

A WEEKLY JOURNAL 0F PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY. AND MANUFACTURES.

IMPROVED BOARD CUTTING AND SEASONING MACHINES. ting table to any height so as to bring narrow logs into the apparatus, running at full capacity, 10 hours per day, can, In the annexed engravings we represent a new machine first or longest part of the drawing stroke. With three men we are informed, produce 280,000 feet of veneers; or its avefor cutting boards and also an improved steam seasoning to attend the machine and one or two to prepare logs, the rage production is about 50,000 feet of veneer, 20 to 25 feet press. Fig. 1 is the board cutting machine, the invention of Mr. H. T. Bart lett. It is claimed to cut from the thinnest veneer up to boards of $1 / 8$ th to $\frac{7}{8}$ inch in thickness, equal in quality to the same thickness of sawed material and requiring no and requiring no further planing,
both sides being perboth sides being pe fectly smooth.
To accomplish this result the usual conditions of cutting are reversed, the log being held stationary while the knife moves through it with a drawing motion.
This is the important feature of the machine; the drawing stroke of the knife being effected by a vertical and horizontal movement of the frame to which it is attached by means of crank and radial rods, with their driving mechanism situated beneath the floor, entirely out of the way. Power is applied by a single 12 inch belt giving the main driving wheels 20 to 25 revolutions and cutting a corresponding number of boards per minute. The several devices for holding the log and the automatic feed during the operation of cutting, while possessing much merit, need not be enlargedupon here. The machine is constructed to cut logs square or cut logs square round, 8 feet 4 inches long; 28 inches thick, 36 inches wide.
The variable drawing motion of 16 to 40 inches of the knife, we are informed, enables the machine to accommodate itself to all the variations in the the varia of texture of the ma terial. There is no dead point during the cut, which is continuous, so that the work is done with comparatively little friction and with economy of power. Another valuable feature in the machine is the adjustabilityof the cut-


BARTLETT'S MACHINE FOR CUTTING BOARDS.-Fig. 1.


STEAM LUMBER-SEASONING PRESS.-Fig. 2.
of $1 / 8$ to $1 / 4$ inch and 10,000 feet of hal inch stuff. The fa cility withwhich the machine cuts board of the thickness last named is remarka ble, and it is, we believe, the first in vention which im proves upon the work of the saw in that respect. A inch mahogan board 24 inches in width was exhibited to us, which ha just emerged from the knife, and which, so far as firmness of grain and smoothness of surface were con cerned, was ready for immediate use. Hitherto the work of cutting machine has been confined entirely to vencer by means of the ap paratus represented in Fig. 3, the con struction of which will easily be understood. The present machine is the first however, as we are informed to pro duce cut boards of $\frac{1}{8}, \frac{3}{16}$, $\frac{1}{4}$, and up to $\frac{7}{8}$ inch thick, with the grain firm and unbroken, and the surfaces so smooth as to need no fur ther dressing.
By the steam press, Fig. 2, the use of the dry kiln is ob viated, and thin lum ber of all kinds can be thoroughly sea soned in from two to twenty minutes It is unnecessary for us to review the present require ments for drying and seasoning lum ber. Large space is required for air drying, which is slow and expensive process, and after it is concluded the wood is ofte'n warped, and exhib its wind buckle or season checks. All these disadvantages re claimed to be avoided in the new steam drying press the inving pres Philip Pfeffer. This onsists of a serie f steam - heated chambers, the steam being introduced by a pipe at one end of each chamber and passing out at the ther, thus keeping constant circula tion of hot steam.

Valves are arranged to govern the entrance and exit of the steam as may be desired. The chambers are adjusted to separate, leaving an aperture between each of an inch or more, according to the thickness of lumber to be seasoned. The boards are then inserted between the faces of each chamber and the pressure applied by forcing the chambers to gether, either by hydraulic or steam power. The heat of the chambers causes the sap in the wood to become vapor ized, which passes off through vents or channels in the op posing face of each chamber, or through perforations in the faces of the lining plates leading to grooves or chanrels in the inner sides.
The rapid action of the machine was well shown by a tcsi conducted in our presence upon a cedar board $11 \frac{1}{4}$ inches wide, 4 thick, and weighing four pounds, and wholly unseasoned, being just from the cutting machine. It, was placed in the press for five minutes, at the end of which time it was found to have shrunk $\frac{1}{4}$ of an inch in width, and to have lost $1 \frac{1}{2}$ pounds in weight. The same principle is applied to curved plates, and thus lumber is seasoned and shaped at one operation. This will particularly apply to coffin, piano, and chair

## Fiy. 3


manufacturers. It is hardly necessary to point out that these machines are of the character which work revolutions in the manufactures to which they relate; and this, not merely from their capability of yielding better material, but from the fact of the economy which they insure. It certainly can be no longer economical to saw thin boards when it is possible to produce the same without loss by sawdust, and without requiring the subsequent planing to fit them for use, resulting in a gain of 40 per cent to 50 per cent on material. The saving of time effected by the seasoning press is too obvious to need any reference here
Both machines were patented through the Scientific American Patent Agency in this country and in Europe.
For further information, address Geo. W. Read \& Co , 186 to 200 Lewis street, foot of Fifth to Sixth street, East River, New York city, at whose large veneering and hard wood lumber establishment both machines are in daily and successful operation, and with whom arrangements may be made for the purchase of territorial rights or licenses to use either or both patents.

## THE WOODRUFF F"IENTIFIC EXPEDIT10N

We have to acknowledg the receipt of a new prospectus of the Woodruff Scientific Expedition, an enterprise which, as we recently explained, has for its object the conveying of a class of students around the world on a two years' voyage of combined instruction, amusement, and science. We observe that the fee (payable in advance fifteen days before the ship sails) has been reduced from $\$ 5,000$ to $\$ 2,500$ per head, and that the steamer Ontario, a larger and more commodious ship, has been substituted for the vessel originally proposed. There are various other indúcements offered, which, if the entire enterprise were not, as we learn, based on a series of contingencies, would render the project a very attractive one.
But .it appears that not only does the necessary capital for its execution depend on the obtaining of 400 subscribers at $\$ 2,500$ or $\$ 2,000$ each-naval cadets being taken at the latter figure-but the various scientific gentlemen who are to accompany the vessel have agreed to go under the conditions that such material support is first secured. Similarly we understand the testimonials quoted in the prospectus to be given by these eminent writers, with the understanding that if the scheme as explained to them can be carried out, then the project is worthy of public attention.
In the present hard times, probably no capitalist would in vest so large a sum as a million dollars in a project of this kind, and hence the promoters have adopted the best and most feasibly way of raising the necessary funds. But on their success depends the realization of the scheme, and it, perhaps, is open to question whether 400 people can be collected willing or able to pay down the goodly sum required in advance. We shall probably revert to this subject again.
H. F. Andrews, M.D., of Washington, Ga., says that cologne water is an efficacious remedy for poisoning by poison ivy. A good article of cologne must be used, and frequently appliad. The vesicles should be broken when the remedy is applied.

# sriventific Ammiram. 

## ESTABLISHED 1845

MUNN \& CO., Editors and Proprietors.
published weekly at
NO. 3 Y PARK ROW, NEW YORK.

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

TERMS FOR THE SCIENTIFIC AMERICAN.
ne copy, one year, postage included...
Cl
ratis for.-One extra copy of THE SCIENTIFIC AMERICAN will be supplied same proportionate rate. Postage prepaid.

## The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THESUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome
cover, uniform in size with ScIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, 85.00 a year, postage paid, to subscribers. Single copie 10 cents. Sold by all news dealers throughout the country
Combined Rates. -The ScIENTIFTC AMERICAN and will be sent for one year, postage free, on receipt of seven dohars. Both The safest way to rem Address MUNN \& CO., 37 Park Row, N. Y
Subscriptions received and single copies of either paper sold by a the news agents.

Publishers' Notice to Mail Subscribers. Mail subscribers will observe on the printed address of each paper the
time for which they have prepaid. Before the time indicated expires, to time for which they have prepaid. Before the time indicated expires, to
insure a continuity of numbers, subscribers should remit for another year For the convenience of the mail clerks, they will please also state when their subscriptions expire
New subscriptions will
New subscriptions will be entered from the time the order is received;
but the back numbers of either the ScIENTIFIC AMERICAN or the SCIEN TIFIC AMERICAN SUPPLEMENT will be sent from January when desired In this case, the subscription will date from the commencement of
volume, and the latter will be complete for preservation or binding.

VOL. XXXVII., No. 10. [New Series.] Thirty-second Year.
NEW YORK, SATURDAY, SEPTEMBER 8, 1877.


