among the
industrial establishments,
there are fifty-nine bakers, forty-three tailors, thirty-six shoemakers, thirty-two carpenters and joiners, twenty barbers (including such as bleed by lancet and leech), nine teen tinners and glaziers, sixteen blacksmiths, thirteen butchers, ten printers, eight sugar refiners, eight soap and tallow chandlers, eight makers of fireworks, four dentists, four bookbinders, four confectioners, three photographers three saddlers, three tanners, and three potters. No for eigner can practice a profession (as medicine or law), and charge for his services, without a certificate from the Univer sity at Rio. Dentistry, being considered a mechanical art, is allowed. There are at present sixteen printing presses at Pará, from which issue fourteen journals-five dailies, thre semi-weeklies, and six weeklies; four bookstores; one col lege (Lycéo Paraense) with twelve departments: a norma chool, having a course of three years; a library, museum and literary club.
The great want of the country is laborers of all kinds, bu especially field hands. Agriculture has been ruined by the universal rush into "extractive industry," that is, the col lection of the natural products, as rubber, nuts, sarsaparilla etc. The rubber trade absorbs supreme attention; sugar cane is grown for the manufacture of rum, sugar being im ported from the southern provinces; and the cultivation of cotton, rice, coffee, and cacao along the Amazons is nearly neglected. Another check to commercial enterprises is the high and irregular tariff. The duty on imports varies from five to eighty per cent. Ordinarily it may be reckoned at forty; but the same goods will enter at different rates, evi dently depending on the caprice of the official. Bribery is openly practiced and expected. The duty on ready-made clothing is determined by weight, and on shoes, by the length of the sole. The usual cost of exportation is seventeen pe cent; but the loss is much greater on certain products, as cabinet woods. This practically discourages labor by taxing it. Not $\$ 400$ were collected at the custom house on all the woods exporied from Pará in 1868-9. Brazil abounds with the most valuable timber in the world, but is prevented from competing with other nations by this system of self-stran gulation. There are but two or three saw mills on the Amazons. A dozen boards of the common wood of the country (c.dar or itauba) costs eighteen dollars at Manáos. Fine rubber costs about fourteen dollars an arroba ( 32 lbs.) up the river, and the loss is about forty five per cent in getting it to Liverpool or New York, half of which is for freight and the ther half for custom charges
But Pará is destined to enjoy an enviable rank among the commercial centers of the world. She can never have a riva at the mouth of the Amazons, for she occupies the only avail able spot, the northern channel between Macapá and Chave being scarcely fit for navigation. Standing at the gateway of a magnificent valley covered with the richest and larges forests on the earth and at the embouchure of a river which affords an unparalleled extent of water communication touching every country on the continent except Chili and Patagonia, Pará must become the

LIVERPOOL OF THE TROPICS.
Her most prominent citizens are men of progress, and the dead weights on trade and labor will soon be removed.
At present the commerce of a country of such vast extent and resources is ridiculously insignificant. As most of the articles of consumption are imported, and many of thos produced are exported, the foreign trade is greatly in exces of the internal.
In 1872 the value of exports to England $=\$ 2,766,761$; to the United States $=\$ 2,371,138$; to France $=\$ 466,788$; to Portugal $=\$ 247,222$; to Germany $=\$ 38,438$; to Souther Brazil $=\$ 171,469$
The greater part of the rubber goes to England and the United States (about 2,500 tuns to each); cacao goes chiefl to France ; Brazil nuts, copauba oil, and tonka beans to th United States; straw hats, sarsaparilla, and tobacco to South ern Brazil ; piassaba and fish glue to England; cotton, sugar rice, farina, hides and cachaca to Portugal. During last year there entered the port of Para twenty-four steamer and forty-nine sailing vessels (tunnage 62,393 ) bearing the stars and stripes; thirty-five English steamers and eighteen sailing vessels (tunnage 41,937); thirty-nine steamers and ten sailing vessels (tunnage 41,845 ) of the Empire; Portu guese sailing craft,twenty three; French, nineteen; and from ther nations sixteen. The total value of exports from Pará in 1871 was $\$ 6,710,561$, of which $\$ 5,323,135$ belong to ubber,
In my next I will treat of the navigation and commercial resources of the Amazons. TAMES ORTON.

# EETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON 

## NUMBER 13.

Berlin, September, 1873
Leaving Vienna late in the evening by express train, the raveller may reach Dresden next morning. The route tra verses a pleasant country, but no objects of remarkable in erest are seen until, not far from the end of the journey, the little town of Bodenbach is reached. Here our baggage is examined by the customs' officials with equal courtesy and care ; we get our breakfast and move on. Here we enter the

## SAXON SWI'TZERLAND

and as we rapidly ride along the banks of the Elbe, we admire the beautiful mountain scenery on either hand, with high rugged cliffs, bordering the river or confining the narrow lateral valleys with their tangled linings of green foliage, the dark ravines and picturesque basaltic peaks and jutting promontories, the remarkable natural bridge at the Bastei, and the lofty hights of these immense rocks, the Lilienstein and the Königstein. The latter is crowned with the once impregnable fortress which defied, in earlier times, the attempt of the "Conqueror of Europe" to breach its walls from the hights of Lilienstein. The strange forms as sumed by the basalt produce quaint and striking views all along the whole distance; from the crossing of the Elbe at Bodenbach nearly to Dresden, these views form an uninter rupted succession of most beautiful panoramas. The river itself presents objects alike novel and interesting. Here and there, anchored in the stream, are queer schiffmühle, large scows or rafts carrying mills for grinding grain, and
deriving power from the action of large paddle wheels deriving power from the action of large paddle wheels
which are turned by the rapid current. Towage is performed by a steamer which is destitute of paddle wheels, screw propelier or oars. It is a Kette-dämpf or chain steamer, which propels itself and draws after it a heavy "tow" by overhauling a strong iron chain which is laid along the bed of the river, and which, coming on board at the bow, passes around a drum amidships and overboard again a the most economical of methods of propulsion, and the apparent ease with which these vessels are steered and manœuvered is quite surprising. It is somewhat remarkable that this method, which has been long known and practiced in this country, and of which the economy is well understood by all engineers, has been so little used in America, where we have so mary locations to which it would be most suitable. The cbjections to its use in other places would probably be found to be the expense of the chain on long routes, and the fact that the craft is confined to a precise line of travel from which it cannot depart to meet the exigencies of wind or tide, or to avoid other vessels. By this pulsion and tow to fifty per cent of the total pulsion and towage, to from ten to fifty
Plying on the river are also many little passenger steamPlying on the river are also many little passenger steam-
ers, conveying excursionists to and from the many beautiful ers, conveying excursionists to and from the many beautiful
watering places and romantic little villages which are scatwatering places and romantic little villages which are scat-
tered along either bank. "Beautiful little boats," the guide books call them, but they look far more quaint and anti quated than beautiful to the traveler who has traversed Long Island Sound, or who has sailed upon the Hudson or upon the Mississippi.
Leaving the river bank, we approach Dresden, crossing a level fertile plain, and are soon landed in this Saxon capital. Dresden has always been a favorite residence both with Americans and with English people, who find here cheap living, good music, a noble gallery of paintings, and good town afford pleasant excursions and beautiful drives in sum mer; and in winter, music, the theater, and skating make the time pass very pleasantly.

## At the earliest possible moment we visited the

## POLYTECHNIC SCHOOL

which is one of the oldest and best in Europe, although no very well provided with models and illustrative apparatus in its technical departments. Some of the work done by the the drawings of waterworks for supplying a large town, an other had completed the specifications and designs of a peculiar form of steam engine, a third had planned a cotto mill, and a fourth had prepared designs for an ironworks The amount of time given to the work in the drawing room,
is, however, exceptionally great. The student is usually engaged in this work sixteen hours per week, beside which he attends to studies and the lectures given in the severa collegiate departments. In some instances, the designs pro duced by the students exhibited considerable inventive tal ent; and, in the majority of instances, the plans were well
chosen and the details were well proportioned. The young chosen and the details were well proportioned. The young have sufficient energy and love of their profession to enter the workshop, and there learn the no less important details of shop practice, cannot fail to succeed in life, even in Ger many, where
We found time to visit the
GREAT PICTURE GALLERy
for which Dresden is noted, and there saw the noble works o: Correggio and of Rubens, of Rembrandt and Titian, and of dozens of other famous painters of early and of later times, and finally stood, in silent, wondering admiration, be fore the noblest of them all, Raffaelle's Madonna di San Sisto, We passed hastily through the Grüne Gewolbe (the
green vaults), examining curiously and hurriedly the wealth of art treasures preserved there.
We wandered through the pleasant streets, enjoyed a ride through the lovely Grosse Garten and, still more, our visi to the great library, where, among its 800,000 volumes, we found many referring to the early history of our own country. We should have been glad to have spent much more
time here, but duty forbade, and we hastened on to Berlin after taking a day to visit the famous old town and the cele brated

MINING SCHOOL OF FREIBERG
the Berg-Academie. Here we found a good collection of models of mining apparatus and machinery, and a consider able number of newly made duplicates, which, we were pleased to learn, were made for some of our own schools in the United States.
Freiberg is situated in the midst of a mining country, and ho exceptional advantages which the school is enabled to offer to students, in consequence of this fact, together with the high character of its professors, have given it a celebrity second probably to none other in the world. A large num ber of young men from the United States have been educated here. To-day, fortunately, there is no necessity for the American student of mining to leave our country to securehis professional education. The town appears to the stranger curiously antiquated, and the people sometimes al most equally so. The picturesque costume of some of the women, consisting of a red hat and a blue gown, or of a blue head covering and apron with a red petticoat, by its strong contrast of colors, is quite striking and pleasing.
The great city of Berlin has many attractions for the tour ist, although it bears no comparison with either London or Paris. Its noble buildings and fine wide streets, its palaces and gardens, and its museums, are exceptionally interesting and pleasing. To us, as to the ordinary visitor, they presented unusual attractions, and the limited time that was allowed for their inspection was enjoyed greatly. But even more interesting than the palaces was the great

## LOCOMOTIVE WORKS OF BORSI

and the two technical schools-the Bau-Academie and the Gewerbe-Schule-were not less interesting than the muse ums.
Borsig's works are among the most important in Germany, as may be seen from the fact that of the 5,455 locomotives reported as belonging to the German railroads in 1870, more than 1,900 were built at this establishment. Only the locomotive works are in Berlin. The iron and steel is made at the large ironworks near the mines, and the boiler shops and orges are at Moabit, a little way from Berlin
In 1870 the Borsigsche Anstalt, in the city, made 158 ocomotives. Its capacity is now 170 per year. The Gesell. schaft für Fabrication von Eisenbahnbedarf in the same year turned out 2,522 railroad cars, valued at three and a half millions of thalers. The ironworks at Moabit in that yea worked up 107,609 centners of iron. The locomotive works now employ from 1,500 to 1,800 men, who work eleven hours per day and receive from ten to fourteen thalers- 5 to 7 dollars-per week in wages. A restaurant and dining hall have been erected on the premises, and a large number of the workmen avail themselves of the privilege thus of fered of taking their meals at the works. The buildings and tools are generally old; but additional buildings are in course of erection, and modern tools are to be placed in them. Ample light, and that usually from above, and good ventilation the points in which cld establishments are invariably defective, are well looked to here; and those most invaluable*of
all tools in shops doing heavy work, traveling cranes, are not forgotten and are well placed.
A few new tools were already in, and among them was a fine tool, imported from England, for the especial work of trimming up engine frames, which here, as in all European locomotive works, are cut from rolled plates. The machine has four tool posts, feeds in every direction, and the position of the cutting tool may be altered to suit the work. The locomotive frames are cut from plates thirty millimeters-on and two tenths inckes-in thickness. Tender frames are of lighter plate, ten millimeters thick. Fire boxes are invari firebox end, the main portion being of iron. Some of the tubes are English, and some are from Düsseldorf.

## FORGED WHEELS.

Here, as all over Europe, all wheels are forged. A cast ron wheel, whether for cars or for locomotives, would be ooked upon here with equal curiosity and distrust.
We were much interested, at Moabit, in witnessing the process of forging these wheels. Each arm is first forged separately, with its proportional part of hab and rim at tached. These several pieces are next welded together to form the rough wheel, and, on each side of the thin hub
thus formed by the union of the inner ends of the arms, is then welded an iron ring, making the wheel complete and ready for finishing in the machine shop. This makes an excellent and thoroughly reliable, but an expensive, wheel Large fires and heavy steam hammers are employed in this work. There are twenty steam hammers in the forge
shops. There was but little that was note worthy in the

## BOILER SHOP.

There were no steam riveting machines visible. The rivet ng was done by hand, but not as is usual in American pracice. The rivet holes were punched a quarter inch or more smaller than the intended finished size, and were then drilled out to the full size. The rivets were roughly headed with he common light hammer and were then given their prope form-the snap head-with a die driven by heavy hammers.