TABLE OF CONTENTS OF

## THE SCIENTIFIC AMERICAN SUPPLEMENT, <br> INO. 83,

## For the Week ending September 8, 187\%.

## wngineerivg and mechanics,-New Traction Engine By

ENGINEERING AND MECHANICS.-New Traction Engine. By J
FowLer \& Co., 3 engravings.
The St. Gothard Tunnel Works, 5 engravings, with an interesting de-
scription.-Shooting under Water. -Measuring Machines. -Compound scription.-Shooting under Water.-Measuring Machines.-Compound
Engines of the Steamships Limerick, Milford and Waterford, with Engines of the Steamships Limerick, Milford and Waterford, with
pages of engravings. How to Use the Car
How to Use the Carpenter's Square. BJJOHNO'CONNEL, Millwright,
20 figures. An excellent practical treatise on the uses of the various tables and figures stamped on the common the uses of the various tions any person may quickly solve many complex arithmetical and geometrical problems
How to Do it and How Not to Do it, 16 illustrations, drawn from Me chanical Life, with practical hints on the Right and the Wrong positions of workmen in executing various mechanical labors, such as Filing,
Chipping, Boring, Sawing, Grinding, Scraping, etc.--Bird'seye Maple TECHNOLOGY. -Photo Notes: By Profassor E STEBBIVG Ant photogenic Colors; fuchsine, naphthaline rose, eosine, chrysoidine.Photography in and out of the Studio.-Measuring force of Explosive
by Photography.
I. AGRICULTURE AND HORTICULTURE.-When to cut Grain.- The
Summer-mulching of Strawberries.-The Peach.-Origin of the Trees and Shrubs in the south of France.-An Insect Rose Thorn.
IV. NATURAL HISTORY, PHYSIOLOGY, ETC.-The Peabody Museum, Yale College, New Haven, Ct. An instructive description of the Zoo-
logical collection, with 7 illustrations. Fishes and Birds ; gigntic cutlagical collection, with 7 illustrations. Fishes and Birds; gigantic cut-
loge fish ; the Irish elk; fossils; rare minerals; antiquities. Fish cultle flsh; the Irish elk; fossils; rare minerals; antiquities.- Fish cul-
ture.-Lobster burying its Prey.-Horse Dentistry.-A joyful sound for the Deaf.-Replantation of a Tooth.-Dedge. An address before the Drine.-Huxiey on Physiolegical Knowleage. An address before the pet Bug. A description of this household pest and hints on best method of extermination.
V. MISCELLANEOUS.-On the Propriety of Limiting Families.
I. CHESS RECORD.-Amateur Centennial Chess Prize.-A ward to W
A. Ballentine. Portrait of Mr. Ballentine ; with specimens of his Problems.-Third American Chess Congress..-Solutions to Problems. - To Correspondents.

adise Single copies of any desired number of the SUPPLEMENT sent to one
adarest of 10 cents.

## DISCOVERY OF SATELLITES OF MARS.

Professor Asaph Hall, of the Washington Observatory, has recently announced the interesting discovery of two satellites attendant upon the planet Mars. At about 11 o'clock on the night of August 16, Professor Hall, by the aid of the great 26 inch refractor telescope, noticed a very smal tar following Mars by a few seconds. Two hours later he looked again, and to his surprise found that the distance be ween planet and star had not increased, although the forme was moving at the rate of 15 seconds per hour. Hardly crediting his discovery, Mr. Hall delayed further observation until he could bring the matter before his colleague, Profes sor Newcomb, and that astronomer, being confident that the discovery of a satellite had been made, calculated roughly its time of revolution, which he found to be 1 day and 8 hours. This enabled the prediction of the probable place of the satellite on the following night-a prediction which was ver ified. On the morning of August 17 another satellite ap pared, and its identity was fully recognized
The distance of the first satellite from the planet is between fifteen and sixteen thousand miles, which is less than that o any other known satellite from its primary, and only about $\frac{1}{16}$ the distance of the moon from the earth. It is exceedingly small, having a diameter of not over 100 miles. The inner satellite is believed to be still closer to the planet, and to have a period of less than 8 hours. The first moon is distant 80 the second 30 seconds from their primary. Further and more accurate details will, however, soon be forthcoming, as probably the keen eyes of astronomers the world over will now be turned upon Mars. Next to our moon, more full and ac curate knowledge is possessed regarding Mars than of any curate knowledge is possessed regarding Mars than of any
other heavenly body. Venusis nearer to the earth, but when most closely approximated she is invisible, being concealed by the solar light. Mars, however, may be examined under favorable circumstances, and during the present year the conditions are especially advantageous, owing to the planet being in opposition to the sun, near perihelion. The appar ent disk is now larger in the proportion of 3 to 1 than when the planet is in aphelion, while the illumination is more brilliant in the proportion of 3 to 2 . At the same time the planet is nearer perihelion than previously for more than 30 years so that in the heavens its brightness is but little inferior to that of Jupiter.

While the surface of Mars has been mapped with remark able accuracy, and although probably no other planet has been subjected to more keen and continuous scrutiny, yet up to the present time all searches for satellites attendant upon upon it have been fruitless. Most astronomers have not hesi tated to assert that none such existed, though it has been said that if Mars has moons they are too small to be recog nized by any telescope extant; but in any event the probable presence of Martial moons was not to be predicated on any phenomenon exhibited by the planet itself, and if their exis tence was suspected it was because it would be more in ac cordance with the nebular hypothesis that they should be present than absent. In a work on astronomy published some 40 years ago, we find mention of a phenomenon on Mars which might possibly lead to the idea that the planet was subjected to reflected light from some near body, and that was, that a curious and persistent illumination of the planet had been noticed, which, under the circumstances, was un accountable, save under the hypothesis that the planet was slightly phosphorescent.
The discovery is a triumph both for Professor Hall and for Mr. Alvan Clarke, the maker of the great telescope. It, be sides, shows what may be expected of the still more colossal instrument which at no very distant day we hope to see es tablished in the Lick Observatory.

## MACHINE HONESTY AND ITS CIRCUMVENTION

The exceedingly ingenious mechanical devices often found among the tools of burglars and safe-breakers are in themselves sufficient to demonstrate the fact that all the inventive ingenuity is by no means confined to honest people; and it is scarcely necessary to say, to any one conversant with that peculiarinstinct of the inventor which causes him to regard almost any mechanical obstacle as a challenge to his abilities, that in the bell-punch and similar apparatus of "machin honesty" the desire to overcome the difficulty is added to the nefarious incentive. Hence attempts to "beat" the ma chine, as the crime is vulgarly termed, are not uncommon, nor yet unsuccessful, although the perpetrators are usually in the end found out. The use of this apparatus began in this city about two years ago, when it was discovered that stage drivers and car conductors were in the constant habit of supplementing their scanty earnings with drafts on the fares collected. Accordingly that ingenious contrivance known as the bell-punch was largely introduced, receipts of the companies at once increased, and it was hoped that the evil was prevented. The bell-punch perforates a slip and the piece punched out is retained in a receptacle in the machine At the same time a bell is sounded and a hidden indicato moved on a dial. Hence the fares collected are shown firs by the number of holes in the slip, second, by the number of pieces punched out, and third, by the indicator; while a placard in the vehicle warns the passenger to listen for the ring when his fare is collected. Hardly had the punche come in use when frauds were detected. A smart mechani drove a thriving business by making neat little bells which were inserted in the conductor's coat sleeve. The latter would on collecting a fare, pretend to punch a hole in the slipcovering, however, a hole already made-and at the same
time by pressing his arm against his body would sound his
concealed bell and so satisfy the passenger. This, by the employment of detectives, was soon stopped; but the ingenious conductors still managed to "keep ahead of the punch" by simply neglecting to use it when the cars, as is often the case, were so packed as to render close observation of their movements impossible. Several city car lines eventually abandoned the device for apparatus much more simple, to which we shall refer further on. Recently, however, another detection of bell-punch frauds has been made, and a regular conspiracy has been revealed between sundry ingenious scamps who showed the conductors how to pick the locks of their punches and set back the indicators, for the consideraof $\$ 1$ per day, the conductor, of course, making up amount and as much more as he safely could by theft.
There are various other devices analogous to the bell-punch now in use on our city car lines. None of them, however, punch slips. One is a metal box suspended in full view on the conductor's breast. On receiving a fare he is required to move a catch which sounds a bell and changes a number indicating the quantity of fares received, which appears on the front of the box. Another machine displays no number, but simply rings a bell and moves an indicator locked up inside. Some of these machines were constructed at first to register only a certain number of fares, say 1,000 , and then to return to the naught point. The conductors soon discovered this, and after collecting the money they would ring the bell up to its limit, help themselves to the amount of money they wished, and then register anew fares to cor spond with the amount they left for their employers.
It will be observed that the tendency of all these machines is to make the passenger a policeman over the conductor to keep him in the path of rectitude, and it is curious to notice that the more of these devices there are invented the more is this duty imposed upon the passenger. The largest street railroad line in this city, that on Third Avenue, has abandoned the bell-punch for a simple dial in the car, with which is connected a square rod which traverses the length of the vehicle near the roof. In order to turn this rod, and so sound the bell and move the index, which the conductor is required to do on the receipt of each fare, a wrench must be used, and, of course, the armlifted high above the head. This compels the conductor to take a noticeable position, and as the rod is accessible only while he is on the vehicle, the conductor can not, as with the bell-punch or other portable device, pretend to register fares while temporarily off his car. The movement of the dial hand attracts attention, and thus the watchfulness of the passenger is still further enlisted.
There are two devices, however, which advance considerable further in this same direction. One is the fare-box, by the use of which the railroad company tacitly asserts that it prefers to trust to the honesty of the public in general than to that of its employees, and the other is a most ingenious apparatus, of which we shall presently speak, and which literally compels the passenger to look after the employees in order to keep himself from being swindled.
The fare-box is, however, fast becoming a bone of contention. It is simply a box into which the passenger is invited to place the correct fare. The driver-there is no conductor in such cases-is not allowed to receive or put in money, and the extent of his pecuniary duty consists in handing back change for small bills, said change being previously sealed up in envelopes, and as the driver aforesaid has always to return the amount he starts out with, he cannot conveniently steal any. When the passenger putsin his money the driver can see and count it, and that done he moves a slide which dumps it into a locked box below, whence it is removed by an official at the terminus. The box, we have stated, is a source of aggravation to the sovereign public, first, because one set of unthinking individuals are constantly throwing in too much and clamoring for change after the money is engulfed in the locked receptacle, when removal is impossible, and second, because perverse people decline to be ordered to do anything by the railroad company and demand that if their fares are wanted somebody must come and get them. The latter have multiplied of late, and are vigorously asserting themselves. The driver cannot take the fare, and if the passenger refuses to comply with the rules, that passenger must be put off the car. The passenger resists and a disturbance results, the upshot of which may be to block the line, and, as was the case here recently, keep some 200 other passengers in rear cars waiting a considerable time.
By far the most ingenious of all these devices is that devised for use on city cabs. There is a metal circular case on the face of which are two concentric circles. The inner one is marked as a clock, the other is divided decimally to indicate dollars and cents. The hands on the inner circle are controlled by clockwork, that on the outer circle must be moved by the driver. From one side of the clock extend wire rods on which is a sign with the words "to hire." Between the rods is a watch. The whole is pivoted on the cab
just in rear of the driver's seat, and in such a manner that just in rear of the driver's seat, and in such a manner that
when the "to hire" sign is turned uppermost it stands above when the "to hire" sign is turned uppermost the passenger in the cab is an opening through which the watch is seen when the sign is turned down
If, when the cab is hired, the driver does not turn down the sign, the passenger will demand it, because otherwise the watch cannot be seen, and by this watch the time for which the cab is used and paid for is determined. But the action of turning down the sign starts the clock, and this then goes on registering hours and minutes. When the passenger leaves the vehicle he pays his fare, and this the driver registers on the dial bell-punch fashion. The driver must then
turn his sign up. If he does not, the clock will continue that the nitrogenous products in the latter are just equal to running, and he will have to pay for the time himself at the the requirements of an idle man, and far below those of one regular tariff 'of 50 cents per hour. So from the two dials at work, while the carbonaceous products-which do not at the end of the day the inspector sees just how long the cab form muscle-are somewhat in excess in one case, and too has been used and the amount collected. On the back of the low in the other. But a better idea of the comparative na clock is still another dial, on which is an index which moves ture of diets can be obtained from some of the following inover one division every time the sign is turned down. This stances of the dietaries of low fed and well fed operative shows the total number of trips, and is locked so that the in England, which we take from the tables of Drs. E. Smith driver has no access to it. It prevents the driver charging and Playfair.
for trips only a fraction of an hour in duration as for a full The mean of twelve classes of low fed operatives, which hour. It will be seen, therefore, that by noting the tripsand number of hours emplnyed, the inspector can at once calculate the amount which the driver owes.
It is difficult to see how such a device as this can be de frauded. The objection to it is its inapplicability of such conveyances as stages and street cars; and for these vehicles some device which shall absolutely ensure the honesty of their conductors or drivers is still a necessity. We commend th subject to inventors as a promising one for their efforts. Only let them remember that, however ingenious they may be, ingenuity as sharp as theirs will probably be brought to bear to circumvent their apparatus. Perhaps the safest rule to go by is to try to contrive a device which shall, like access or alteration even to the inventor himself.