In some cases the lighter hammer was entirely dispensed with. This makes a good job, and, particularly for heavy plate and large rivets, is probably much superior to the riv eting so universally used with us. The conical head is not nearly as strong as the snap head, and it is far more liable to be injured by cold hammering in giving a finish. Where the strain upon the rivet is longitudinal, as where the brace are riveted to the shell, this difference is of great import-

Like nearly all great establishments, this has grown up from very small beginnings. The first locomotive was turned out in 1841, and to-day the total number has exceeded 3,100 . This prosperous growth has apparently been due to the energy, skill, and enterprise of one man, Borsig, its founder, and, in no small degree, to his exceptional interes in the welfare of his workmen, who learned to look upon him as a friend as well as an employer, and who felt a con fidence in his regard for them which was never betrayed. Whether this trait in his character was a phase of simple be nevolence, or was merely an evidence of his appreciation of the often forgotten axiom that " the real interests of employers and employed are identical," matters little. It probably came of both. The result has been the founding of a great establishment, and the founder has earned a most enviable name. A large wreath-crowned bust of this great man, who is now dead, is mounted at one end of the great dining hall of the locomotive works, and along the walls are suspended pictures of his most remarkable productions. Flags which bear legends, referring to celebrations of importan events in the history of the establishment, are suspended above them, reminding the visitor of the display of battle flags in the Tower of London, or of the relics of our own sad civil war. These are trophies of a far more pleasing kind. At the

## baU-ACADEMIE AND the gewerbe-schule

there is much to interest those who are engaged in this branch of education, yet not much that can be given here The former bas 650 students and has no room for more There are 58 instructors. The model rooms contain some unusually fine models of bridges and a large collection of architectural and other models in plaster. The lectur rooms are quite well arranged, but do not compare favora bly with those of many colleges in the United States.
The Gewerbe-Schule is more a school of engineering, and is one of the best in Europe. The buildings are very large and are quite well arranged; the lecture rooms are unusually well fitted up, and the collection of models and of illustrative apparatus is probably the best in the country. Several workmen are kept at work, in a machine shop attached to the school, making new models; and such students as desire to do so, and at the same time exhibit special talent, are permitted to work in the shop under instruction. The col ections are thus continually g'owing, and the school, under the administration of Professor Reuleaux and his large corp of assistants, is doing a great and a good work.
After making valuable additions to our memoranda, both educational and technical, and paying a hurried visit to a few of the many attractions of Berlin, and after spending pleasant hour with the distinguished historian and diplomat who so ably represents the United States at the Prussian capital, we reluctantly left our pleasant lodgings Unter den Linden, and started westward vid Cologne and the magnificent valley of the Rhine.
R. H. T.

## Lard as an Unguent.

It is well known that rubbing the body with hog's fat has the effect of reducing the temperature of the skin in scarlet fever. A gentleman of our acquaintance has used the fat portion of smoked ham with beneficial results, and writes to the editor to disseminate the fact for others' benefit. A celebrated German physician recommends to incorporate one or two grammes of carbolic acid into one hundred grammes of lard, and, with this, to rub the whole body, excepting the head, two or three times a day, according to the intensity o nflammation characterizing the case in hand. The effect of his kind of treatment is to produce a pleasant feeling of colness, to keep the skin softer, and after each application the temperature of the skin falls somewhat. The carboli acid operates to destroy the germs and spores of the disease.

## Packing Oranges and Lemons

A full grown orange tree yields from 500 to 2,000 fruit an nually, and arrives at the bearing state in three or five years, as does the lemon tree; both grow luxuriantly in most soils. The plantations (in the Mediterranean countries) are called gardens, and vary in size, the smallest containing only small number of trees, and the largest many thousands The fruit is gathered in baskets similar to peach baskets, lined with can $\cdot a s$, the basket being held by a strap attached and passed around the neck or shoulders. From the garde the fruit goes to the repacking magazine, where it is re moved from the boxes, in which it was packed in the gar dens, and repacked for shipment by experienced female packers, after háving been carefully assorted by women, and wrapped in separate papers by young girls. As many as 500 persons (mostly women and children) are employed by some of the fruit growers in their gardens and magazines, in gathering, sorting, and repacking for shipment, the wage paid them varying from nine to sixteen cents a day. In sorting, every fruit that wants a stem is rejected. The boxe re then securely covered, straped, and marked with the brand of the grower, when they are ready for shipment Twenty years ago, this trade was nothing in its commercial haracteristics, or the inducements it offered to capitalists. Now it is progressing with giant strides into prominence,and is a considerable source of revenue to the government

## COMBINED HAY RAKE AND TEDDER.

The principal part of this device, an engraving of which
is herewith given, is the tedder, which consists of a novel arrangement of a three-throw crank with sliding forks. The laiter are actuated in a manner closely imitative of the motion of the arms of a person in handling a pitchfork to toss the hay, for the purpose of admitting a free circulation of the air through the same and thus causing it to be properly cured before removal from the field. The balance of the invention is a very easy and expeditious manner of converting the tedder frame into an improved horse rake
The oblong frame, which forms the truck, is mounted on wheels and provided with keepers which adapt it for the introduction of a pole or shafts so that the machine may be used with one or two horses, as desired. There is a suitable seat and foot board near each extremity of the axle, A, and inside the main wheels are attached cog wheels, B, which engage with pinions, C. The latter connect with the crank latter connect D. These shafts, as shafts, D. These shafts, as
above intimated, are an arabove intimated, are an ar-
rangement of the crank in rangement of the crank in
threefold relation, twice duthreefold relation, twice duplicated, and consist of two separate parts, the inner ends of which may meet in a hinged box, $H$, or be simply inserted in a suitable bearing on the central beam of the frame. $E$ are the fork stems which, six on each shaft, are bent around and embrace the crank rod between shoulders or Hlanges on the same. Between the parallel parts of the stems, and next to the cranks, ranged elastic boxes or shift ing bearings for the crank connection, so as to relieve the same from sudden strain, and adapt it to the free motion of the forks. The latter are shown in the engraving in two forms; those marked F
are spring forks, the tines of which are coiled to form eyes, through which and a hole near the end of the stem, bolts pass. This, with the bows of the tines, being slipped over open slots, also in the stems, secures the parts quickly and firmly together. This fork is well adapted for light grass. For heavier work, however, ordinary forks, $G$, are dovetailed by short shanks to the stems and secured by headed screw bolts.
Returning to the crank shafts, D, it will be observed that their outer ends are held in hinged boxes, also marked H. Near the extremities are arranged radial pins which, in connection with loose clutches united with the pinions, C , bring the latter in gear with the cogged wheels, B. A rod or wire between clutch and pinion is led through keepers to a lever, I, placed conveniently to the foot of the driver, so nhat, by moving the bar in either that, by moving the bar in eithex way, ore or both may be thiown tion. The collars or flanges, shown on the axle, A, serve as guides to the stems in their sliding movement caused by the cranks.
Our artist shows the tedder in action, and the rake also attached to the machine, but out of use. In order to put the rake in operation the tedder must first be removed, an easy proceeding, as the crank bars are quickly lifted from the hinged boxes, $H$, and the forked stems slipped off the axle. The stems slipped off the axle. The hay rake bar, J, fits in permanent bearings, $K$, placed on each side of and centrally on the frame pieces. The tines or teeth are independent in their motions on the shaft and are held thereon between shoulders. Spring braces, L, bear upon every tine, so that if one be raised the others are not affected. A hand lever, M, connects with the shaft and serves as a convenient means for raising and discharging the rake. In connertion with the same appli-
ance is a foot piece, which, when pressed down and brough under a lug, keeps the rake in an elevated position when not in use.
The reader will, before this, have noted that this device is not complicated, and that it furnishes, in one apparatus, two very useful machines. Its width is about that of the ordinary horse rake. From an examination of the model, we
should judge it to be a machine well worthy of the attention of agriculturists. It has the merit of being a very neat me an unusually small quantity of gearing, a point of importance when considered in connection with the innumerable cogs, racks, pinions and other devices, which too often en cumber agricultural machinery for even the simplest pur poses.
The inventor is Mr. R. J. Colvin, of Lancaster, Pa., and he date of the patent is April 22, 1873.
Further particulars may be obtained by addressing the


OLVIN'S COMBINED HAY RAKE AND TEDDER
ranged gearing, to impart proper speed to the pump, E, at ached to the frame, B, over one of the bearings of the oller, A. When the machine is drawn over the ground, the roller, rotating, communicates its motion to the pump which ejects, with any required force, the fluid contents of the cylinder with which it has been previously filled; air is supplied through the opposite bearing to satisfy the vacu um. A lever, actuated by the foot of the operator, and not hown in the engraving, serves to disconnect the pump gear ng, when the services of the roller alone are desired.
The present engraving illustrates one of the simplest and cheapest forms in which thi machine is constructed. It is built of any desired capacity from the hand garden roller of the horticulturist to the larges and heaviest of machines ope rated by steam for the rolling and sprinkling of streets. One form of construction confines all the machinery within the drum, pendant from a tubular shaft in the center of the roller longitudinally. In this ar rangement the fluid is forced through the shaft into the frame, which is also tubular as well as the drawing attach ments, a hose being attached to any convenient point. In the more expensive forms of construction it is considered an advantage to build the ma chine entirely of iron, constructing the frame of piping as well for the addition $\because 1$ strength and beauty of form as for the added water space and utility.

By using this machine, it is claimed, liquid manures are made more cheaply and readily available. In the distribution of all fluids by this irrigator, the liquid is thrown high in the air and falls in fine rain or spray over the surface. As a roller it possesses the same ad vantages as any ordinary land roller being adjustable in
present ow
burgh, Pa .

IMPROVED COMBINED ROLLER AND IRRIGATOR.
The combined roller and irrigator, represented in our il ustration, unites, in obvious utility, two sources of success to industrious husbandry $\rightarrow$ the preparation and proper irri gation of the soil. It is quite simple in construction, so that most of that weight being in the best position to most out of the way and most advantageously applied
Patented'June 17, 1873. For further particulars address the inventor, Mr. Dean S. Howard, Drewry's Bluff, Chesterfield county, Va.

Burning Coal Beds.
The so called "burning mountain" at Dudweiler, in the distrist of Saarbrück, which has been an object of interest to tourists and men of science for more than a century, is now shorn of its attrac tions; to the former it presents the spectacle of what is, at best, but a smoking mountain; to the latter it is a mere impostor, since, instead of being, as was supposed by earlier scientific observers, a display of volcanic action, or a proof of central fires, it is now clearly established as the result of the spontaneous combustion of a stratum of coal. These smoldering fires, produced by some change which takes place in consti tuents of the coal may, indeed, burn with more or less intensity for centuries. The thought of such waste is peculiarly distressing at the present time, and the burning mountain of Dudweiler shows only common good feeling by mitigating its destructive proceedings at this crisis. A coal bed at Niederplanitz, sis. A n wickau, in Saxony has been near Zwickau, in Saxony, has been burning in 400 yeaner between 300 and 400 years. The heat given out by this subterranean fire, at a cost which it is distressing to calculate, is not wholly wasted. An ingenious person, since dead, has established a magnificent nursery ground on the burning area, in which, by means of a system of pipes, the supply of caloric is regulated and applied at will. Tropical plants flourish here in the open air with a luxuriance which the best forcing houses and conservatories cannot insure.-Mining Journal.

## HOWARD'S COMBINED ROLLER AND IRRIGATOR.

but a brief description of its parts (as indicated by letters in the illustration) is necessary. A is a hollow drum of wrought or cast iron, so arranged in the frame, B, which is made of hollow tubing, as to revolve on hollow watertight bearings at oneor both ends. It also has a gear flange, C, attached to either end, the teeth of which engage with a
pinion at $D$, which, in turn pinion at $D$, which, in turn, gives motion to any suitably ar-
[Passing through the coal region of Pennsylvania, not long ago, we saw smoke issuing from a mountain in the distance, which, we were told, had been burning for more than a quarter of a century; and that a great deal of money had been expended in the attempt to sever the coal vein and conduct water into the seams to extinguish the fire, but without succeșs.-EDs.]

## improved match plane.

We illustrate herewith one of those ingenious devices which in a single instrument combines the capabilities of a variety of tools. It consists in a match plane which, by suitable adjustments of its parts, may be set to tongue boards of any thickness.
A is the main stock, B is the iron, and C the key, shown in the side view, Fig. 1. The face of the tool, Fig. 2, is formed in two parts, one of which is an adjustable piece, D, which, fitting into a rabbet of the stock, is made adjustable later ally thereon by screws passing through slots, as shown. By moving this piec out or in, the length of the mouth of the tool is varied so as to correspond with the width of the adjustable iron, $B$. The latter, Fig 3 is made in two po The latter, Fig. 3 , is made in two por tions, also connected byscre a atting so that the spen the cutting edges may be made broad or narrow to receive the tongue, which is cut of cor responding size

E, Fig. 2, is a guide adjustable on the face of the tool by the same mean as above described, and $F$ is a gage op erated by the thumbscrew, G, for reg ulating the depth of the cut. Any or dinary plow iron may be used in th grooving tool, and the tonguing too may be adjusted to suit the groove. With a single pair of implements there fore, it is claimed, the operator is en abled to perform work which ordina rily calls for the use of a multiplicit rily calls the of devices, thus saving much expens and trouble. Patented through th Scientific American Patent Agency June 10, 1873 , by Mr. James Edwards of No. 323 Fifth avenue, Brooklyn, N Y., from whom further particulars re garding sale of patents or State rights may be obtained.

## THE GLOBE STEAM GAGE

The amount of correspondence concerning boiler explo sions, which has been lately published in scientific journals points out the importance of a trustworthy pressure indica tor, which can be relied on, at all times, to show any varia tion in the force within the boiler, and to indicate the same accurately after long continued use.
The invention which we illustrate herewith is a steam gage of quite simple construction, which we are informed has been in use on the Erie railroad for four years past, dur has been in use on the Erie railroad for four years p
ing which period it has not varied one pound from the test gage with which it was first compared Various certificates from railroad officials and others, submitted to us by the owners ofthe patent, speak highly in recommendation of the instrument so that it may be fairly considered as having suc essfully withstood the test of actual experience.
Fig. 1 gives the appearance of the dial of the apparatus, and Fig. 2 a section showing the essen tial portions. A is the case, and B a metal spring the space, $C$, in rear of which contains water Steam enters from a pipe at D, and presses the spring inwards into the position of the dotted line The motion of the spring, by suitable lever and other mechanism, is transmitted to the dial needle which registers the pressure in accordance with the amount the spring is driven inward. The in trument is very sensitive and accurate; and it i laimed that it will withstand a heavy pressur without the spring becoming permanently set, and also that at 140 lbs . pressure the spring is forced out from the center $\frac{1}{8}$ of an inch. Under a press ure of 700 lbs ., to which the apparatus was sub jected a short time since, at the manufactory in Waterbury, Conn., the spring was reversed in form and blown out, falling some ten feet distant
It is further stated that the gage does not get out of order, and that when in use upon a locomo tive there is no vibration or trembling of the point er, no matter how high the speed at which the e ngine ma be running.
For further information, address Messrs. Austin M.Ha ward \& Son, Susquehanna Depot, Pa

## Test for Copper and Tin in Extracts

The poisonous nature of copper, and, to a less degree, of tin, makes the following method of testing for them in an ex ract, as described by Hager, both interesting and useful, or either of these metals may have been dissolved from the alls of the vessel in which it was prepared. "The extract is, for this purpose, dissolved in five parts of water, or ver dilute spirits, and slightly acidified with of water, or very dilute spirits, and slightly acidified with a drop or two of hydrochloric acid. A bright strip of zinc is placed in the solution, and, after half an hour, if no impurities are present,
the zinc will be found as bright and colorless as when first put n. If, however, copper and tin are present, it will be coate with brown film; if tin alone is present, the film will have a grayish white color. It is washed with water and dried by heating the strip of zinc gently in an alcohol flame, and the copper will be indicated by its well known copper color Under like conditions the film of tin is a dull grayish white f copper and tin are both present, and it is desired to deter mine the quantity of the tin, the film is peeled off with knife into a test glass and 5 to 8 drops nitric acid added. It
is carefully boiled until entirely dissolved, when 75 drop ammonia is added, the solution shaken and allowed to settle. If $t$ in is present, it will separate as amorphous oxide of ti in white flakes." We venture the suggestion that lead can be determined in a similar manner by precipitating on zinc.

Mineral Oils for Iron
The use of heavy mineral oil as a preservative for iron is strongly recommended by the London Oil Trade Reviero, the
quired. For domestic purposes, for the cleaning of all kind of household iron work, for the preservation of such thing as mowing machines and other garden tools or exposed iro implements, the brown oil should be sold in small bottles at a cheap rate. For manufacturers of iron work and for iron mongers, to whom it will prove invaluable, it must of cours be supplied in larger parcels. At present it can hardly be used at all, on account of the difficulty of obtaining it in re tail quantities.

## Ruled Test Plates for the Nicroscope.

 In a recent paper read before the Quekett Microscopical Club, London, Mr. Wil liam Webb takes the ground that the al leged ruled plates of Nobert and others purporting to present 200,000 lines to the nch, are illusions, it being a physical im possibility to cut any such number of dis inct lines within such limits. He sas
That a micrometer with the lines the rat a mor the one 200 -thousandth of an inch apart ruled n glass is an absolute impossibility That if it be possible to rule lines themelves of the width of the one 200 -thousandth of an inch, to make them definable there must be a clearly defined line between them, and a clearly defined line in the same plane of observation. That beyond the first few coarse bands of $M$. Nobert's tests, there is not, properly so called, a single line. That in the finest bands, except at their extreme sides, here is not half a line. That in the finest bands the only thing certain, except the edges, is the uncertain polarized aerial lines. That the microscopical world has been pursuing a phantom, and adopting a fallacy. That polarization of light in the examination of these and analagous tests is a deceitful servant of the microscopist.

## EDWARDS MATCH PLANE.

ducts of shale distillation, so extensively practiced in Great Britain. Whether a similar product can be obtained from our petroleun

## Theraty

The action of the oil is twofold. First, it is detergent hen vigorously and freely brushed over an already rusted surface. It seems to loosen the bulk of the rust and it darkens that which remains. Secondly, it acts as a varnish if applied after the cleansing has been effected, or to new and bright work. Its superiority to vegetable or animal oils de-


## THE GLOBE STEAM GAGE.

it leaves only a very fine film behind. If the oil is lightand fully refined, it evaporates so completely as to do but little good in this way; but if tinged or "once run" oil of suf ficiently high gravity be used, the resinous or carbonaceous matter which gives the tinge to the oil remains behind and

Fi"i\% :

forms the thin protecting film of varnish. Ordinary varnish eaves far too thick and obvious a film, while the film of the once run oil does its work of protection without displaying itself. As regards the density of the oil required for this purpose, we recommend that which stands between the burn ing oil and good lubricating oil; it is known, and sometimes sold, as "intermediate oil." We are satisfied that a good trade may be done by anybody who will bring this before the public in a proper manner, and supply the article as re-

That oblique illu mination is another deceiver. That if M. Nobert were to attempt to fill his incisions with black, his finest bands woul ${ }^{d}$ be merged each into one black line of the breadth of ea ${ }^{\text {ch }}$ particular band. That a test must be a known thing wh ${ }^{\text {ich some power will either disperse }}$ or fail to define, as in the case of a spectacle vendor, who places before $a^{n}$ intending purchaser's eyes words printed in types of different sorts as a known test of visual powe thare are no tests so reliable as a nown , off by the black, and in which, the rays transmitted being transmit ted by direct illumination, mitted being transmotinterfered with; such rays becoming parallel rayo, passing out at right angles with the surface of the glass, the unalterable law of natural optics being that the angle of incidence and the angle of reflection are equal.

## The Cincinnati Exposition.

The second Annual Exposition held in Cincinnati is now in progress, and attracting, on an average, some 12,000 visitors per day. We learn that it is the finest and largest display yet made in the West, and fully in accordance with what might be expected from a city inferior, in point of number and variety of its manufactures, only of New York and Philadelphia. Cincinnati alone furnishes one half the steam engines on exhibition, besides a fair proportion of the agricultural and labor-saving machines. There is also a large display of furniture of fine workmanship, coming from the various establishments of the city. Stoves occupy a prominent place in the list of local products; and from the manufacture, it seems probable that Cincinnati may fairly rival Troy and Pittsburgh. The makers of boots and shoes also carry on an extensive business, em ploying the most approved machinery and selling goods at the rate of $\$ 2,250,000$ per year. Miscellaneous goods, and also leather, are exhibited in pro fusion. Of the latter the city makers, last year, produced $\$ 2,473,800$ worth. There are from twenty to thirty different kinds of carriages displayed, the workmanship of which compares favorably with that of the best eastern firms. Pork packing is of course represented on a large scale. The figures of the past two years show a marked increase in this important trade. During the winter of 1870-71, there were packed 481,560 hogs, and in the succeeding winter, 6:0,301.
The Exposition is drawing large numbers of the country people to the city, and the attendance appears to be increas ing in spite of the rival attractions of the Louisville Fair.
J. W. S. writes to say that he has a perpetual motion in run ning order, and he will dispose of it for $\$ 2,000,000$ for a " plot ;" but if he has to carry it to Washington, he will ask $\$ 5$ 000,000 . The existing financial crisis will, we fear, prevent our correspondent from receiving either of the sums he mentions.

During last autumn, says the Journal of the Society of Arts, there were no less than seventeen companies extract ing gold from the auriferous sand of Finland. One of the panies returned a dividend of 70 per cent. The largest nugget weighed 28 pennyweights.

## Printing with Aniline Black

When ammonia is added in excess to a solution of alum, a gelatinous precipitate is formed which consists of the hydrated oxide of aluminum. This hydrate is soluble in acids, acting in that case as a base, but it is also soluble in caustic soda and potash, when it acts as a weak acid and forms salts known as aluminates of soda and potash. The aluminate of soda can be prepared very cheaply, and is advantageously employed, according to Dr. A. Kielmeyer, for coating the employed, according to Dr. A. Kielmeyer, for placed under the calico and running along with it. In cloth placed under the calico and running along with it. In
calico printing a portion, of course, of the color or mordant calico printing a portion, of course, of the color or mordant
employed passes entirely through the cloth which is being employed passes entirely through the cloth which is being
printed; and to prevent it from being deposited on the pressure rollers and returned to a clean part of the cloth upon the second revolution, it is customery to have a piece of thick woolen cloth (a little wider than the calico, running between the calico and roller to take up this excess) and to pass it over one of the heated cylinders; it is thus
dried and can be used two or three times before it has to be dried and can be used two or three times before it has to be
cleaned. The great expense of these "travellers" and the cleaned. The great expense of these "travellers" and the
lobor of cleaning them has induced several calico printers to substitute a piece of the unbleached cotton cloth. After being used once it can be bleached and is in no way injured for calico, except in one particular case. A piece of unbleached muslin which has been soiled by aniline black cannot be entirely cleaned by the bleaching process, and, moreover, the fiber is injured. For this reason it has been neces sary to adhere to theold method of expensive woolen "trav ellers" when using aniline black.
Dr. Kielmeyer has, however, made the interesting discovery that aluminate of soda mixed with scorched starch prevents the aniline black from attaching itself to the cotton. The alkalinity of this substance prevents the black from being developed; and at the same time, the solid hydrate of alum-
ina is formed where aniline blask and aluminate of ina is formed where aniline blask and aluminate of soda come in contact, and protects the fiber by preventing, the black from coming in contact with it. Attempts to employ the carbonate and acetate of alumina for the same purpose have not sucment of the black, they do not form that insoluble layer which protects the fiber.
In preparing the goods, the unbleached muslin, as In preparing the goods, the unbleached muslin, as
soon as it is singed, is passed twice through a cold soon as it is singed, is passed twice through a cold
solution of aluminate of soda of 4 or $5^{\circ} \mathrm{B}$. It is left solution of aluminate of soda of 4 or $5^{\circ} \mathrm{B}$. It is left
unrolled for two hours that it may become evenly unrolled for two hours that it may become evenly
distributed throughout the goods, and then dried on distributed throughout the goods, and then dried on
the hot cylinders. The cost of material for prethe hot cylinders. The cost of material for pre-
paring a piece 164 feet in length is, in Germany, paring a piece 164 feet in length is, in Germany,
about 4 cents. For light patterns, like shirtings, it used over two or three times, for heavier ones butonce; and if the pattern is very heavy, a solution of $10^{\circ} \mathrm{B}$. should be employed. Before proceeding to bleach them, they are placed in a muriatic acid solution of $2^{\circ} \mathrm{B}$. and washed. After bleaching there will be no trace left of the black. It has also been observed that the black patterns printed over this background do not strike through the goods so much as otherwise, and consequently the fabrics are not weakened so much; but upon the right side they are perfectly bright and full. Even this latter is of no small account when we re member that all aniline black, if never so carefully prepared has more or less tendency to rot or weaken the fiber

## IMPROVED SHOEMAKER'S PINCHERS.

Mr. William H. Hanna, of Chico, Butte county, California, has recently patented, through the Scientific American Pat ent Agency, an improved form of shoemakers pinchers, a


## with present.

It will be observed that the distance between the ends of the jaws and the pivot is considerably shortened, so as to secure greater power of grip. For the same purpose, the le ver is extended beyond the extremity of the handle. On the under side of the lever is made a projection, so that the jaws act as a fulcrum against the last and thus preserve as large a range of movement as can be afforded with the ordionger jaws The upper lever is placed in about the same plane as the jaws, so that the ine of drafi; coincides with the lever, and the lower handle does not come in contact with
the last, as is commonly the the last, as is commonly the
case before the leather is sufcase before the leather is suf-
ficiently strained. The teeth abut against the turning face of the jaws so as to bring the
bite near to the pivot, thus bite near to the pivot, thus
enabling the upper to be drawn enabling the upper to be drawn as close as is desirable to the no slipping off of the tool in cases of unusual strain and it is not liable to teartheleather or hurt the hand. Patented July 22, 1873. Further particular will be found in the advertising columns of our present seue.

## A Check to Railway Enterprises

Among the bad effects of the recent financial crisis is the cessation of work upon unfinished railways and railway machinery in various parts of the country. Many thou sands of laboring men have been suddenly thrown out of employment, and a winter of suffering appears likely to overtake hundreds of worthy families.
As an example of the mischief wrought by this unfortuate state of things, we may mention that the orders for locomotives at the Rogers works, Paterson, N. J., have been canceled and 600 men have been discharged. It is supposed that the principal locomotive shops will soon discharge several thousand men in the aggregate.