## FOOD.

In discussing, last week, the subject of how shall working men live, we quoted a table prepared by a working man's wife, showing a list of necessaries on which her husband, herself, and five children (under 9 years of age) subsist This category, which is claimed to represent the cheapes and most economical living attainable by the compiler, w here republish, as we propose to use it as a text for some further remarks.
 trogen 184

It may be said that working men cannot be expected to consider chemically everything they eat. Perhaps not, but it is the duty of sanitary authorities, and others charged their welfare, to do it for them. Half a pound of cheese, a pound of Indian meal, and a quart of milk, together aggre gating 5187 carbon, and 449 nitrogen, cost 14 cents. On thi a man could do steady work for one day, and could keep on on the same diet continuously. The same sum would pur chase one loaf of bread and a quarter of a pound of butter on which, as a continuous diet, a man could not subsist For the guidance of working men who wish to base thei living on proper and cheap food, we give herewith Dr living on prope
Letheby's table


The American Institute Exhibition.
It will not be the fault of this paper if the coming exhibition of this Institute should prove to be a chaotic mass of half arranged merchandise on the opening day (Septembe 12), for we have so often given notice of the fact that an ex hibition is to be held, and have as repeatedly given notice of the time; nor will it be the fault of the officers of the In stitute, for the building is always ready in time; but will we presume, be the fault of the exhibitor, who, as a genera rule, procrastinates, and is often many days behind. W should think that, if an exhibition is worth attending at all, that the exhibitor would desire that his exhibit should be ar ranged upon the opening day, and not a week or ten days later. For information address General Superintendent room 22, Cooper Union Building, New York.

## A Remarkable Railway Bridge

The new iron railway bridge over the river Douro, near Porto, Portugal, crosses it with an arch of a single span which measures 160 meters ( 520 feet) and has a rise of 42 meters ( 138 feet 6 inches). It is crescent-shaped in form; that is, the extrados and the intrados, which are connected by struts in the form of St. Andrew's cross, are farthest apart at the crown.

Manufacture of Eburine.-Eburine is a composition formed from the dust of ivory or bone cemented togethe with gum tragacanth or albumen, and colored at pleasure In some cases pressure and heat render the addition of any glutinous matter unnecessary.

A Nubian Temple.-The temple of Ypsambul, in Nubia, is cut out of a solid rock, and is of vast dimensions. In it are four colossal figures sixty-five feet high, twenty-five fee across the shoulders, with faces seven feet high, and ear across the shoulde

IMPROVED OVERHEAD SEWING MACHINE
We extract from Iron the annexed engravings of Laing's patent overhead sewing machine, which has the rare merit patent ove and unique method of producing f bing on entirely not and und method of producing edge material, making a lapping stitch round the the same principal shaft is also a large pulley, F, which opeand fabric from "overhead" to the under side. and then passing upwards round the edge, once morepierces and masses through passes through he material, and o on, ad infinium. This is a copy of the action of handsewing in making a seam where the thread or cotton continually encircles the two edges which are brought together to be united.
This effect, or stitch, is beautifully produced by a circular he. lical needle, $a b$, Fig. 3, which makes two or three turns round a central spindle, I, Fig. spindle, I, Fig. 3. The interior diameter of the


LAING'S OVERHEAD SEWING MACHINE.
shaft has anoth
er pulley, $\mathfrak{G}$, up
on it that drives
by a band the
thread cylinder.
Upon the coun-
tershaft, be
tween the two
standards, is a driving cone, L which cone, L justing by an ad justing band, $i$ may be set to drive the oppo site cone, Q, at a varying speed, according to the position of the band, which is determined by a guide traveling upon a screwed spindle.
The use of these two differ ential cones is to give a horizol tal variable sliding motion to the thread or string barrel The end of the cone through cone throug which the circular needle is considerably greater than that of the spin- $\mid$ ness. In Figs. 1 and $2, D$ and $C$ are the fast and loose pul- $\mid$ screwed portion of the spindle passes is provided with a dle within it, and as the driving band, H, is arranged by $\mid$ leys, which may be driven by the strap from an engine shaft- $\begin{aligned} & \text { movable catch which gears with the screw; the action of the }\end{aligned}$ guide pulleys, $f$, to pass only round one side of the needle ing, or may be replaced by a hand wheel or treadle. Upon machine itself throws the catch in and out of gear with the and spindle, $I$, the needle is thus pressed away from the the main shaft, $B$, is a miter gearing, which drives, by the screw according as the stage of sewing operations require spindle upon one side, and is suitably placed for piercing the changeable cog gearing, 12, the spiked feed chain, 9 . This that the string or thread barrel should recede slowly into the material as it revolves. One end of the spiral needle, $b$, is, spiked feed chain seizes the fabric as soon as it is fed upon hollow cylinder, or emerge suddenly therefrom to resume its


LAING'S OVERHEAD SEWING MACHINE.
normal position. This action is very ingeniously obtained by a weight to bring the thread barrel out, and by the screwengaging catch gradually drawing it in.
This means of obtaining the sliding motion of the thread barrel has, in the latest designs, been considerably modified. The use of the drawing thread, which also carries the whole of the suspended weight, has been substituted by an involute cam, with a double throw and deep step back to the axis, as shown in Fig. 1. The slow revolution of the cam causes the inclined surface of its throw to bear upon a stud in a rocking lever, S. At the extremity of this rocking lever. in a radius from its axis, $T$, is a toothed quadrant, which gears in a rack attached to the thread barrel, and which is thus steadily drawn in. When the half revolution hasbeen completed, the drag weight, X, draws over the lever, S, down the sudden step, and thus shoots out the thread barrel ready for its next gradual feed. The length of feed may be varied by change of cams


FLY FAN.
The thread is held against the circumference of the ho: low spindle when thrown from the barrel. The barrel in revolving carries round with it the thread thus held or jambed against it, and pulls tight the stitch last made, the slack of the thread being transferred to the barrel by the action of the thread catch or drag.
The fabric to be sewn is fed upon the table of the machine from left to right in a direction parallel to the axis of the spiral needle.
The amount of grip or edging embraced by the over-edge stitching will be regulated by distance from the axis of the needle at which the material is fed in, and this may be determined by a fence upon the feeding plate. As the fabric is fed past the plate or fence, it is caught and carried forward by a spiked endless chain, which passes over two chain pulleys, one at each end of and situated below the feeding table. One of the said chain pulleys is fixed upon a countershaft, which is driven by gearing from the main shaft of the machine. The speed of the feed will be varied according to the rate of revolution of the chain wheels, which can be regulated by the use of change wheels in the intermediate gearing. The fabric is held down to the feeding table by a pressure whose tension may be regulated by a screw.
The latest practical improvement in this arrangement consists in the presser being carried in two brackets from a spindle, which runs parallel to the axis of the needle. In the brackets are a couple of coiled springs, which give the necessary pressure upon the material, and when the pressure is not required it may at once be lifted up clear of the material.
An exceptionally fine adjustment for the rate of feed is now applied to the machine. This is effected by using friction wheels to pinions instead of the spur gearing, and by introducing a friction clutch on the shaft that drives the pitch chain by which the width of the stitches is regulated, as well as the tension on the spiral needle. This tension is prevented from reaching an extent which would be dangerous to the needle, by reason of the friction clutch slipping before that degree of tension is reached.
In course of time the thread coiled upon the barrel becomes exhausted, when the spiral needle may be automatically re-threaded, so that a fresh thread is placed in the eye of the needle, without stopping the machine or interrupting the progress of the work: and the string and thread barrel being again brought out of the cylinder by the action of the weight, a fresh supply of thread or string is coiled thereon, and the work proceeds as before.
The thread may be supplied to the machine in hanks of such a length as to fill the thread or string barrel. A perhaps preferable arrangement is to use a reel driven by the machine, and alternately measuring from a bobbin and transferring its measured contents to the exhausted thread or string barrel. The re-threading of the needle is effected by a tube, which, after feeding the thread or string to the
reel, catches it into the hook or eye of the needle, and af terwards severs the thread by bringing it in contact with a knife edge.
In sewing with this machine the pitch or width between each stitch may be regulated by the relative speeds of rotation of the needle and the travel of the feed chain. When the latter feeds slowly, the pitch of the thread or stitch will be very short; when the latter travels quickly, the pitch will be large. The elastic nature of the needle enables it to extend to suit the varying pitch of the stitching. The relative speeds of the feed chain and rotating needle may be adjusted by the change whaels, W.