## VENTILATION OF SEWERS.

The annexed diagram represents one of a series of fans placed in the line of a sewer, with an air pipe from it, sup posed to be in connection with the atmosphere above the houses. It is the design of Mr. John Phillips, given in the Builder. By causing the sewage to fall into the fans on one side near the top and to escape on the other side at the bottom, they are made to rotate, draw air out of the sewer, and force it up the pipes into the atmosphere. The fans, therefore, are self-acting; and, if properly constructed and fixed, will not get out of order. If, in addition to the usual drain communications, pipes are laid from the open air into the sewer, at points midway or nearly so between the fans, it is evident that the air currents, established along the sew er by the rotation of the fans, will remove the gases as they

emanate from the sewage. Thus the power of the water flowing in the sewers not only carries off the sewage, but, by falling into the fans, with air pipes to and from the sewers in connection with the atmosphere, it is made available for ventilating the sewers as well.

Some New Phosphoric compounds.
A. Gautier has prepared a singular compound of phosphorus with oxygen and hydrogen, which has the formula $\mathrm{P}_{4} \mathrm{HO}$. If a certain quantity of crystallizable phosphorous cid is sealed up in a tube with 5 or 6 times its weight of terchloride of phosphorus and heated to $79^{\circ} \mathrm{C}$., hydrochloric acid and pyrophosphoric acid are produced. A bright yellow colored compound gradually separates, and can be obtained by first distilling off the excess of chloride of phosphorus, cooling the residue to $-10^{\circ} \mathrm{C}$., adding ice water, and then filuering. After washing on a filter, it is dried in a vacuum nd then heated to $140^{\circ}$ in a current of carbonic acid gas. The reaction is thus represented : $11 \mathrm{PCl}_{3}+27 \mathrm{PH}_{3} \mathrm{O}_{3}=4 \mathrm{P}_{4} \mathrm{H}$ $\mathrm{O}+11 \mathrm{P}_{2} \mathrm{H}_{4} \mathrm{O}_{7}+33 \mathrm{HCl}$. When the reaction takes place at a temperature of $170^{\circ} \mathrm{C}$., red phosphorus and pyrophosphoric acid are formed ${ }_{3}^{n}$ The compound $\mathrm{P}_{4} \mathrm{HO}$ is an amorphous body possessing a beautiful yellow color, insoluble in water alcohol, ether, benzol, chloroform, oil of turpentine, glycer in, and acetic acid. It can be heated to $250^{\circ} \mathrm{C}$. in dry car bonic acid without change. Heated in the air, it burns slowly with flame; mixed with chlorate of potash, it is exploded by percussion.
The same chemist has also obtained a compound whose formula is $\mathrm{P}_{5} \mathrm{H}_{3} \mathrm{O}$, by mixing the biniodide of phosphorus, $\mathrm{PI}_{2}$, rapidly with a large quantity of water. The new body is amorphous, of a pure yellow color, tasteless and odorless, and insoluble in any solvent. It is oxidized very violently by ordinary nitric acid, also by sulphuric acid. Heated in a urrent of dry carbonic acid to $135^{\circ} \mathrm{C}$., it is decomposed, phosphuretted hydrogen being evolved. Ammonia forms with it a brown compound; but on neutralizing with hydrochloric acid, the original substance is restored. The properies of the body $\mathrm{P}_{5} \mathrm{H}_{3} \mathrm{O}$ seem to agree with those of solid phosphuretted hydrogen, $\mathrm{P}_{2} \mathrm{H}$, described by Thénard.

## The Industrial Expositions.

The reports of the openings of the various industrial fairs hroughout the country indicate the strong favor with which his graphic system of demonstrating the material progress of the nation is regarded by the people From all accounts, the number and variety of the productions displayed has never been exceeded during any previous year; nor does it appear that any single fair has, from the hour of its commencement, failed to attract throngs of interested visitors. The Chicago Inter-State Exposition, a full description of the immense buildings of which ( 800 feet long by 200 feet in width), constructed through the generosity and enterprise of the citizens of Chicago, we have already presented, was recently formally opened, and during the first day of the exhibition 20,000 people entered its doors. Regarding the articles displayed, it is yet early to particularize, We learn
that every department is complete in a full representation of the important arts and industries to which each relates, so that in our future references to this fair will doubtless be found descriptions of many novel and important inventions. To the Kansas City and Cincinnati expositions, we have already alluded in detail. Both are succeeding admirably, and exciting no small interest in their respective vicinities. Indiana, in her State Fair now in progress at the Fair Grounds of her capital city, is making an excellent show of the manufactures and industries carried on within her borders. Louisville, Ky., celebrates a second Annual Exposition, and in St. Paul, the Minnesota State Fair was recently opened. In Baltimore, the 26th Annual Exhibition of the Maryland Institute, and in New Orleans, the Louisiana Fair, will afford the manufacturers of the Southern States a means of displaying local productions. Canadian industries will find representation in the Montreal Exposition and in the International Fair soon to be opened in Buffalo, N. Y. The excellent results of the experimental show of 1872 , in Newark, N. J., has stimulated its projectors to new efforts, and we are promised an exhibition even superior to the very creditable one of last year. In Albany, we learn that the New York State Fair is attracting 20,000 people per day, and that the display of live stock, especially, has never before been equaled. In our own immediate neighborhood is the Kings County Fair, held in the Rink on Clermont avenue, in Bronklyn, and devoted to the local manufactures and industries of our sister city : while in New York is in successful progress the 42nd Exposition of that parriarch among fairs, the American Institute.
Inventions Patented in England by Americans. [Compiled from the Commissioners of Patents, Journal.] From September 6 to September 9,1873 , inclusive. Blast Furnace.-T. F. Miner, Albany, N.Y Engine Valve.-H. I. Hoyt, Norwalk, Conn.
Flock Cutting Machine.-J.Pitts, Melville. Mass., et al.

## Getent Gmmical and foreigy eqatents.

Abraham C.Hulse and Joseph S. Crum, Palmyra, Ill.-This invention consists in constructing the parts of a pruning knife in such a manner that it may be quickly
pruner or the reverse.

Charles E.Evard, Leesburgh, Va.-This consistsinmovable jaws, provided with rectangular receesses across the upper corners and horizontal chain
rest, the said jaws when closed leaving an intervening open space large rest, the said jaws when closed leaving an intervening open space large e nough for the downard passage of the rivet.

Improved Ventilator.
John Ballou, Boston, Mass.-This is a frame in which a revolving ventilator is arranged so that the draft can be governed and light not be
excluded. The device consists of four wings, two of glass and two of wice gauze, amounting to two planes set at right angles to each other. By a quarter revolution, the glass will be thrown into a horizontal position, and the perforated pieces will take its place, thus admitting air while excluding insects.

Improved Farm Gate.
Tmproved Farm Gate.
Edward B. Decker, Carrollton, $\mathrm{Ill1}$. -This invention is an improvement in
in the class of farm gates wherein the lower part may be ratsed and lowered In the class of farm gates wherein the lower part may be raised and lowered
independently of the upper part. Two lower bars are pivoted at their rear ends to one of the gate standards or cross bars. Their forward ends enter ends to one of the gate standards or cross bars. Their forward ends entel
slots in the opposite cross bar. To one of the upper horizontal bars is attached a latch and hook, the latter of which, when the lower bars are
raised, catches their forward ends and holds them up. raised, catches their forward ends and holds them up.

Improved Milk and Cream Cooler.
Henry C. Baldwin, North Wolcott, Vt.-The outer vessel of this cooler is pipe in its lower part for drawing off, the water. There is also an opening to allow the waste water to escape when a stream of running water is introduced into the spout. A ring flange is attached to the bottom of the outer vessel to support the inner vessel, so that there may be a water space be tween the bottoms, and has a number of holes to allow free circulation.
To the outer vessel are pivoted hooks to keep the inner vessel in place To the outer vessel are pivoted hooks to keep the inner vessel in place
when the water is poured in. The cover has ventllators to allow the air to circulate freely, the mouths of said ventllators being covered with wire gauze.
Edward M. Deey, New York city. Fliting first part of the invention consists of an arrangement of devices for adjusting the roller and regulating the the goods can be raised without contracting the pressure springs. Less power is thus needed than is required to lift it against the springs. The second part consists of guides in connection with the roller to control it against lateral vibration. The third part consists in having the wheel by
which motion is imparted to one of the rollers provided with and rigidly which motion is imparted to one of the rollers provided with and rigidly
attached to a short shaft which couples with the roller, so that the latter can be removed without disturbing the wheel, and without the necessity of sliding the wheel off and on a portion of the roller.

Improved Steam Lubricator.
Reed A. Filkins, Cheskire, Mass.-It is proposed to have a hollow globe holder for the oil, having a hollow standard, with a conical enlargement of the hollow space at the lower end. This end screws into a hollow stand on
the steam chest or journal box. A stationary conical plug projects upward the steam chest or journal box. A stationary conical plug projects upward
from the bottom of the socket into the hollow of the lower end of the standard, so as to regulate the flow of oll by closing the mouth of said standard more or less, as the holder and standard are screwed up or down. The holder has $\varepsilon$ notched ring around its middle, which is graduated and numbered to show the extent of the opening of the feed at the mouth of the standard, and a spring click engages it to hold the oil holder to any
position in which it is set. From the socket below the standard of the holder the oil enters a little chamber, in the middle of which a tube rises around the passage from said chamber into the steam chest to retain a quantity of oll in sald chamber. In feeding, the oil will flow from the surface of the body contained in said recess, on the top of the tube, and down the inner surface of it, while the steam rises up in the center of the space.
There is a valve which will screw into the proper passage and close it, so that the steam may be shut off at any time to allow of taking off the holder when it may be desired to do so

Improved Breech Loading Fire Arm.
Daniel Hug, New York icty, assignor to himgelf and William H. Speer,
Jersey City, N. J.-This inventlon consists in a plvoted breech block, havJersey City, N. J.-This inventlon consists in a pivoted breech block, having a spring hook connected therewith and a cartridge extractor arranged
centrally beneath the barrel, combined, to extract the old cartridges and centrally beneath the barrel, combined, to extract the old c
throw them clear of the gun, as well as support the new one.

Improved Projectile.
James G. Hope, Wichita, Kas.-This invention is more particularly an improvement on the projectlle for which letters patent were Issued to
applicant October 4.1870 ; and consists in providing the stem of the project. ile with a double set of guide wings, one for preventing its rotation during filght, and the other for causing it to describe a curve of greater or leal
radus. radus.

Improved Can Soldering Machine. feeding cans to a soldering apparatus, and for reversing them so that both heads may be soldered to the body in rapid succession and without the removal of the same from their holder.

> Improved Ventilating Window Sash. linger, Philadelphia, Pa. -This invention relates

Collin Pullinger, Philadelphia, Pa. -This invention relates to convenient
modes of ventilating rooms through the windows without bringing to bear modes of ventilating rooms through the windows without bringing to bear
upon the persons therein a cold draft of air. The invention consists in a
novel arrangement of a small supplementary sash to slide above the to upon the persons therein
novel arrangement of a s
and to the bottom sash.

Improved Rudder for Vessels.
Juan B. Batista, New York city.-This invention is an improvement in
Juan rudders of the hollow class, and consists in forming a balanced rudder of
two parallel plates attached to transverse bars, which impart rigidity to said plates, and are in turn secured to the vertical shaft in such a manner as to leave a space between each of said plates and the shaft. The object

Improved Fence.
Wilbur S. King, Gonzales county, Texas.-This invention relates to fence Wilbur s. King, Gonzales county, Texas.-
adapted to those parts of the country where stock farming is pursued,
where timber is scarce, and where the object is to make a fence which will turn hogs as well as cattle and horses, at the same time being cheap, easily put up, and susceptible of quick and ready repair. It consists in posts, rails
and stakes, wired together so as to allow the lower parts to be filled and stakes, wired together so as to allow the lower parts to be
with brush.
Furnace for Producing Wrought Iron from Ore.

Furnace for Producing Wrought Iron from Ore. with a rotary puddling furnace, a gas-producing furnace and a deoxidizing chamber, so that the waste gases may be convent en.
Improved Combined Wardrobe, Bedstead, Chair and Table.
Walker Getchell, Bath, Me.-The front of the cabinet has narrow sides, constituting the pendent sides of the table top when detached from the case and arranged for the table. The folding legs are pivoted to it, boding
let down and fastened by buttons. Part of the top of the cabinet constitubes the back of the chair, and has the seat hinged to it. It also has an
upholstered cushion above the seat; and this is so fitted on the back and upholstered cushion above the seat; and this is so fitted on the back and
connected to the seat that, when it swings down against the side of the back to adjust the latter for its place in the cover, it draws the cushion
down below the top to uncover the end sufficiently to rest on the top of the down below the top to uncover the end sufficiently to rest on the top of the
sideboard of the cabinet, and when the seat swings up into position it of two boards, which nest together so as to be laid on the top of the cabinet and constitute the balance of the cover. The sections of the sides of
the case, and boards between the front and the main part, comprise the the case, and boards between the front and the main part, comprise the
principal portion of the bed or reclining couch. The wash stand, with a principal portion of the bed or reclining couch. The wash stand, with a
towel rack attached, is mounted on a door, which is hinged to the side
where an opening is made in the side of the case into a chamberwithin so that thestandswings into the case and is inclosed when the door is shut, and swings out for use when the door is opened. At the side opposite the
one having the wash stand, a drawer is arranged for linen and other like goods.
John McAuliffe, New York city.-The inventor $\begin{gathered}\text { Improved Umbrella }\end{gathered}$
fastening to umbrella ribs, to pivot. The inventor makes clips or laps for fastening to umbrella ribs, to pivot the braces to, by taking little strips of
sheet metal, well coated with tin, and folding the ends over back on one sheet metal, well coated with tin, and folding the ends over back on one
side, enough to make the elevation of the folded part about half the thickness of the rib, and so that the space between the said folded part will be
just enough to wrap around the brace and Inclose it snugly when the folded just enough to wrap around the brace and inclose it snugly when the folded
parts meet on the inside of the rib. A projection is thus formed to which the branched end of the brace can be pivotal. These ends and the folds are united together, and also the lap to the rib, by a drop of solder

Improved Wheel Plow.
son, Roscoe, Ill. -This invention
Lionel W. Richardson, Roscoe, Ill.-This invention is a sulky attachmend, which may be applied to the beam of an ordinary plow. The axle
is bent in peculiar shape. One wheel works on a crank axle, which, by a
suitable lever, may be adjusted so that the wheel may run in a furrow or on the surface and the machine still remain horizontal. The plow has a free lateral and vertical movement, easily governed by a lever at the hand

Improved Machine for Turning Wagon Axles.
eorge A. Bolder, Indianapolis, Ind.-This invention consists of a arrangement of the tool carrier, pattern, and feed screw, in a machine in Which the stick to be turned is stationary and the cutter is revolved around laid on a bench between the posts and centered by suitable means. A large
short tube is bolted to the posts in the axis of the machine, so that the axle to be turned projects through it. A pulley revolves on this tube, and carplate, in fourarms, arranged on the sleeve of the tall center and connected to the first face plate by a rod, feed screw, tool supporting rod, and the pat-
tern rod or centers, all of which are arranged at equal distances a part tern rod or centers, all of which are arranged at equal distances apart
around the axis, and at equal distances therefrom. The pattern is a facsimile of what is to be produce ed. It extends from the face plate to one of
the arms, and is fixed on them so that it can revolve making he arms, and is fixed on them so that it can revolve, making one revolu-
dion on its axis during each revolution which it makes around the axle. The tool holder consists of a freely moving bar, and it rests on the pattern.
The cutteris attached to the bar on the side next to the pattern. The cool bar is moved along slowly in the direction of the axis of the axle to carry the tool from one end to the other of the part to be turned. It is also pro-
posed to utilize this machine for making oval tenons on spokes upon the posed to utile
same plan.

## Improved Wood Filling.

Jerome E. Dittenhaver, Chapaleau, Ohio.-This invention relates to a ism, and consistsin a preparation which is entirely devoid of color, and will not therefore change the characteristic hue of the wood, which can be
applied with an equally favorable result to all varieties, and which permates so thoroughly the pores and fills so completely the interstices be-
tween the fibers that a single coat of varnish or paint will be generally sufficient to produce the designed outside face upon the wood.
Henry S. Cubberley and David Mann, Bloomington; Ill.
Henry S. Cubberley and David Mann, Bloomington, Ill.-This invention
consists in a frost proof jet, above which is a hollow standard surmounted by a movable bent tube. Within the standard is the valve rod, to the lower part of which is attached the valve. The rod continues on down below
the latterand is encircled by a spring which forces the valve up against its seat. On the upper part of the valve rod is a rack, in which works a pinion,
connecting by suitable mechanism with a hand wheel outside. By this means the valve is opened or shut.

## Improved Harness Maker's Clamp.

Daniel Eighme, Chicago, Ill.-This Invention relates to apparatus to
holding leather in the operation of sewing it for harness or shoe making o other purposes. The stand is wedge-shaped, and on each of the inclined sides of the wedge there is a rib. There is also a shoulder on each side
equal to the thickness of the lower end of the jaws. Theinnersides of the equal to the thickness of the lower end of the jaws. Theinnersides of the
jaws are grooved for the ribs and fitted to the inclined sides of the wedge. Jaws are grooved for the ribs and fitted to the inclined sides of the wedge.
The jaws are raised by pressing on a lever, and when raised are lowered and them in their normal position, which is to tightly clamp the leather. The jaws act a
lowered.

Improved Spring Hinge.
William Hoar, Floyd, Iowa--This improvement consists in attaching a
standard to one leaf of a hinge, and connecting a spring encircled extent standard to one leaf of a hinge, and connecting a spring encircled extern-
sion thereof with the pintle of the hinge. On opening, the spring is com. sion thereof with the pintle of the hinge. On opening, the spring is com-
pressed so that the action of the same on the door produces the shutting of the latter, securing also at the same time sufficient resistance against the accidental blowing open by the wind or otherwise.

Improved Portfolio Holder.
Jonas B. Aiken, Franklin, N. H. -This invention relates to portfolio holders which are adapted to be fastened conveniently against the wall of
a room and above the wash board. It consists in the mode of combining the two side frames with the bottom support of the portfolio, so that th latter may be held closely locked and protected against unnecessary hand
ling while it may be also held at an oblique angle so as to be easily exam ling while it may be also held at an oblique angle so as to be easily examwhich prevent withdrawal of the portfolio and are adjustable to those of
different sizes. different sizes.
Stop Mechanism for Doubling and Twisting Machines.
William Cockcroft and Reuben Ackroyd, of Chester, Pa., assignors themselves and James Massey, of same place. -This invention consists of stop motion in connection with the feeding or delivering roll of a twisting machine, so contrived that if the threads or yarns break it will stop the de
livery, and thus prevent the ends from going from one spindle to another The tension of the yarn holds the inner weighted end of a lever up above
stud pins on the pulley of the delivery roll so long as the yarn remains taut stud pins on the pulley of the delivery roll so long as the yarn remains tau
and unbroken, but when the yarn breaks the inner end of the lever will and unbroken, but when the yarn breaks the inner end of the lever will
fall and stop the delivery roll by engaging one of the stop pins, and thus
Improved Machine for Rolling R Round Tapered Bars.
Charles F. Brown, Warren, R. I. -The object in the present invention is Charles F. Brown, Warren, R. I.- he object in the present invention and it consists of two eccentric disks revolving in opposite directions on a
central arbor in a suitably constructed frame, so beveled as to roll or straighten a tapering spindle or other article, and in one or more guide through which the article to be tapered is introduced. The eccentric sur faces have the effect of inclined planes upon the spindle, approaching each
other in one part of their revolution, and receding from each other in an other in one part of their revolution, and receding from each other in an
other part, while the spindle simply revolves and receives its form and shape from the pressure imparted by the beveled and eccentric revolving
surfaces.
Improved Saw Tooth Gage.
Cyrus E. Grandy, Stafford Springs, Conn. -This invent anions cular saw, to gage the teeth round and as to the set ; and mandrel of a cir Improved means for attaching the sweep to the mandrel second a temple in combination with the sweep, to insure the parallelism of the sweep with the saw, and an arrangement of the tooth gage supporting arm in the
end of the sweep to shift laterally, as required, to adjust the gazes to the plane of the saw; third, an arrangement of the gage holding arm to oscil late in the sweep, to adjust the gage to the front face of the teeth; fourth angle of the teeth front may be ganged by it with certainty (it is also ar ranged so as to gage the teeth round); fifth, an adjustable gage on the afore said arm for gaping the set of the teeth; and, sixth, an upsetting
holder on the said arm.

Improved Compound Metal Working Machine.
L. Jones, Danville, Wis. -The object of this invention is to fur nigh for the use of blacksmiths and wagon manufacturers a combination tool, by which the operations of cutting and punching iron, and the tight
ening, upsetting, and bending of tyres may be accomplished in a single ma chine. ' The frame of the instrument, of oblong shape, is firmly secured to the ground, and provided with strong vertical standards between which is
pivoted an eccentric which is operated by a lever. The eccentric operates pivoted an eccentric which is operated by a lever. The eccentric operates
on the knee joint levers, one of which is hinged at its outer end to a heavy block, moving in a recess of the frame. The block is pivoted with its lowe end to frame, and provided with a cutting blade which acts on a simile
blade of the frame in the manner of shears. The other knee joint lever hinged to a sliding carriage which moves in a recess, and to which is se-
cured, in the direction of the longitudinal axis of frame, the puncher which acts on a perforated steel cutter in a socket. The upper side of car rage is grooved and has a vertical extension plate which carries a strong
bar or bolt and a partially grooved eccentric. Other eccentrics and grooved bases are arranged, between which and their corresponding grooved bases, the wagon tyre is clamped and either tightened or upset when
off the wheel, as required, by the lever acting on carriage. For bending or rolling the tyre the cylindrical rollers are arranged sidewis of the frame. The outer rollers are adjustable for tyres of different sizes
and thicknesses. The notched roller is placed between and above the and thicknesses. The notched roller is placed between and above the
outer rollers and turned by a crank, giving the bend to the tyre on its pass age through them.

## Value of Patents, and mow To obtain reni.

 Practiced lilts to liranilorsHe
ROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent are found to pay correspondingly well. The names of Blanchard
arse, Bigelow, Colt, Ericsson, Howe, McCormick, Hie Morse, Bigelow, Colt, Ericsson, Howe, McCormick, He, an tins, are well known. And there are thou
have realized large sums from their patents.
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HOW TO
多 This is the closing inquiry in
nearly every letter, describing 0 BT A

## swer canonly be had by presenting a complete application for a patent to

 the Commissioner of Patents. An application consists of a Model Draw-inge, Petition, oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this
business himself are generally without success. After great perplexity and business himself are generally without success. After great perplexity and
delay, he is usually glad to seek the aid of persons experienced in patent
business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them they will advise whether
the improvement is probably patentable, and will give him all the directions the improvement is probably patentable, and will give him all the
needful to protect his rights.
How Can I Best Secure My Invention?

How Can I Best Secure My Invention?
is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows. and correct :
Construct a
Construct a neat model, not over a foot in any dimension-smaller if pos-sible-and send by express, prepaid, addressed to MoN \& Co., 37 Park Row
New York, together with a description of its operation and merits. On re celt thereof, they will examine the hivention carefully, and advise you as
to its patentability, free of charge. Or if you have not time or the means
at hand, to construct a model, make as good a pen and ink sketch of the
improvement as possible and send by mail. An answer as to the prospect improvement as possible and send by mall. An answer as to the prospect
of a patent will be received, usually, by return of mail. It is sometimes
best to nave a search made at the Patent. Office. Such a measure often saves

## Preliminary Examination.

## In order

 ton, in your own words, and a pencil, or pen and ink, sketch. Send thesewith the fee of 85 , due time you will receive an acknowledgment thereof, followed by a writ en report in regard to the patentability of your improvement. This special
search is made with great care, among the models and patents at washingarch is made with great care, among the models and patents at W.
on, to ascertain whether the improvement presented is patentable.

## Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made dare

## To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if suse. ceptible of one, although sometimes it may be dispensed with; or :t the in
vention be a chemical production, he must furnish samples of the ingrediants of he inventor's name marked on them, and sent by express, prepaid. Smalt
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Waring \& Bro., colora, Cecil Co., Md. Brown's Coalyard Quarry \& Contractors' Ap.
paratus for hoisting and conveying material by ron cable
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dies. ghaping Machine for Wood working. T. R. Balley $\underset{\substack{\text { dles. © Shaping Machin } \\ \& \text { Vall, Lockport, } \mathrm{N} . \\ \mathrm{Y}}}{\text {. }}$

Peck's Patent Drop Press. For circulars,
address Milo, Peck $\&$ Co., New Haven, Conn. Boring Machine for Pullloys ono. limit to
capacity. T. R. Bailey \& vall, Lockport. N. Y.