The speed of movement of the thread barrel towards the feeding end of the machine is adjusted according to the breadth or grip of cloth through which the seam is made, that is to say, the barrel is caused to unwind the thread or cord faster or slower, according as a broader or narrower " grip" is required. This adjustment is made by shifting the driving belt on the cones by means of the belt shifting operated by the screw and hand wheel.
The automatic threading is accomplished by a very ingenious and simple operation. So long as the needle is working with a supply of thread from the sliding string box, and so long as the string box is continuing its steady travel outwards, the threading lever is pushed back out of the way. But as soon as the cylinder has almost completed its travel, the inclined side of a plate comes in contact with the end of the threading lever, which carries the end of a fresh hank, stretched across an open fork, in its extremities. Just as the stroke of the string cylinder is completed, the lever is suddenly thrust forward, so that the tail of the needle catches up the string from the loop, and re-threads itself, when at once the threading lever returns out of the way. The eye of the needle is thus not a perforated one, but a species of hook in which the string is gripped by the rotation of the needle.

## IMPROVED AUTOMATIC FLY FAN.

The invention illustrated herewith consists of vanes or The invention illustrated herewith consists of vanes or
fans which are rotated by suitable mechanism with the nbject of agitating the air and driving away flies. The device may be placed upon a dining table, in show windows, beside invalids' beds or children's cradles, and will prove especially convenient for confectioners.
The circular box which forms the base contains a simple train of clockwork, which is wound up by a key applied to the shaft, A. This mechanism rotates the vertical shaft, B. On said shaft is a sleeve having a ring flange, to which last are suitably hinged the arms which carry the fans, $C$. To the middle of the arms are attached braces which are hinged to anotherflanged sleeve, D. On the shaft, B, are catch springs, as shown, by means of which the upper sleeve, and consequently the arms and fans, may be adjusted to any hight. The motion of the fans is thus regulated. The pivoted bar, E , has a notch which slips over the squared end of the shaft, A, preventing the latter from turning and thus stopping the movement of the clockwork when desired. In Fig. 2 a sectional view of the sleeves and method of hinging the arms and braces is given.
Patented August 21, 1877, through the Scientific American Patent Agency. For further particulars address the inventors, Prather and Shirley, Lineville, Iowa.

## COMBINED PUSH-PIN AND WATCH KEY.

This invention consists in a removable push-pin for watch es, which is provided with spring for holding it in place in

the stem of the watch, and with a watch key point at its in ner end which may conveniently be used for winding the watch.
Referring to the illustration, Fig. 1, which is an enlarged sectional view of a watch stem containing the improved push-pin and key, A is the stem of a watch, which is chambered out, leaving an internal angular edge at the top of the stem. B is a push-pin, seen detached in Fig. 2, having a
milled head, into the inner end of which a steel watch key milled head, into the inner end of which a steel watch key point, C, is screwed. The push-pin is drilled transversely at

D, and is grooved longitudinally from this point to the hea to receive a wire spring, E. This spring extends upward at each side of the push pin, and is notched to receive the edge of the watch stem. The notches are of sufficient width to permit of moving the push-pin sufficiently to operate the case spring. When it is desired to wind the watch, the key is drawn from the watch stem and used as an ordinary key When the point, C, becomes worn or broken it may readily be unscrewed and replaced oy a new one. The advantage claimed for the invention are that it obviates the complica tion of stem winders, and at the same time provides a key that always accompanies the watch.
This improvement was patented through the Scientific merican Patent Agency, by Augustus A. Fisher and Simeon H. Lucas, of Santa Fé, New Mexico, June 26, 1877.

IMPROVED FASTENING DEVICE FOR BILLIARD CUSHION RAILS
It has hitherto been customary to use, for the attachmen of the cushion rails to the bed of a billiard table, bolts,

which were provided with large finished heads, and which were so applied that, while the body of the bolt passed through the cushion rail, and its threaded end engaged with a blind nut letinto the bed, the head of the bolt took its bearing on the outer face of the cushion rail. This head, in which were holes to allow of its being turned by a suitable tool, has commonly been exposed to view. We illustrate herewith a novel device for covering the head, which may be applied without the use of any separate screw or washer, and without requiring any countersink or other alteration on the rail.
A is the cushion rail; B the bed, and C the frame of the table; D is the bolt, the threaded end of which is engaged by the nut, E . In the head of the bolt a hole is drilled and tapped to receive the screw teat of the ornamental cover, F , which is set in place after the bolt is inserted. A knurled surface near the outer edge of the cap allows of its ready manipulation in screwing it upon the bolt. The cap is struck up of sheet metal in a tasteful pattern, or it may be an orna mental casting of bronze or other metal, having the screw a part of the same. By this construction the cushion rail is not weakened, as is the case where the bolt head is countersunk or let into the rails; the screw of the ornamental cap being a part of the cap itself, makes few parts; and when re plating or a new design may be wished, for ornament, the cap can be readily unscrewed from the bolt, while the table can be employed as usual. It may be made, we are informed, at a small cost, and it saves the usual expense of finishing the bolt heads, besides being an ornament to the table.
Patented July 31, 1877. For further information addres the inventor, Mr. H. W. Collender, r38 Broadway, New York city.

## Preparation of Celluloid.

Paper is treated by a continuous process with 5 parts of sulphuric acid and 2 of nitric acid, which convert it into sort of gun cotton. The excess of acid is removed by pres sure, followed up by washing with abundance of water. The paste when thus washed, drained, and partially dried is ground in a mill, mixed with camphor, ground again, strongly pressed, dried under a hydraulic press between leaves of blotting paper, cut, bruised, laminated, and com leaves of blotting paper, cut, bruised, laminated, and com-
pressed again in a special apparatus suitably heated. It is said to be hard, tough, transparent, elastic, fusible, becom ing plastic and malleable at $125^{\circ}$. It ignites with difficulty is decomposed suddenly at $140^{\circ}$ without inflammation, and gives rise to reddish fumes. It is inodorous, and does no become electric on friction.-Bull. de la Soc. Industrielle de Rouen.
Steam Power in France.-It is computed that France now possesses steam engines of an aggregate force of 1,500 , 000 horse power. This is equal to the effective labor of $31,000,000 \mathrm{men}$, or about ten times the industrial population of the country.

## Cummunationg

## Manufacture of Tobacco

To the Editor of the Scientific American :
Your answer to J. W. F., who asked how the raw taste of tobacco can be removed, is a wilful insult both to the tobacco user and to the manufacturer. He has a reputation to preserve as well as the sugar refiner, or the baker, or any other man. In the manufacturing of chewing tobacco the leaf is taken out and carefully examined, and all dirt removed; then it is put in large bins, where it is sprinkled with a sirup made of best brown sugar and licorice; after it becomes partly dry, it is made into rolls, then taken to press.

If G. W. F. wishes to manufacture his own chewing to bacco, let him first get some green hickory or sugar maple, cut into small logs, say two or three feet long and from five to eight inches diameter, then with a large auger bore holes three parts through. Make a stick of hard wood to fit the hole easy; leave it a little longer than the depth of the hole. This stick is to be used for a rammer. Wash your tobacco clean, let it dry or nearly so, remove stems and all bad portions, stuff it into your logs hard; the tighter it is rammed the better. When nearly full make a plug and drive it in so tight that it will keep out all outside moisture. Pile up your logs in the woodshed or some place where they will not be exposed to the weather or the wet ground. After stuffing your logs let them rest for about two weeks, then examine for the ones that show a tendency to split. Take the ax and cut open. If you open only one log at a time, as you need the tobacco, it will keep good for years. If you keep the air from it the last plug will be better than the first. The wood sap will give it a pleasant flavor. If you wish to make it sweeter, make a sirup of 1 lb . sugar to $\frac{1}{4} \mathrm{lb}$. licorice, boiled in two or three gallons of water. Sprinkle lightly and toss well.
Mansfield, Pa
Alex. Thompson.

## Bees and Hives.

To the Editor of the Scientific American:
Since the appearance of my communication in Scientific American of April 21, many of your readers have written me for more definite information in reference to certain points connected with bee-keeping, and with your permission I will answer through the columns of the Scientific American. The information asked comes under the following heads:
First, The distance bees will go to collect honey.
Second, Is it necessary to provide food for the bees?
Third, A more particular description of the hive I use. Fourth, How to prevent loss in winter
Fifth, How to prevent the ravages of the moth.
First, then, as to the distance bees will go to collect honey. There has been much speculation in reference to this point, and many conflicting opinions advanced. As I was the first to obtain the Italian bee in this section (none of this variety, at that time, within twenty miles of mine), I decided to investigate thoroughly, during the honey season, and the result was I found the Italian bees seven miles from their hives, collecting honey. The great difference in color of the Ital ians from the native bees rendered it a very easy matter to trace them. I think the native bees, being smaller, do not go as far for honey as the Italians. It is not so easy, however, to determine, as there are some of the native bees in every section, which renders it very difficult to trace, from any one apiary; but from what evidence I have been able to obtain bearing upon this point, I think it safe to say the natives go five miles at least to collect honey. There are many amusing traits in the habits or instincts of bees. If a hundred hives are ranged side by side with the entrances not more than two feet apart, and the bees leave such hives in quest of honey, they return by thousands every hour, yet not one fails to changed so that bees enter other than their own hives, they are immediately slain and cast out of the hive. There are ar.e immediately slain and cast out of the hive. There are
traits in the nature of bees which seem to be akin to reason traits in the nature of bees which
as manifested in the human family.
It is not absolutely necessary to furnish food for bees. The myriads of flowers in forest and field afford honey in great abundance. Some of the principal sources of honey are clover, buckwheat, basswood, fruit flowers, red raspber ry, catnip, etc. Yet under my system of management find it profitable to furnish my bees with nearly all the food they require for their own use. I have constructed a feeder on entirely new principles, so I can put each stock in its own hive, and so that all the bees of the hive can have access to it, and not a bee from any other hive reach it. The food I prepare for them costs only about seven cents per pound, and meets all the wants of the bees as well as honey collected
from flowers. By this arrangement I furnish nearly all the food my bees require for their own use, and thus secure as surplus all the honey the bees gather from flowers throughout the season, which is a great increase over the amount
otherwise obtained. As the bees consume a great deal of otherwise obtained. As the bees consume a great deal of their own daily wants the year round, with my arrange ment I have had a swarm of bees take from the feeder, in one hour, over a gallon of food, and store it in combs in the hive.

It is hardly possible for me to describe the hive I use, on paper, with sufficient accuracy as to give a correct idea of all its parts; it must be seen to be fully understood. I will, however, give a general description of some of its leading
points, and here let me say that I have no objection to any one using it who wishes to do so, and if I possessed sufficient skill I would describe it so that every bee keeper could construct one for his own use. The central portion has six movable comb frames suspended on rabbetings on the ends this section will hold about 40 lbs . of honey, and is for the permanent occupancy of the bees; here they build thei combs, in the movable frames, here they rear their young and store up sufficient food for their own use. At the side and top are arranged thirty small glass boxes, in which the bees store their surplus honey. Each box holds about 4 lbs., and gives the honey in the best possible shape for mar ket. The boxes are so placed in connection with the hive that in entering them the bees are not obliged to pass through any partitions, but pass directly to the boxes. These boxes when filled are removed, and empty ones substituted in their places. They are so arranged as to be removed separatel or collectively. A ventilator is arranged for winter use, so that the bees winter in perfect safety on their summer stands. In connection with straw packing, I consider the use of thi ventilator renders bees safe in any climate
As to the bee moth, a strong stock of bees is never injured by this pest; bee keepers who keep their bees strong and in healthy condition will find no trouble from this source Stocks must first become weak and diseased from some cause bcfore they will be injured by the bee moth.

Bee keeping is a very profitable occupation when managed on correct scientific principles. Great progress has been made within the past twenty years. I know of scme be keepers in New York State that keep upwards of 300 stocks,
and some years sell more than seven thousand dollars worth and some
West Gorham, Me.
Mrs. L. E. Cotton.

## Architectural Science Class. elementary replies.

Question.-Describe different materials used by painters. Describe ingredients of color.-The materials used by painters are paints, oils, driers, stains, varnishes, etc. Colors or paints may be divided into five classes, according to their principal may be divided into five classes, according to their priricipal
ingredients. Lead paints, most commonly used, havewhite ingredients. Lead paints, most commonly used, havewhite
lead or carbonate of lead as a basis. This material is ground up in oil in a stiff paste. Linseed oil, with litharge or other driers, and sometimes turpentine, are added to it to form the paint ready for use. The required tint is obtained by adding to this the proper coloring pigment. The exact proportion of ingredients is regulated by the nature of the work, climate, etc. Red lead enters into the composition of the priming coat because it is a good "drịer," and sets "hard." Linseed oil is used as a medium for applying the paint; it fiils up the wood pores, and acts as a preservative. Turpentine makes the paint easier to work, and more liquid, but it plays no part in the preservation of the wood, as the greater part
evaporates. Driers are mediums to cause the contained oil evaporates. Driers are mediums to cause the contained oil
to dry and set quickly. Various materials are used, as litharge, sugar of lead, etc. Zinc paints have zinc oxide as a basis. Silicate paints are manufactured from almost pure
silica, which is not acted upon by any metal or acid-in fact, silica, which is not acted upon by any metal or acid-in fact
is almost indestructible. This kind possesses the advantage of great durability, has no galvanic action when applied to iron, as in the case of lead paint, and does not tarnish by the action of gases. Colors are made same as the lead paints, and are mixed in the same way. Oxide of iron paint acts as a good preservative for ironwork. Bituminous paints are used for a similar purpose, and for rough carpentry. Stains are
mixtures used to darken wood to the color of the imitated wood. Varnishes are of various kinds-copal, etc.-and are used to preserve the paint, and give a gloss to the finishing coat.
Question.-Describe the process of common painting woood and ironwork.-Woodwork is prepared for painting by brushing over all resinous knots with a thin coating of knotting (a compound of shellac dissolved in naphtha) or gold size, to confine the resin, and prevent it running under the paint. The priming is then laid on, any plain color, well worked into the pores of the wood, with and across the grain; when this is dry, the stopping is done. All nail and brad holes, etc., must be well filled up with putty, and lightly rubbed
off with glass paper. The second and following coats are applied with more care, brushed with the grain, and the work covered equally everywhere, showing no tool marks or running edges. If the last coat is to be light, the second and third should be similar in color, and if it is to be finished dark, dark color must be used for the previous coat. Ironwork should be cleared free of all rust, oil, or grease before painting. A good first coat is color made up with red lead the other coats may be similar to that used for wood. Iron weing almost non-absorbent, three coats are sufficient for new work, unless in very exposed situations, and for the same rea son, care must be taken, especially in ornamental work, not to fill up the fine lines of leafwork, etc., by using too much paint, as the character of the work would thereby be injured It is not so much a thick coat as a thorough one that is the best protection.
Question.-In coloring walls what precautions should be used?-The walls should be thoroughly dry. In coloring walls the coats should be carefully laid on and smoothly, each coat being rubbed slightly with sand paper before ap plying the next. The "flatting" or finishing coat should b made a few shades lighter than the pattern, as it darkens in
drying. Japanner's gold size, if used, should be applied quickly, as the turps evaporates quickly, leaving an indelible glossy surface. A certain time should be allowed between
the coats, the drying of the same depending upon the quan tity of driers used, the weather, and temperature of the apartment. To expedite the work, new walls are generally "distempered" when not dry enough to receive the perma nent decorations. Distempering is a kind of painting with color prepared with size or some other glutinous substance In distempering, the walls must be dry and free from damp f not, at the completion will be shown all the defects. Two or three coats should be applied, in order to obtain an even color.

## advanced replies.

Question.-Explain the theory of coloring.-The accepted theory is that there are certain colors that cannot be produced by any combination of other colors. They are termed primaries, because all other colors can be obtained by mixing them in certain proportions. The primary colors are red blue, and yellow. Some authorities substitute green for yel ow. Secondary colors are derived from mixtures of the primary colors in pairs-as violet from red and blue, orange from red and yellow, and green from yellow and blue. Ter tary colors are produced from secondaries-as citrine from orange and green, etc. White and black are usually con idered neutrals. To secure "harmony of colors" they must be equalized to the varying proportions shown in the solar spectrum-the three primaries being used either in their purity or compounded. The eye being constructed to see white light, when looking on a colored surface, it is best pleased by a contrast. Contrasting colors to harmonize should be mutual complementaries of each other-making up the full complement of colors contained in the solar rays. The complement of any primary-say, red-will be the secondar compounded from the other two primaries-as green from blue and yellow-red will thus harmonize with green, blue with orange, and yellow with violet. The best proportion for mixing primaries, so as to harmonize, is; red, 5 ; blue, 8 ; and yellow, 3. The latter is the most vivid, and should ob tain a prominent position. Blue is least vivid and retiring and should be kept in the background-red to be used as an intermediate color.
Question.-Describe the proper mode of painting wall sur aces.-To paint wall surfaces properly often five coats ar necessary; but if the plaster be not very absorbent four will be sufficient. If the work is required without gloss the las coat is mixed with turpentine only, which is called flatting if the work be not flatted the finishing coat is two of turpen ine to one of oil. For the priming coat hoiled nil should b used, then the three coats of white lead and oil, or more if required; generally the first coats should be some shades darker than the finishing coat. The proper drier to be used or walls is sugar of lead, and in painting wall surfaces grea care should be used in selecting the very best quality of oils and white lead-the older the oil the better
Question.-What is the best paint for ironwork?-The best paint for ironwork is either the oxide of iron paint, known as the Torbay paint, or the silicate oxide paint, both consist ing of oxide of iron and silicious matter, to which any colo may be added and applied in the usual way. They can be applied even after the surface has commenced to rust, a from their nature they amalgamate freely with the rust, form ng an impervious coating adhering well to the surface, and yet sufficiently elastic to prevent cracking when the iron ex pands or contracts under variations of temperature. Bitu minous or tar mixtures, thinned with linseed oil, are well dapted for ironwork, especially when they can be applied ot, or to the heated surface of the metal, so as to insure firm adhesion by entering the pores. A mixture of silicate oxide with tar also forms a good durable coating on iron When ironwork is to be painted with ordinary lead paint red lead should be used. The adhesion of such a coating on iron work can seldom be depended on in consequence of the non porous surface. This is further prevented by the galvanic action that sets in between the iron and lead. Galvanizing or coating the surface with a preparation of zinc, is also fre quently resorted to as a preservative. With all such coating he surface must be perfectly clean and free from rust. It is advisable, so as to prevent rusting, that all ironwork should e coated with some preservative soon after it leaves th mould, forge, or mill.-Building Newos.