##  <br> C. A. P. asks: How can I braze a broken

H. asks: How can I make the best bleach-
ing liquid for washing clothes? J. W. R. asks: : What is a good artificial
bait for sunfish? "
Grubs are scarce in my locality." T.ess ascertained the tensille strength of the material composing his balloon, as well as the pressure to be
borne by il (determined by the required weight to be
W. H. B. asks: Is there a substance or comignited with a matche eith her with or without the uese of a
witc?
It mast trod easily melted, and if poured in that state upon a flat piece of ordinary solder must adhere so frmly as, when
hardened, not to become removed by ordinary handling

## 

W. P. H.'s query is incomprehensible. J. J. H.s question 1sa professionai one; he should on-
uit some good engineer.-J. s. B. should read the des

F. O. B. asks: Would it not be a a good idea
to place air pumps on a locomotive engine, so that, in
 a train to arrest the motion, that the air pumps could be
usee to torce air intoo the oboller, thereby y nereasing the usually wasted in applying the brakes? And could no the steam cyllinders themselves be used for that purpose B. A. K. asks: Will a broad gage locomo
tive run 200 miles in a shorter time than one built on the
 much the larger? 2. Does aro brod agaegelocomotive carry
more dead weight in proportion to its size than the nar.
 might be differences between the performances of the
two engines, but one would not necessarily have any
F. O. C. asks: 1. Who was the first inven-
tor and builder of the locomotive engine, and who laid down the frst railroad? 2. Would a leaden tank do for
storing muriatic acid inl large ounantities 3 . What metal
 The stockton and Darlington Railroad, in England, was built in 1825. This was the first. 2. It, probably would,
3. Read the article on page 307 of our volume XXVII. Wh. L. asks: What is the highest degree at
which water can be boiled? If I have 15 lbs. of steam
 Answer: The boiling point of water depends upon the
pressure to thich it sis subjected. Se article on "Prop.
petse volume.
G. asks: How can I calculate the horse engines and pumps? Answer: We cannot answer the
question about horse power without more data. You will find rules given in former answers to correspon. with w whil beourne's "catechism of the steam Enenine,
which can be obtained from D. Van Nostrand. Ther Which can be obtatned from D. D. Van Nostranu. The
are many things realating to engines and pumps tha cannot be learned f
ered by observation.
C. G. H. Asks: When out of sight of land
how will Professors Wise and Donaldan know in what how will Professors Wise and Donaldoson know in what
course they are moving? The compass will point out the north; but as the balloon has no stem or stern, they
can not tell which way they are going. Answer: Mr. Donalason
course by dropping something from the balloon, an observing the direction with reference to that.
W. B. asks: If a horizontal pipe, of 6 inches
nside diameter, about a foot long, havfingconnected on one side $a$ half or three quarter inch (inside diameter
pipe, standing erect, about $t$ feet long: and at the other
 tion to the water pressure from above, and pushes
against an object in its immediate front: will there be a horizontal forward pressure, and none backward? 2.
If so, how much, by a pipe 4 feetlong and half an inch fore, standing erect, with a 6 ineh bore of a foot long
horizontal pipe?
3. If the water is forcibly driven in will the force, resulting in the forward pressure, be
equalto the force above expended, or greater? Answers: There will be both a forward and back ward pressure The later pressure can be resisted by a plug tn the pipe
2. The amount of this pressure will be about 49 pounds 3. If the water is pressed above, the forward pressure
W. C. B. asks: 1 . What is the limit of the
hight to which a siphon will dra w water or what is the highest point at which it can be worked? Will it do
any good to let the pump down in the ground 10 feet let the pipe run over the tow of the the gillond on the feet, and
of the ground? of the ground? Answer: From 30 to 32 feet 1 is the great-
est hight tin practice, and any lift above 28 feet causes
 must be low
craseadift.
E. G. F. asks: Is there a book devoted ex clusively to stationery and portable engines, their con
struction, management, etc.?
Answer: Yes. See cata logues of som.
in this paper.
A. L. K. Says: Is it possible to produce an
articicial ir
rost overan area of some square miles? S. J. J. O. asks: Where can I obtain the " Ta,
ble of Change wheels for the Scre w cutting Lathe," recently reviewed in your columns? Answer: We are un-
able to add any information to that already pubblished an our notice of the work.
M. O'R. asks: 1 . Where can I find a des-
oription of Profesesor Boyle's experiment or device for
 there any method or process for depositing nickel on gheress similur or analogouss ot the proceess by which sil-
ver is deposited on glass? I want to get a bright metal-

 his machine for local retoucheses consisted in the em-
per ployment of a lozenge shaped local polisher instead of
the usual round one. Robert Browning of London makes silvered glass mirrors, and sends a pamphlet for a shilling. Mr. Clark tried one of his 13 inch specula and
found that the diffraction around the three strips of Tound that the iifriacion around the three strips of
steel supporting the ciagonal mirror caused the image
of astar to has completed with his own hands a silvered glass mir. ror, twenty-eight inchese in diameter. It is supported on an india rubber air cushion. Professor Smith recom
mends nickel-plating cast ron careful annealing. The silver coating tarnishes wherever the air contains compounds of sulphur. In towns,
therefore, the silver coating of glass mirrors should be nickel-plated by the battery after polishing.
J. F. S. S. asks: Would the collection and
condensation of the gas or gases arising from hot min condensation or the gas or gases arising from hot muri-
atic acil, after it has done its work in clearing tin scrap, be patentable? Answer: Whenther your method
isew depend upon ho wou collect and condense the gas. If you condense by means of an ordinary conden. ser or worm, or receive the gas into cold water, there
is nothing new in tt. But this plan of collecting and saving the hydrochloric acid gas might be combined wit your process of cleaning tun scraps and be patenta-
ble, as might also improved machinery for effecting
eiltherresult
Improvenents either result. Improvements for preventing
of gas into a room would also be patentable.
C. E. F. asks for directions for preparing cupro-ammonium consists of a solution of cupric oxide
or black oxide of copper in aqua ammonia. It may be produced by precipitating a solution of a copper salt, a the sulphate, by strong ammonia, and then adding am
monia in excesss so as to dissolve the precipptated oxide In this ases, however, it is not pure, as the acid of the
conper salt, when the oxide of conper is pecip it copper salt, when the oxide of copper is precipitated,
comblnes with the ammonia, forming an ammonia salt, which remains in solution. To form pure ammonio trongestaqua ammonia.
W. R. asks: Is there any kind of air pump
hat will produce a stronger pressure of air against any object than a good strong wind? If so how much would
such an ar pump weigh, and how heavy an engine
sould it take to run it it? Could they both be taken up in a balloon? Would $1 t$ be practicable thus to drive a
balloon against the wind? Answer: Such air pumps are ade, but the machinery wo
practicable for use in a balloon.
W. B. asks: Why do music boxes squeak
fter they have been cleaned? The noise is not in the running machinery, but in the steel reeds which the
pegs of the roller strike on. Answer: Probably the noise
pegs.
A. asks: Why cannot we do away with Anstructed as to work a screw? Answer: The idea Old and impracticable. By no mannerof device can you
make the wind drive a boat directly against the wind. You can sall obliquely, and for this purpose the ordinar ans would give you more proy elling
convenient form, than any windmill.
G. V. . H. says: My house is stone, with pine shea thing, and I shall ceilit it with pine. What ma.
terial would be best to put in between the roof and the
 Answer: Sawdust illing in this case is objectionable timber, either rot or dry rot ; second, because it will de cay itself and find its way through the joints of the
boarding, thus illing the rooms with dust and deteri orating the air. The usual course in such cases is to
unspend strips at from one to three feet below the roo joists and at about two feet apart, and to put the ceil ng upon these, thus depending upon a large air space
between the celling and the roof, as a non-conductor of heat. The strips are made firm by being braced at short intervals to the joists; and if a plastered celling is re
uurea, a series of narrow cross strips are nailed to the ersat 12 incles apart, to which the lath are secured. R. B. C. says: In regard to D. B. M.'s an
wer to ask: 1. Whydo the observations have to be taken 12 it when the shadows of the two plumb lines coincide?
. What kind of an almanac will tell how en . What kind of an almanac will tell how much the sun he true merdian from the results obtained by the pumb line arrangement? 5 . Is there any more reliable
pparatus for determining the meridian than by usin lumb lines? Answers: :1. No. In 11 hours na 58 min the pole. The pole star is on the meridian about seve reen minutes after the plumb line covers both it an Alioth, (epsilion Urse Majoris) \#fth star of the Dipper beginning with the pointers. The plumb lines may also
be ranged with the north star at its greatest eastern or vestern elongation. Then, if the lines are 100 tnche epart, one of them must be moved two and six tenths
nches to range with the pole. 2 . Look at the almanac nches to range with the pole. 2. Look at the almanac
or "sun at noon mark," which is the required correcion. sun at "non mark," which is the the required correc
in ire placed in the true meridan, that is, they range due
orth and south. 5 . Yes; by using the solar compass, ransit, etc.
G. R. asks: Is there any difference made, in
he amount of water di scharged by an hydraulic ram, by Increasing the size of dischargeed by pine trom tram one inch to hight to raise, 60 feet. Of course the size of pipe ( 1 inch ) is already sufficient to allow a discharge of fifty times more water than Is elevated by the ram. Does the size
of the pipe, by exposing more or less surface to water,
ofter more or less friction ischarged? Answer: Unless the supply pipe is very eng a diameter of one inch will probably give better esults than a diameter of one foot. This is on the sup.
position that the ram is properly designed for $a$ pipe
W. G. A. asks: Would not one bumper on
J. W. H. asks: 1. How can I determine when water is foaming in a steam boiler? 2. What is
generally usef for cementing grist mill stones, and for
fastening fastening smaller sized stones in iron cups? 3. I have
20 inch corn mill. The top stone is broken in two the 2inch corn min. The top stone is broken in two in the
center, and the cement, from exposure to the weather has roted. I made a thin solution of plaster of Prars,
set the burr or stone, and then poured the solution arourd the burr in the cup. It is a fallure and does no become hard. What shall I do? 3. Can you give me
instructions how to temper mill picks A answers :
 observing whether solid water or a mixture of steam
and water issues therefrom. 2. Set the stone in the cup ailing up the back with a cement composed of plaster of Paris. Fill the interstices between the stones with
a cement composed of powdered alum and a powde made from small pieces of the millstone. 3. Picks ar
D. B. Says: Suppose I have a steam cylin-
der, with 50 inches area, and 20 ibs. constant pressure and insert two pistons, admitting steam in center be
tween the pistons, so that they are both forced out $\mathbf{w a r d}$, would each piston orercome a resistance of 1,000 lin
dess friction (less friction), or the two only 1,000 118s. collectively
Answer: Each would exert a pressure of i,co pounds.
C. M. N. asks how to precipitate sal ammo precipitated by hydrochloric acid or any chloride. If
in a solution by itselff it will crystallize out on concen rating the solution by evaporation. The two salts can not exist in the same solution, as the sal ammonia
would precipitate the silver. sal ammonic is precip. ated by the itchiorde of plainum in concentrated 8 lations. If C. M. N. N. will ilive a more preceise explana
lito of what he wants, we may be able to assist him . W. M. F. asks: 1 . What is the use of a
storm glass? 2 . How is it used? 3 . Should the long 4. How can I tellel the a pproroch of a s torm by the use of
he storm glass and thernometer combined? 5 . Ho the storm glass and thernometer combined? 5. How
can Imake muriate of ammonia? 6. How can I make malic acid? Answers $1,1,2,3$, 4. It is not necessary that sign of fair weather. If the solid particles rise in th
iguid, it signifes rain liguid, it signifies rain. Before a storm or very high
wind, the liguid will become thick. 5 . From the ammo niacalliquors formed in the manufacture of coal gas tain ash. You would do well to consult some standard
work on practical chemistry, as we have not space to ive demion 1 Wh
 engine, which is constructed on the old plan of hollo shaft and arms, through which the steam passes, ex
hausting at the curved ends of said arms, always in an opposite direction? 2. What per centage of economy can
be realized from the above plan, compared with the be ealized from the above plan, compared with the
best form of reciprocating engine? 3 . Would there be any gain of power if the steam, in exhausting from the carved arms, came directly in contant with the inner ratcheted face of another whel, causing it to revolve
in the opposite direction, the two emitting their power nt he opposite direction, the two emitting their powe
by means of one e cross and one straight belt, beleding to another shaft at suitable distance?' 4. What is you oinn ion In regara to a series of feet beesing connencted
each other by means of links or hinges, therr inner face beting provided with rollers, the whole forming an end
ess traction device, revolving around an endless tract nd propelled by engines mounted on the frame? Some twenty patents have been allowed to different invent
ors for oertain improvements on this form of traction ors for oertain improvements on this form of traction
engine during the last 12 years, and yet there seem engine during the last 12 years, and yet there seem to
be none in use, either because the whole machine com bined is too complicated, or the connections, being con
tantly exposed to grit and dirt, are not durable. Su pose these revolving feet to be 4 feet $x$ 14 inches each,
and they are so connected that one does not leave the and they are so connected that one does not leave the
ground untll the nexxt one relieves it it ; f we construct a traction engine with two traction Wheels 6 feet diam is driven by engines of the same power as the ones em
ployed to drive the endless traction machine, which of these plans will draw the greatest 1oad at the sam
heeed and which would be the ost practice se every day use? 5 . What is the object in the rubber tire used on road steamers? ? is it to give increased traction
or is it for the purpose of relieving the body of the maor is it for the purpose of relieving the body of the ma
chine of the shock or concussion which would occur if Generally speaking n engine depends upon its mode of construction, sys be given that will apply to every case. 2. We have no eecord of tests that will enable us to answer this ques ion. 3. If applied on the principle of the co onpound
engine, there might be a gain. 4. Traction engines ar argely used in England, and their introduction into thi forms of traction wheels in use which have more adhe sion than the engines of the machines can overcome
N. A. P. says: Two forms of screw propel
er are tried on the same vessel, each screw or whee eing of the same diameter, and the pressure of stean A, 4,000 revolutions are required to propel the vessel mile in 8 minutes: while with wheel B, 3,000 revolution make the 1 mile in 8 minutes. Is there a difference o nace consume more fuel with wheel A on the shaft? so, how much more? Answer: If we understand you
question rightly, wheel B has 25 per cent more efficienc han wheel A, and consequently 25 per cent less fuel A. F. B. Says: 1 . Is the pressure of steam on
every square inch of the fues the same as it is on the shell of the boiler, or has steam the same pressure towards the
center as it has from the center of the boiler? aw that action and reaction are equal and in opposite d rections applicable to the first query? Answers :
Steam presses equally in every direction. 2. Yes.
J. G. D. T. asks: 1 . Does gunpowder, when stance) create pressure by producing air? 2. If so, is
there a gradual expansion of its atoms, so as to create gradual force? Answers: 1. The solid grains of th nd carbonicacid. There pronsion atho ing with a pressure of nothing and rapidly increasing A. M. B. asks: Is it an uncommon occur boilers in? Was not the Dictator launched with her
machinery complete? Answer: It is not usual. The Dictator and most of the $m$
their engines and boilers in.
C. E. H. asks. II there any way of remov-
ing coal tar from the bottom of a asill boat, the boat
 works? Scraping will not answer. Answer: After
scraping offas much tar as practicable, try naphtha as a solvent for the remainder. Rub with a sponge or clotit soaked in the naphtha.
P. asks: What is the best cheap prepara-
tion for preserving pine shingle roofs, to be applied either betore or arter laying the shingles? Answer:
TTe article advertised as slate paint may answer your purpose
J. B. S. E. asks. Is amor hous phosphorus
soluble in any of the ethers? If so, what is the process? If not, what is it soluble in? Will the additition of another substance, not deleterlous, make it soluble f An
swer: Red or amorphous phosphorus is insoluble in the ordinary solvents of common phosphorus. According to Möhler, red amorphous phosphorus may be rendereed
colorless and perfectly transparent by fusing it in a con. centrated solution of bichromate of potash mixed with sulphuric acid. After this treatment it usually re.
mains licuid after coollng, but solidiffes Instantly when mains liquild after cooling
touched by a solid body.
E. L. Says: Suppose four canals, each one
nile ion gand thirty feet wide to be six feet deep at discharge end, with water below, level with the bottoms.
At the entrance ends, the depths are $5,6,7$ and 8 feet respectively, with full supply of water at these depths, and regulargrades between inlet and outtlet: How Hume
will each canal discharge in 24 hours? $A$ Answer: You can find approximately the velocity of discharge in feet per second, and from this the quantity discharged per
second, by the following formula $\mathrm{V}=$ velocity in feet per second, $\mathrm{t}=$ total fall in feet, $\mathrm{A}=$ cross
feet $1=$ lenction of canal in in feet. $\mathrm{V}=\mathcal{V} \overline{(10,000 \times \mathrm{f} \times \Lambda)} \overline{\div}+(\mathrm{l} \times \mathrm{p})$; or the velocity of discharge in feet per second is equal to the suaure root
of the product of 10,000 by the total fall in feet area of cross section, div
length and wet perimeter.
J. D. W. asks: Does the term steam engine a biller? Idor ont refer to toprtable enmpinese wnstivert
A steam engine does not include a boiler unless it is so stated expressly.
P. D. W. asks: What is magilp composed and mastic varisish, used by artists as a vehicle foet their
colors. The proportions vary according to the work. Itis thinned with turpentine.
C. M. L. asks: What can I put over silver
leaf to keep its color?
Answer: Trya varnish composed
of pale shellac 8 ozs., rectifed spirit, i quart; dissolve. J. W. H. asks: Is it thrue that, the warmer
water is. the more gas it will absorb?
that can be meansorbed by water. Answer: The any general lua can be absorbed by water. Answer: The general
law is that the colder the water, the greater the quanti law is that the colder the water, the greater the quanti.
ty of the gas taken up and retained by it. Hydrogen is all temperatures of the water.
H. H. M. asks: What is the name of some how is that article manufactured? Answer: Carbolic
acid is made from coal tar. The tar is distilled until anthracene comes over. The resulting oil is rectified, 3020 and $392^{\circ}$ Fahr. This oll is mixed with saturated potash ley and powdered hydrate of potash, by which it
is converted into a white crystallized mass. This substance is dissolved In hot water ; the oill which rises to neutralized with muriatic acid. Impure carbolic acid now rises to the surface as an oll. This can be purified by washing with a little water, digesting over chloride
of calcium to dry it, rectifying several times, and finally cooling to $14^{\circ} \mathrm{Fahr}$, when pure crysto of and finally separate, from which the remaining fluid portion is
poured off. We know of no treatise on the subject.
$\underset{\text { wall six feet from the floor heat a room as quickly and }}{\text { H. C. L. asks }}$ as cheaply as one placed fifteen inches or less from the floor, and why? Answer: Yes : for whether the regis
ter is placed near the ceiling or the floor, the warm air will ascend to the former at once, unless some obstruction intervenes. Where a lower hall way connects with an upper one by stairs, and the register is in the lower
hall, the warm air will net nascend to the upper one, be hall, the warm air will net ascend to the upper one, be
cause of the obstruction of the ceiling and the attraction of aggregation which subsists between the parti-
cles of the warm air ; but in an ordinary rectangular oom such obstruction does not exist. The proper place for a register for warm air, however, is at or near the floor, for convenience in warming the feet, etc., in very
cold weather. All rooms intended to be warmed by the ingress of warm air should have a ventilation flue having a register at the bottom and at the top of the room, to insure a proper inflowing of the warm air, an
this flue should be on the opposite side of the roon rom the warm air flue.
C. A. H. asks: By connecting a 2 inch hose all 2 inch? Answer: The friction of the water will b decreased by this arrangeme
large hose will be the least.
K. asks: Is a mining $\operatorname{lamp}_{\text {ase }}$ as safe if en
en in swer: Yes.
E. C. G. asks : 1 . Is, there any way of re-
placing the gilt on a frame, and what is it?
2. How can galvanize wrought iron? Answers: 1 . You could lenceln the matter. We would advise you to entrust it to some one who makes a specialty of this kind of ofus-
iness. 2. Dip the iron into muriate of zinc, and afterards into molten tin.
R.A.P. asks: What is the formula for engine smoke pipe, as used by succeessful engine build greatly, and the best rule would probably be an empir cal one based on data obtained from successful examples. For an approximate rule, the following is a ver good one: Allow 200 cubic feet of air for the combustio
of one pound of coal per minute ; and having assumed diameter for the chimney, and the number of pounds of coal to be burnt per hour, it will, be easy to ascertain velocity in feet per second. Then for a temperature o hight of the chimney in feet necessary to produce this velocity is equal to one eighteenth of the pruare of the
velocity in feet per second. More accurate method are given in Professor Rankine's "Treatise on othe
Steam Engine and Other Prime Movers."
J. S. says, in reply to T. H. ., who asked if a
spar of white pine could be used as a float for deep sea soundings: At the depth he mentions, namely, s.000
fathoms, I am almost certail his spar once down, would never rise again, for the following reasons: Dry wood is principally composed of cellulose, the specific gravit of which vares from $1 \cdot 25$ to 1.5 ; and were it not for the
eellular structure of wood, it would not float at all s practlcally shown when it becomes water-logged. a depth of 5,000 fathoms the pressure would be abour
5,0001 bs. to the square inch, or 1,080 tuns to the squar foot. Ido not think white, pine could resist such an
enormous pressure. The use of a mixture to generat gas at the bottom of the sea is not impossible, bu
hould say 1 it ishlighly should say it it is highly impracticable. Sea water isabou
850 times hea vier than atmospheric air; but at a depth of 5,000 fathoms, air would be compressed 1.000 times and therefore would become heavier than water. An,
gas of a greater density than art, such as carbonic acid Is of course out densty than air, such as carbonic acit gas that could be oused. $1,1,000$ cubic in inches of of hydrogen
hat at 600 Fahr. and barometer 30 Inches, weigh 21.379 grains
at the above depth 1000 eubi
 nches of hydrogen would have a lifting power (at th above depth) of about 237 grains; or to lift 10 lbs., a T. H. Wants to do, it would require 170 cubic feet of hy
drogen. This scarcely requires comment. T. H. could asily accomplish his object by using as a float a fexible waterproof bag containing some liquid lighter than
water, say cylindrical ba ba f inches diameter and 2 feeit long, thus filled, would have a lift ting power in sea water of abou
Ilbs, All liquids being nearly alike compressible, the dit