## Converting Iron into Steel without Melting.

The known processes for transforming iron into steel (re ining by the oxygen of the air, or the Bessemer method, or Reaumur's method, improved by Siemens, Martin, and thers), ingenious as they are, do not and cannot give but imperfect intermediate compositions between the castings of rue iron and steel. Although of undoubted utility and low n price, these products are not applicable to any of the manufactures requiring fine steel. To overcome these de ects, and to give to the metals the requisite qualities Messrs. Kraft \& Julien-Sauve Fils, of Paris, subject them for some hours to a red heat in a retort filled with carbon ceous matter, over which is slowly passed a current of azote of carbonic oxide, and of various carbonated hydrogens. They introduce wood, vegetable charcoal, peat, coke, or any kind of vegetable materials, very dry, and heated to a tem perature of about $50^{\circ}$, into a hydrocarbon oil of any kind (such as the heavy oil of schist), which is also heated to the ame temperature. This latter is absorbed in the proportion from 12 to 15 per cent, and they form with bars of Bessemer metal, Martin metal, or any other product arising from the refining of cast metal, as above mentioned, alternate layers, the whole being enclosed in a vessel, similar to a gas
retort and of desired form, and heat gradually to a red heat.

By these means the excess of oxygen that is contained by the vegetable materials in presence of the vaporized hydro carbons is transformed into carbonic oxide, and their azot into ammonia, in such wise that the metals under treatmen are immersed in a gaseous medium, which is allowed to be the best for the purpose of converting them into fine steel.
Now, as it may occur that before this absolute conversion the productive source of the gas may be exhausted by distil lation, they provide against this inconvenience by passing through the apparatus a current of carbonic acid or carbonic oxide mixed or not with azote. When they obtain this gas eous mixture from the products of the combustion of the furnace which serves to heat the apparatus, they separate from it its free oxygen, and change it to carbonic oxide by causing it to pass over carbonaceous matter heated to red heat before it is passed to the metals. In the Siemens, Pon sard, Muller, and other retorts, the principle of which con sists in the gasification of combustibles, they give a mixture of the gases, which they employ equally to the heating of the apparatus as to the transformation of the metal to steel. The gas which escapes from these furnaces also serves for this double purpose. When, on the contrary, they obtain this gaseous medium by direct calcination of limestone, or the mixture of this with other carbons, the gaseous products (carbonic acid and carbonic oxide) are passed directly into the apparatus containing the layers of charcoal and metal. They obtain at the same time from the lime, which they may convert into pyrolignite of lime, the little pyroligneous acid which separates equally from the wood as from the hydro carburetted peat during the heating to red heat, and which they take care to collect as is ordinarily done in the distillation of wood.
It will be understood that the mixed gases produced and composed in and that have passed through the apparatus may on their passage therefrom be collected in a gasometer to be again used for the same purpose, or passed under the furnace of the apparatus, where they will be utilized as combustibles. If the products prepared according to thei process are melted, cast steel of the finest quality will be ob tained, and by these means they may obtain without melt ing steel of the first quality for the manufacture of files and other articles from Bessemer metal, Martin metal, and gen erally from all metals which are obtained from castings, either by refining with the oxygen of the air, or by refining by reaction. In addition to the steel they obtain simulta neous and at will, from the lime, the ammonia, and the pyroligneous acid, tarry hydrocarbons, which they use over again, and wood or peat charcoal of denser quality than that used originally, not only fit for domestic purposes, but fo use in metallurgy.
If cast iron particularly acted upon, and if this cast metal heated to red heat is exposed in a retort to a current of car bonic acid alone or mixed with air, it will be transformed into steel, and the gas will become carbonic oxide, which in passing into another retort charged with Bessemer metal at red heat will effect the conversion of this metal into fine steel, and will itself be converted into carbonic acid. Thus the carbonic acid $\left(\mathrm{CO}_{2}\right)$ raised to the casting its excess of carbon (C) is transformed into carbonic oxide (2CO); this passing over the iron of the Bessemer metal and the like will give up the carbon (C), and will return to the state of carbonic acid $\left(\mathrm{CO}_{2}\right)$. From this a given volume of carbonic acid gas being given enclosed in a gasometer they may, by passing this gas in the retorts heated to red heat and charged, the first with cast iron, the second with Bessemer metal, the third with cast iron, and the fourth with Bessemer metal, and thus in succession (provided that the series commencing with cast iron terminates with one or two retorts charged with Bessemer metal) transform the whole of the metal into steel, and on collecting the gas in a second gasometer the same operation may be recommenced, and so on indefinitely. Th the passage of the gas takes place in a converter charged with melted cast irron, the transformation of the
casting is more regularly and easily done, and with less loss of iron.

## A fire escape accident.

A distressing accident occurred at the Astor House, New York, just across the way from this office, recently, through the breaking of a fire escape while the owner and exhibitor of the same was endeavoring to lower himself from a lofty window. The apparatus known as the Kenyon Fire Escape consists of a wire rope $\frac{3}{16} \mathrm{inch}$ in diameter, one end of which is secured within the room. The other end is wound on a drum, which is provided with brakes and arranged in connection with a stout belt, so that by regulating the brakes the wearer of the belt can cause the wire slowly to unwind and thus may lower himself in safety. The exhibitor, Mr. S. E. Hardman, of Providence, R. I., attempted to do this, but some part of the apparatus became inoperative; and in endeavoring to fix it, he brought some sudden strain on his rope so that it broke at the point where it turned over the sharp edge of the window sill, causing the unfortunate man tr fall headlong to the pavement beneath, killing him instantly.
The failure of the wire rope simply indicates that it must have been of poor quality. Had a single wire of steel or even iron been used, the tensile strength would have far exceeded any strain which one person descending could have put on it. A sit is, probably deterioration of the metal, coupled with the abrasion by the sharp stone edge of the window sill, determined the break. The casualty only goes to show another source of danger which should
be provided for by making lowering ropes not only abund antly strong but also by applying to them means of protect ing them from accidental injuries. In general, however we do not think the portable fire escape problem is by any means solved yet. There is still an excellent opportunit for inventors to devise some system which shall be absolutel safe and certain in its action, and at the same time shall re quire nothing or nearly nothing to be performed by the pre umably thoroughly frightened person whose life it is de igned to protect.

## Artificial Gems.

What we popularly call paste is technically known a strass; this is also the French word for the same substance (from M. Strass, its reputed inventor). Paste, then, is material with which diamonds are imitated, and by mixing up with it metallic oxides of various kinds, colors in grea variety are imparted to the paste, by which it serves as epresentative of the various colored gems. Strass is pre pared, according to the method of M. Donault, who has attained great proficiency in this art, from silica, potash, borax, and oxide of lead, and sometimes arsenic. Rock crystal and flint consist almost entirely of silica; but as flin enerally contains a little iron, the silica obtained from it is liable to have a tinge of color, which is detrimental to the fidelity of the imitation; rock crystal is therefore employed.

The crucible in which the materials are melted claims par ticularattention, since, if the substance of which it is formed contains metallic particles, color would be imparted to the strass. Hard porcelain and Hessian clay are the best mate rials for this purpose. When the crucibles are supplied with the proper quantity of ingredients, they are placed in a porcelain furnace, where they are exposed to a steady heat for twenty-four hours, and then allowed to cool very slowly, so that a kind of annealing goes on. By this means is produced a strass, or paste, which, after passing through the hands of the lapidary, who gives it the form necessary for "setting," presents us with an imitation of the diamond.
Having once produced strass which imitates diamond, al the other gems may be imitated, by mixing with strass va rious metallic oxides and other substances, according to the color which it is desired to produce. Herein is manifested great diversity of opinions, different experimenters advoca ting different modes of procedure and different ingredients To imitate topaz, add glass of antimony, precipitate of Cassius, and oxide of iron, to the white strass; for ruby, add oxide of manganese; for emerald, oxides of copper, iron, and chromium, and acetate of copper; for sapphire, oxide of cobalt; for amethyst, oxides of manganese and cobalt and precipitate of Cassius; for beryl, glass of antimony and oxide of cobalt; for garnet, glass of antimony, precipitate of Cassius, and oxide of manganese.
M. Donault has given directions somewhat different from the above; but we need not particularise them, as it would carry us into too minute details. We may, however, men tion that he produces the imitative rubies by a particula treatment of the composition employed for topaz. Thi composition is 1,000 parts of strass to 40 of glass of an timony and 1 of purple of Cassius; at a certain stage of its preparation it affords an opaque mass, translucent at the dges, and affording thin laminæ of a red color. A part
of this opaque topaz matter, added to 8 parts of strass of this opaque topaz matter, added to 8 parts of strass
melted in a Hessian crucible, and left 30 hours in a potter's furnace, affords a beautiful yellowish crystal. If this crystal be remelted by means of a blowpipe, it produces a stras nearly equal to the finest Oriental rubies. The art of producing imitative gems, ingenious as it is, is necessarily a confined one; for as soon as faithful copies of certain jewels are obtained, the object of the art is attained. The object is to deceive the eye; for, as M. Dumas remarks, "the most perfect description of strass, if it imitate no particular and identical gem, has no value, because it deceives nobody.' There is a less perfect but a curious mode of producing ar tificial gems, with what are called doublets, by a process of cementation. The artificial gem consists, in this case, of
two pieces of white transparent glass, or of crystal, which is cut into two pieces, conjointly so shaped that both to gether present the external form of the gem about to be im itated. A transparent cement is then formed of Venice turpentine and mastic melted up together in certain proportions, and to the mixture is added a portion of some color ing matter, according to the nature of the gem. Carmine crimson lake, Prussian blue, verdigris, dragon's blood, Spanish annatto, etc., are employed, either separately or mixed one with another, until the required tint is imparted to the gummy mixture.-British Trade Journal.