would be very minute. As the deposit at the bottom of ne sea is in some places, I believe, of a tenacious nature,
. H. 's sounding rod might possibly stick there, unless his float was inconveniently large. It mighi beadvisa,
hie for him to provide for sucha a contingency by ving the apparatus represented by the engraving. Fig. 1 is a tube with a slot, S, on en elther side, containing a lo osely,
itting piston P , with two lugs projecting through the itting piston, P , with two lags projecting through the
silots, also a strong spiral spring. Fig. 2 shows the weight and catch disengaged ; the lugs of the pisto striking the weight, jerk the tube clear of everything.
The disk, D, prevents the posibillty of end of tube king in the bottom, without disengaging the welght
A. T. A. says, in reply to G., who is troubled bout twent y -hve pounds of sugar, and I am frequently roubled with these same red ants, but when so troubled get three or four large black ants and put them in th De seen, the black ones eating them up. As a means of
preventing ants from getting on to a table, I put a reventing ants from getting on to a a table, , put a
piece of tobacco under each of the feet, and keep the blefrom contact with anything else
R. S. H. says, in reply to C. F. B., who says bevel on the front or cutting side of the tooth than on
the back side : This is correct. He further says that the ifference in the bevel is caused by the taper of the file
this, Ith thak, he is not correct. The difterence The difference of even on the two opposite sides of the tooth is caused
y the position in which the flie ts held. If he runs his ie level, while the saw is held plumb, he will find the cult to decilde which on the has the mast 1 will be dir ficult to decide Which side has the most, showing tha
the taper of the file has little or nothing to do with it Dropping the handle end of the file and elevating the
point will and does produce the effect which he lays to the shape of the flle. Moreoverit producesa deeper cut nd a lorger and more pointed tooth, which gives
sharpercutting point, and furnishes more space in whicl o carry the sawdust.
S. S. says, in reply to F. A. S. . who asked
or directions for constructing a stove to dry fruit e eto without changing the culor: He should have the drye
made of brick, or, if it is made of fron, have it tited vith a porcussining, and neever allow the heat to get selow 1000 as the color changes in proportion to the
ime it takes to dry the fruit. If he intends to dry large uantittes, it should be made with several chambers, tha the green
tially dry
$\underset{\text { A. H. Says, in reply to J. C. S., who asked }}{\text { bout the dimensions of a belt per horse power: Alinch }}$ belt at a velocity of 750 feet per minute is a perfectly afe rule to calculate for one horse power. [There
seems to be a considerable difference in the tigures used or belting, and we shall be glad to hear from any of ou eaders who have made experiments. A rule by Mr
Rider, lately published, tataes that a belt one inch wide nd bearing on at least one third of the circumferenc pounds, at any velocily. ent case, we find that, with a velocity of 750 feet pe minute, the belt would transmit $(19 \cdot 25 \times 750) \div 33,000=0 \cdot 43$
T. M. G. Says. in answer to a querist who
asked if broken ylles can be mended: I nave to say that my father one imported a lot of files, many of whicl
mrived broken
He tunned the arrived broken. He tenned them on the clean broken
ends and " sweate"" the the strength of the joint so made, one was struck acros
D. R. says, in reply to a correspondent who
asked how to tharden jewellers' rolles : Put them in a cast iron box with carbon made from fivory chinp, and
keep the box ata dull red heat for 4 or 6 hours; then sep the box ata dall red heat for 4 or 6 hours; the
ip the rolls it water, or salt tand water. They must be andied quilckly fr
poils the surface.
A. S. G. replies to R. B.'s query as to pass
in trains as follows: Engine A can run on to the sidin vitheight cars, leaving the other elght on main track ngine B then runs past, pushing the eight cars before
$t$, after which A regains its place on the mann tract arter which $A$ regains 1 its place on the mant rack,
eeting out of the way while $B$ puts the eight cars on to the siding, runs by them, and pulls them again on to he main track. The trains have now passed, and nothing remains but for $A$ to pick up its cars, and go on
the way. No problem of this kind is in insoluble, as long st he siding can hold at least one car with its engine Answers similarly correct have been reeeived from
F.D.C., E. . W., T. M. W.,G. E. K.,H. R.R., H. C. B. O.B.A. S., E. R. .and J. N. P.- Ed . .
B. B. says, in reply to R. B's query as to
rains passing each other: Two trains cannot pass eacil es described.
J. S. B. \& $\&$ Co. say, in answer to $\mathrm{H} . \mathrm{H}$. who
asked for a cement for a leaky cast iron furnace: cleai brings or turnings of cast iron 11 lb ., sal ammoniac,
zzs, Ilowers of sulphur, 1 oz. Mix them well together and eeen dry. When reauired for use, take of the mixture
part, clean borings 20 parts: mix thoroughly and add a suffcient quantity of water. A little grindstone dus added mproves the cement.
w. D. N. replies to A. A.P., who is troubled
 n your engine while cooling oft. Any engine is harder
to start after cooling, partly pecause of the water of condensation and partly because the engine is cold. LA.P. says that when he uses a small quantity of water
in his boiler, he does not have the trouble; hence it does not probably occurf from condensation in the cyl
D. B. says (in answer to A. B. F. who asks
Does sulphur when burned for bileaching purposes do equally well whether the flame is bue or red with a
sparkling blaze? 2 . Dees the burning in the two dif.
sferke rerent
revent cotton or linen fabrics from becoming mil
ewed? must be produced by some impurity. 2 . The blue, of
mex an be prevented by the use of powdered sulphur
G. W. W. Says. in reply to E., who asked
now to utilize several hundrea horse power running to waste at a distance of 3 miles: Put a water wheel at the fall, and attach ald pumps, lay a p pipe from the pumps to
the factory, of suttable size, then connect to your engine the same as with steam. Start your pumps and
git gine, without steam, fuel or boiler. You will have no placed on your main pipe to carry off surplus pressure.
Power can be let all along the line of pipe, and it can be
J. H. W. says, in reply to A. K., who asked good one: No. 1. 1 dram sulphate of copper or of iron, 1oz. water; put into a bottle. No. 2.1 dram prusslate
of potash, 1 oz. water; put into another bottle. Write
 the fultd on the writing, when it will be perfectly visible
The writing will be of a dark blue color. This is called he writing $w, ~$
nvisible ink.
$\underset{\text { asked how to remove ink spots: Use cyancer ore of potash }}{\mathrm{J} . \mathrm{H} . \mathrm{W} \text {. says, in }}$ or oxalic acid. After the removal of the spots, wash well with water; and if the color of the cloth 18 taken
out, apply ammonia, when it will be instantly restore
C. H. A. Says, in answer to G., who asked
to get ants out of sugar: Every ant in it will , sooneror later, go home with a load, and then return for more. Hence, if the vessel containing sugar or other
substance infested by ants be removed from the place where it stood to another, the ants in it will take their loaid and depart. Those returning will be like an Irish
riend of mine, who seeking Iriend of mine, Who, seeking a foot bridge which had
once been laid across a stream, exclaimed. "Here ti is an' 'tis gone, sure!" The very last ant will leave in the course of a few hours, but it may be necessary to move he package several times, to prevent those which have
ound their way home from returning with theit trien have tried this repeatedly and it thas never faliled.
G. W. F. says: E., in a recent question, waste," etc. It seems to me to be a problem, well worthy of the most serious consideration, how to make
the most of water power, particularly where it exists, as your querist states, to the extent of several hundred horse power. The most perfect key to this matter, con as practioe sems to be that mentioned in your list ission power by means of compressed air. The letting of xcess power to run anybody's factory readill suggesta
self, or even its application for the manufacture