## The Manufacture of Mosaics.

The modern process of making mosaics now commonly followed at Rome is this: A plate, generally of metal, of the required size is first surrounded by a margin rising about three quarters of an inch from the surface. A mastic ce ment, composed of powdered stone, lime, and linseed oil, is then spread over as a coating, perhaps a quarter of an inch in thickness. When set, this is again covered with plaster of Paris rising to a level with the margin; upon which is traced a very careful outline of the picture to be copied, and just so much as will admit of the insertion of the small
pieces of smalto or glass is removed from time to time with pieces of smalto or glass is removed from time to time with
a fine chisel. The workman then selects from the trays, in
which are kept thousands of varieties of color, a piece of the tint which he wants and carefully brings it to the necessary shape. The piece is then moistened with a little cement and bedded in its proper situation: the process being repeated until the picture is finished; when the whole, being ground down to an even face and polished, becomes an imperishable work of art. The process is the same for making the small mosaics so much employed at the present day for boxes, covers, or articles of jewelry; and this work is sometime upon almost a microscopic scale.
The Florentine mosaic, which is chiefly used for the decoation of altars and tombs, or for cabinets, tops of tables, coffers and the like, is composed of precious materials in mall slices or veneers; and by taking advantage of the nat ural tints and shades which characterize the marble, the agate or the jasper, very admirable effects may be produced in imitation of fruit, flowers, or ornaments. The use of his kind of mosaic is extremely restricted, on account of he great value and expense not only of the materials, bu of the labor which is spent upon them. None but the hardest stones are used; every separate piece must be backed by hicker slices of slate or marble to obtain additional strength and every minute portion must be ground until it exactly crresponds with the pattern previously cut

## Formic Acid as an Antiseptic.

The number of antiseptics is now so considerable that it seems almost hazardous to wish to increase it. Each new antiseptic that appears is extolled as the only saviour, and page after page of testimonials proves its excellence and in allibility. As the people may easily be distracted if every discoverer"pours forth the abundance of his paternal joy ver his offspring, which is frequently far from ripe, it is easy to see that the series of experiments made without pre judice by disinterested persons are of great value. In thes xperiments, made and published recently by Bidwell and others, they overlook, says G. Feyerabendt, one substance which for certain purposes cannot be replaced by any other namely, formic acid. He does not lay claim to priority, for Dammer, in his excellent dictionary, mentions its antiseptic roperties, nor is he a manufacturer of the article; so he oes not speak in his own interest, butin that of the subject. In acid solutions, formic acid far surpasses carbolic acid, nd is especially adapted to the preservation of fruit syrups. Experiments made by Feyerabendt in his own household fo wo years have, without exception, been crowned with suc cess. He has two jars of pickles made with vinegar an ugar from the year 1875, that have only been covered with loose glass cover, yet they have preserved their freshness an show no trace of mould or decay. The taste of formic acid is pure, acid, and pleasant, the price low, and its use ver simple. He has employed from $\frac{1}{4}$ to $\frac{1}{2}$ per cent of it in vin egar, fruit juice, glue, ink, etc., and is convinced that even maller quantities will answer the purpose
He especially seeks to excite the attention of housekeepers, and feels confident that they will be satisfied with the result and introduce formic acid as a good and true friend in panry and kitchen
Ordinary formic acid is made by heating together to $110^{\circ}$ C. equal parts of dry oxalic acid and glycerin, until no car bonic acid is evolved. The pure concentrated acid is obhydrogen, and might contain lead.

## The Oregon silver Mud.

Professor Silliman of New Haven informs us that the al leged argentiferous mud of Wasco county, Oregon, an ac count of which we recently copied from the San Francisc Examiner, is a fraudulent production. As regards the form in which the silver was added, Professor Silliman says tha he metal in the sample analyzed by him was spongy, in a gray powder, and generally in the condition in which silve appears when reduced by zinc. An authentic example from the locality, obtained by a trustworthy correspondent of Pro fessor Silliman, yielded no silver whatever.

## Coloring Zinc Roofs.

Among recent German inventions is a simple process, de pending on the use of acetate of lead, by which every kind of color is applicable to sheets of zinc. By mixing black lead, for instance, with the sait, a very agreeable light brown hue is obtained. It is by this process that the cupola of the synagogue at Nuremberg has been painted. A sufficien length of time has already elapsed, it is said, to show that the atmosphere has had no influence on the zinc sheeting of the roof, thus showing the practical value of the process in such cases. By the addition of other coloring matters, light or dark shades of yellow or gray may be produced.

## A Large Steam Pump.

Messrs. Cramp and Sons have now completed, with the ex eption of the boilers, the immense steam pumping engine which is intended for the Frankford Water Works, Philadel phia. The entire machinery will be ready to go into opera tion by October 1. This engine was built at the contract price of $\$ 46,000$, and has a pumping capacity of $10,000,000$ gallons per day. It is a double cylinder engine, the smaller cylinder being 40 inches and the other 60 inches in diameter The pumps are 21 inches in diameter, and five feet stroke The Frankford reservoir has a capacity of $36,000,000 \mathrm{gal}$ lops, to which have been run a 30 inch pumping main and 20 inch distributing main. There will be three boilers, two o which will furnish steam for 500 horse power. The thir boiler will be held in reserve for emergencies.

IMPROVED STEAM ENGINE GOVERNOR. We illustrate herewith a new and simple device which acts both as a governor and as an automatic cut-off. It is quite sensitive, may be adjusted so as to allow of the engine being

run at any desired speed, and is so constructed that in case of its rupture the engine is caused to stop.
A, Fig. 2 , is the eccentric which connects with the valve rod in the usual way. Its hub is guided by gibs, B , which rest on the slides shown; and at the same time are provided with lateral grooves into which the edges of the slides enter, as shown in the sectional view, Fig. 3. The slides are adjustable so that wear may be taken up. To the eccentric are attached the system of levers, $C$, which are pivoted to the arms of the disk in which the device is disposed, and to which are attached the weights, D. Also attached to the eccentric is the coiled spring $E$, the outer end of which is fastened by a screw and nut, by means of which the tension of the spring may be increased or diminished at will.
The shaft passes through the slot shown in the eccen tric, which slot is of such length as to permit sufficient lateral motion of the eccentric to prevent the valve from opening at the minimum throw. It will be obvious that, when the speed of the engine increases, the weights, D, are thrown out by centrifugal force, and the eccentric is moved across the shaft. The travel of the valve is thus reduced until the engine is brought back to its former speed. If there is a tendency to decrease the speed, the spring, E, draws the eccentric in the opposite direction so as to impart a longer stroke to the valve. The joint acto the valve. The joint action of the tension spring, E , and weighted levers, $C$, on the sliding eccentric thus serves to keep up the uniform motion of the engine according to the degree of speed to which the engine is adjusted, while in case of breakage of the spring it will be clear that the action of the weights will be such as to reduce the valve throw to minimum and so stop the machine.

The device has been applied with much success to small engines of the type shown in Fig. 1, which are especially constructed for small steam yachts. We are informed its addition does
not increase the cost of the engine over that of one fitted $\because h$ the usual ball governor
Patented through the Scientific American Patent Agency, by Mr. H. Tabor, May 22, 1877. For further information ad dress the makers, Messrs. B. W. Payne \& Sons, Corning, N. Y.

The docks on the Mersey are, perhaps, the most magnificent series in the world. They extend over a water area of $255 \frac{1}{2}$ acres, and possess $18 \frac{1}{4}$ miles of quays. Facing the river they present an unbroken line of more than 6 miles. On the Birkenhead side, the water area, including the Great Float, is 165 acres, the quays are more than 9 miles in length, making in the whole 421 acres of water area and 28 miles of quay ing in the whole 421 acres of water area and
space, a set of statistics which will probably afford a clearer space, a set of statistics which will probably afford a clearer
idea of what has been done than the most elaborate attempt at word painting.
The Corn Dock is of comparatively recent construction, and boasts a splendid range of warehouses and elevators. Into this dock the largest ships engaged in the grain trade can be brought with perfect ease, and here they can lie against a range of magnificent warehouses ten stories in height, and with a cellar story below the level of the water. The corn is discharged from the vessels which bring it in bulk by very simple yet effective machinery worked by hydraulic power. From the ships it passes into the cellar floor, draulic power. From the ships it passes into the cellar floor,
which is perfectly rat-proof and water-tight, and thence is raised in a species of hopper worked by the same power to the topmost floor. Each of these hoppers, of which there are ten in all, carries exactly one ton. and it can be filled, raised, and discharged in something over a minute. On reaching the topmost floor a valve opens and the grain pours out in a steady stream upon an endless band of india rubber about 15 inches wide, which is kept in constant and rapid motion over a series of rollers. The effect of this motion is very curious. The corn keep its place exactly on the band; not a grain falls to the ground on either side until, on arriving at the point of discharge, a guiding shoot sends the stream into the secof discharge, a guiding shoot sends the stream into the sec-
tion of the particular floor marked out for it. By a simple system of registration the keepers of this vast granarywhich is believed to be the largest in the world-can point out with unfailing accuracy the whereabouts of each consignment in store. The precautions against fire are elaborate in the extreme-a fact which need surprise no one who remembers how cruelly Liverpool has suffered from its rav
ages in the past. In addition to the usual orders about lights,


COLLIER'S RIVET-MAKING MACHINE.
power of the engines is, as we have said, water, which is obtained from a lofty tower at the dock gates. The water is pumped into the machinery at the top of thetower by steam, the engine used for the purpose being capable of producing a pressure of 700 lbs . to the square inch. This same power is also utilized for the purpose of opening or closing the dock gates, and it is said to be even more perfectly under control


STEAM ENGINE GOVERNOR
than steam itself. One last matter of detail-the warehouses will hold 165,000 quarters of corn, and the elevators and machinery are capable, without any undue pressure, of lift ing from the ships and putting into place in the warehouses 250 tons of corn per hour.-British Trade Journal.