Minerals, etc.-Specimens have been re eived from the following correspondents, and xamined with the results stated
R. J. azys: 1.1 I send a specimen which completely
puzzles me. Recently had given to me several very ich specimens of geld ore. I extracted the gold by pouring on it $11 /$ parts of hydrochloric acid to one par of nitric. My object tn putting in a larger quantity of hydrochloric than nitric was to precipitate the silver
which was in the ore. I left them together until all
 IIquil, which I evaporated until it got gummy; this 1 .
put into cruche and heated to put Into a crucible and heated to a white heat, and the
pecimen herewith was the result. ork on chemistry? Answer ou have been decelved in the appearance of the or dee sent us consists largely of the red oxide of tron; an from your account, there is 1ittle doubt that you hav
been trying to extract gold from the bright yellow sul. phide of fron, or iron pyrites. The effervescence wa
caused by the decomposition of the nitric acid, nitrous umes being evolved. The sulphur was oxidized by th itric acid into sulphuric acid, which combined with the
ron oxide to form sulphate of iron, some sulphur being separated. It was this sulphur which caused the liquit
o become gummy when evaporated and heated. Th
layed a minor part. The solution finally contained
ulphate of iron, free sulphur, free hydrochloric acid, d perhaps some chloride of iron. The white heat, to Which the solution (evaporated to dryness) was inally
ubmitted, decomposed the sulphate of Iron, driving oft
 rains of metallic goll, , owevere, as there generally 1 s in on pyrites, though seldom enounh to pay for extrac
on. The gold can be extracted by the followingmeth.
 itated with mercury. The mercury combines wit he gold present, forming an amalgam of mercury and
old. This amalgam is then submitted to the action of eat, by which the mercury is driven off and the gold ecovered in the metallic state. The mercural vapor i
of course condensed, and the metal used for another of course condensed, and the metal used for
operation. 2 . Bloxams' is highly recommended. E. B. G.-The stone you send is a hard fine grained graphic purposes, but the specimen is too small for us o judge accurately of tits value. A yood lithographic Sone is of a yellowish gray color, and uniform through.
ut; free from veins , fbers and spots ; a steel point akes an Impression on it with difflculty, and the splii ers broken off by the hammer have a conchoidal fra ture.
E. L. W.-Your specimen is rich in lead, and is proba.
ly a lead ocher; but it tis too small for complete analy

## communications received.

The Editor of the Scientific American acknowledges, with much pleasure, the re ipt of original papers and contribution pon the following subjects
On Crank Pins. By W. A. S.
On a Balloon Experiment. By D
On Pressure and Space. By J. A.
On Air and Steam Engines. By F. A. W On Perpetual Motion. By J. W. S.
On Traction Engines. By H. M. S
On the Art of Inventing. By J. E. E
On Street Pavements. By W. H. B.
Also enquiries from the following
E. G. de W. \& Co.-J. S. B.-D. M.-C. W.-J. J. H.

Correspondents who write toask the address of certain nanufacturers, or where specified articles are to be had
liso those having goods for sale, or who want to find artners, should send with their communications a mountsufficient to cover the cost of publication under devoted to such enquiries.
Correspondents in different parts of the country ask
Where can I obtain pipe clay for making lead pencils Who owns the patent rights for the various artifici he vapor stove, using crude petroleum, work well practically? Who recently invented a process for tem-
pering and preserving the elasticity of steek and brass pering and preserving the elasticity of steet and brass
aprings? Makers of theabove articles will probably pro mote their interests by advertising, in reply, in the

## [OFFICIAL.]

## Index of Inventions

## FOR Which

Letters Patent of the United States were granted for the wrek endina

September 9, 1873,
and each bearing that date.
[Those marked (r) are eresued potent

$\xlongequal{\text { Cruster and harrow lood. Young \& Worthan... }}$

Derrick, , E. Beniamin. Derrick, J. E. Serrell.
Dredger, J. F. Morse.
Drill and planter, seed, W. F. West Drill jackpost, etc., Eastman \& Morri Elevator, E. Boyden A. Edison
Envator, hay, C. H. Kirkpatric Engine, rectprocating, A. Stale Engine, rotary, F. J. Ho:lenweger Engine, steam, R. T. P. Allen........ Envelope machine feed box, E. Allen Evaporating liquids, J. J. Johnston (r) Fence post socket, G. W. \& J. B. Durant Fire arm, breech loading, w. C. Hicks (r) Flask, powder, M. Cilik...... Floor for refrigerators, etc., Smith \& Schmid Furnace, malleable iron, D. R. Nash
Furnace, oxide of $z$ inc, Furnace, oxide of zinc, J. G. Lang
Glass molds, treating,
Hammer lifter, drop, C. Peck..
Hammer for planishing iron, w. D. Wood Harrow, R. L. Taylor.....
Harvester rake, J. L. Owe
Hatch way, self-closing, A. B. See. Hay, sling for loading, G. W. Long..........
Heater for steam fire engines, W. F Heater for steam fire engines, W. F. Sha
Hinge for blinds, lock, T. Clucas, Jr Horseshoe, A. W. Smith
Horseshoe, sectional, J. D. Abbott Horseshoe nails, D. Turbayne.
Horseshoe nall die Horseshoe nail die, A. H. Caryl.. Jack, lifting, I. A. Crippen. Jeweler's show case, Martin \& Studer Journal packing rack, W. H. Humphrey
Kettle and pan scraper, E. . Whitman Kenie, Knife, drawing, E. Parker Lamp, F. Rhind..
Lamp, street, J. S. Hagerty Lard and tallow, drying, A. Smith Lever for drawing timber, J. N. E Lock, permutation, P. W. Hall. Loom picking mechanism, w. Stearns Mandrel, tube welding, H. K. Flagler

| Metal working machine, compound, H | B. Sevey....... |
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## Mill, boring, F. E. Hahn.......................... Mold s, blackwashing, J. B. Aston.

 Molding machines, cutter head for, J. Alloway Needle case, Marchant \& Hart..Needle sharpening device, Barn Nut lock, K.H. Lioomis. Ore concentrator, J. A. Pee
Ore washer Ore washer, J. A. Peer...
Organ, reed, L. K. Fuller Organ, reed, L. K. Fuller.
Packing machine, A. Ralph Packing machine, A. Ralph......
Packing, metallic piston, J. Masse
Paper Paper pulp, wood, T. B. Armitage. Pavement composition, S. J. Whiting Paving composition, A. Thiele..
Pile or fagot, J. Barker. Piston, C. B. Allen. Pitman, J. H. Carothers Pitmen with shafts, connecting, R. Cleaveland Planing machine cutterhead, E. G. Richards... Planter, corn, N. C. Lamb.. Planter, corn, G. W. Starrett Platform, dumping, F. Peteler.....
Plow and cultivator, shovel, A. Plow and cultivator, shovel, A. Smith
Press, hay or cotton, D. A. Nelson Printing press, J. G. Peterson.. Printing press ink, E. Allen.. Propeller, chain, E. P. Russel
Pump, rotary, C. P. Holmes Pump, rotary, C. P. Holmes.
Pump, hand lever, o. T. Earle Purifier, middlings, L. S. Reynolds Purifier, flour and middlings, E. N. Lacretx. Railroad cattle guard, Tunison et
Railroad rail, J. B. Johnston. Rail, fastening for, B. W. Buchheit Rail, joint for hollow, R. S. Sanborn. Railroad, street, J. R. Beckett. Railroad switch, D. E. Brockett.
Railroad switch stand, R. A. Rash Rake, revolving horse, G. Penisten, S Refrigerator, oyster, etc., J. C. Jones Rivet, J. E. Wootten, (r).. Roof, metallic, I. S. Mettler....................
Sad irons, etc., varnishing, w. J. Reagan Sandpapering machine, H. L. Hapgood... Sash balance, L. S. Wright.
Sash fastener, L. L. Bates... Saw fling and setting machine, N. G. Ross. Saws, gage f(r gang, N. C. Moody Sawing machine, E. Inma Sawing machine, spoke, J. L. Thralls.
Screw blank s, machine Screw blank s, machine for threading, E. Croft
Separator, grain, J. W. Breese. Separator, grain, J. .. Breese...................... 142,662
Sewer basin for street corners, J. H. Boschen... 142,671

## Sewing machine caster, E. R. Clark............. Sewing machine hemmer, J. D. V. Eldredge. Sewing machine table lock, J. B. Logan

 Sewing machine treadle, M.H. Knapp... Sewing machines, motor for, R. H. Atwell.........Shoes, manufacture of, C. W. Green......142,691, Shook holder, J. I. Berry........
Shutter, fireproof, A. Gottlieb. Shutter, fireproof, A. Gottlieb.......
Shuttle box meehanism, J. Schrack Skirts, etc., ornamenting felt. J. W. Blackha Sled brake, P. Gable....................
Spray jet, adjustable, A. Nickerson. Spray jet, adjustable, A. Nc.........
Square, try, w. H. Cooper...... Stamp, fountain hand, F. J. Coutant....
Staples, machine for making, W. Malick Stove, heating, Little \& Nation Stove pipe for vessels, J. Hall. Stove, reservoir cooking, D. H. Nation
Stove oven attachment, Craine et Straw cutter, R. A. Rash.. Table, extension, J. M. Sackma Table, ironing, A.J. Palmberg. Tallow, etc., oooling, A. Smith............
Thrashing power, traveling, R. w. Fart Thrashinq power, traveling, R. W. Faris THle machine, C. J. Merrill ......
Tobacco ridger, J. R. Whittem Tool handle, w. B. Hill.
Trap, stench, J. Semple...........................
Trunks, etc., strap fastening for, W. Grinsted Type, arranging, D. B. Ray.
Tyre setter, J. Pailca (r)... Tyre tightener, M. E. Jacobs Valve, main stop, C. W. Isbe
Valve, steam, H. P. Jones... Vegetable cutter, G. W. Park
$\qquad$ Veneers, cutting, J. A. Squires.
Ventilating building, L. B. Valk Vessels, center board for, J. Call..............
Vessels, relieving grounded, w. R. Righton Wagon brake, W. F. Osborn...

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APPLICATIONS FOR EXTENSIONS. Applications have beenduly filed, and are now pending
or the extension of the following Letters Paten t. HearIngs upon the respective applications are appointed for the days herenafter mentioned: 26,454.-Railway Switch.-W.Wharton, Jr. Nov. 26.
26,484.-Platrorm Scale.-T. Fairbanks. December 3 . 26,486.-Pipe Molding.-J. Ferth et al. December 3. $26,513,-$ Nail Plate Fexder.-J. Newell. December 3. EXTENSIONS GRANTED. 43.861.-Nut Making Machine.-W. E. War 25,395.--Boot Hext.--S. Dodge, Jr., et al. , 4 . Portable Furnace, etc.-D. R. Prindle. 25,473.-Scale - Turnbull.
DISCLAIMER.
24,442.-Portable Furnace, etc.-D. R. Prindle.

DESIGNS PATENTED 6,874.-Sad Iron Handle.-J.Hargrave,Cincinnati, Ohio. 6,85.-CHairs.-G. M. Harwood, Troy, N. Y., et al.
6,876.-LAMP STAND.-W. H. Perkins, Meriden, Conn 6.877.-Fire Place Stove.-S. B. Sexton, Baltimore,Md. , 880 . . 6881.-MonUMENT.-M.Van B. Mitchell, Zanesville, Ohio.

TRADE MARKS REGISTERED
$\qquad$ 1,443.-Whisky.-Derby \& Day, St. Louis, Mo.. ,444.-Watch Case.-J. C.Dueber, Cincinnati, Ohio. 1,446.-MEDICINE.-Fenton Manuf. Co., Cleveland, Ohio 1,44.-SEEDS.-D. M. Ferry \& Co., Detroit, Mich. 9.- W. M. Fless \& Co., New York city 150.- Gold Rings.-Dueber Watch case Co 0 SCHEDULE OF PATENT FEES: On each Caveat.....
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