## IMPROVED RIVET-MAKING MACHINE

We illustrate, from The Engineer, a new and simple rivet making machine, recently patented by Messrs. W. Col lier \& Co., of Salford, Man chester, England. One of the great defects in all previous rivet-making machines has been their liability to form the head of the rivets out of center with the shank, and one of the principal objects Messrs. Collier \& Co. have had in view has been completely to obviate this, and render it impossible to make crooked headed rivets in the new machine. The general design of the machine and its mode of working will be readily understood from our engraving. The header or "snap" is carried in a vertical slide which has a reciprocating motion imparted to it by an eccentric shaft driven by suitable gearing. The dies, five in nmber, are carried in a circular table and brought successively under the header or snap by an intermittent feed motion, which not only moves the table until the die is perfectly central with the snap, but locks it, and holds it firmly while the rivet is headed, so that should the iron get more to one side than the other it will right itself by pressure and not spring the table and form a crooked head. The motion for moving and locking the table is carefully protected from scale and water. An ejecting apparatus lifts the headed rivets out of the dies, and a simple self-acting motion picks them up and delivers them clear of the machine into a wrought iron trough or other suitable receptacle placed by the side of the machine. An apparatus is also attached for cutting the iron into the required lengths for making into red lengths for making into riving stop to measure the pieccs.

THE CLAMOROUS FROG
by c. few seiss.
This frog, first described by Merrem as the rana clamitans, is a widely distributed species, and, although numerous in many sections of this country, is commonly supposed to be the young of the bullfrog (rana catesbiana of Shaw). It is, however, a distinct species.
There is one strong specific character in the clamorous frog by which it can always be identified, namely, the elevated fold of skin which originates behind each eye, passing over each tympanum, and disappearing near the bend of brook and yellow frog, rana favi-viridis, by Harlan. Hol the back. These cutaneous elevations are always present in the clamorous frog, even in quite immature animals, while they are never found in the bullfrog at any age.
I have seen specimens of this frog colored almost exactly like the bullfrog, so color alone cannot be taken as a criterion in the specific identification of frogs; nor can it in the majority of animals.

I subjoin descriptions of three living specimens of rana clamitans.
No. 1 (male). Form rather ro bust; snout somewhat pointed. Head, anterior part of body above, and back of tympanum, bright green; posterior portions of the back and sides pale olive brown, or light greenish brown. Arms and legs pale olive brown. Upper posterior surface of body and legs, also the sides, spotted with small pale blackish-brown blotches and spots; nates mot tled darker brown and white. Tympanum almost twice the size of the eye, bronzed, with a light green center. Throat lemonyellow, passing into yellowish white on the abdomen. A few dark marks on the upper jaw. Body and posterior extremities slightly tuberculous. Latero-dorsal cutaneous ridges prominent, extending from orbit to bend of back. Length, from tip of snout to vent, $2 \frac{10}{16}$ inches.
No. 2 (female). Snout less pointed than in No. 1. Head, and anterior part of back, grass-green; posterior part, and legs, olive brown, much darker than the preceding. A few blackish brown spots on the rear back. Legs barred with black-brown. Sides spotted black and white. Labials marked with blackish brown wavy lines, inclosing whitish spot. Tympanum but little larger than the eye. Nates
and latero-dorsal ridges, as in the male; the brown mottling of the nates darker, almost black. Skin more or less tuber culous. Length $2 \frac{11}{16}$ inches.
No. 3 (female). Before each orbit, below each nostril, a arge green spot. Rest of head and fore part of body, dull olive green, with a tinge of brown. Remaining parts as in
No. 2, but the colors paler and the markings less distinct. No. 2, but the colors paler and the markings less distinct.
The male, as described above, was called the spring frog,
rana fontinalis, by LeConte, Holbrook, and DeKay; and the green and yellow frog, rana flavi-viridis, by Harlan. Holbrook says the spring frog is only found in cold spring water.



## THE CLAMIOROUS FROG

The typical clamitans I have found to be the most common one one-thousandth Daniell about ponds and streams, and our spring frog was captured in a creek, far distant from any spring. Its abrupt croaking note is exactly similar to that of the other. Its habits are note is exacly silar to that of the other. Its habits are the same, and I have witnessed a male of this variety em-
bracing a female of the typical variety, clamitans.
The food of the clamorous frog is various. Insects of all kinds, crawfish, worms, salamanders, and small frogs, I have known it to devour. I have seen a female seize and
swallow young frogs of her own species, and which probaswallow young frogs of her own species, and which proba bly were her own offspring. The young frogs were invaria level pathway, the designer has placed steps on the arches bly were her own offspring. The young frogs were invaria- $l_{\text {themselves, so that the traveler is obliged to ascend and de- }}$


A CURIOUS BRIDGE AT IWAKUNI JAPAN.
scend five eminences to make the crossing. This extraordinary structure is three hundred years old and is regarded as one of the natural curiosities. The supporting pillars are of stone, and the superstructure of wood.

## Improved germinating apparatus.

The apparatus represented in the accompanying cuts is intended to test the germinating capacity of seeds, and is de signed to be used by seed dealers, gardeners, and others.
The apparatus is shown in Fig. 1, and in Fig. 2 is seen a vertical longitudinal section. Fig. 3 is a vertical cross section, and Fig. 4 shows one of the perforated seed plates with which the apparatus is provided.
As shown in Fig. 1, the apparatus is enclosed in an iron covering with a tightly closing front door, through which the seed plates, $a, a, a$, are placed. The plates are introduced into the apparatus and supported on shelves, $c, c, c$, made of perforated sheet metal. The seed plates are made

of a mixture of pulverized firebrick, sawdust, and powdered charcoal. Every seed plate has a number of oval indentations or cells, in which the seeds are placed, and these cells are made proportionate to the size of the seed. The seed plates are placed in sheet metal pans, $b, b, b$, in which is a sheet of felt of the same size as the plate. Both seed plates and shelves are enclosed in a jacket formed of two rolls of sheet metal, the space, $d, d, d$, between them being filled

with water which is heated by a communication with the vessel, $e$, which is also filled with water and heated by a petroleum or alcohol lamp, $g$. To prevent the loss of heat by radiation, the spaces, $h, h$, are filled with ashes or any nonconductor of heat. Cold air is admitted to the interior through the channels, $i, i$, and the moisture is conducted away through the pipe, $l$, which has a small drip cup, $m$, for the water of condensation. At $k$ is shown means for drawing off the water if desired.

Fig. 4.
 000000000000000000000 000000000000000000000
000000000000000000000 apparatus, the seed plates are When it is desired to use the certain amount. The plates are then placed in the pans, in which water has been previously poured. The seeds are then wet and placed in the cells. If it be desired to germithen wet and placed in the cells. If it be desired to germinate the seeds at the temperature of the atmosphere, all tha
has to be done is to keep up the supply of water in the pans, but if a more rapid germination is wished, the apparatus is heated by the lamp until the requisite temperature is obtained, when that heat is kept up by reference to the thermometer and regulating the lamp.

The article upon the gorilla in our last issue should have been credited to Frank Buckland, in Land and Water.

## notes of patent office decisions.

## PATENTS.

Adams brought a suit in equity against the Joliet Manu facturing Company for infringement upon his letters patent for an "Improvement in Corn Shellers." The object of the invention in question was to secure an operative automatic feed, which, without the care of an attendant, would keep the stream of ears of corn steadily and uniformly running into the sheller, instead of permitting it to pile up or choke in the throat. This he accomplished by a series of wings, wheels, or projections, so arranged on a shaft as to revolve in the same direction in which the corn was running, and so placed relative to the throat as to force into the corn sheller all misplaced or hesitating ears. Upon the question of novelty, a large number of devices for feeding or regulating the feed of corn shellers, thrashing machines, straw cut ters, planing machines, carding machines, etc., were intro duced in evidence. One of these devices, in feed regulators for corn-shellers, which preceded the complainant's, was, in form of construction, almost precisely like that of complainants, except that it revolved in a contrary direction. It consisted, in brief, of a winged shaft, or beater-bar, over the throat of the sheller, so arranged as to revolve in the opposite direction to the stream of the ears of corn, and to drive back the overriding ears as they approached the throat. When at rest, however, and without the gearing by which the motion was secured, the two devices would strike the eye as substantially alike. The circuit court, however, has just rendered its decision sustaining the complainant's patent. It holds that the prior device was found to do but little towards securing the desired result, as the ears thrust or knocked back only got in the way of others, and the machine was therefore still liable to clog, so as to make the feedirregular, and require frequent attention from an attendant, and that an improved result was obtained by the complainant's dean im
In the infringement suit of Henderson vs. The Cleveland Cooperative Stove Company, it appeared that the specification of the complainant's patent for an improvement in coal stoves, described a combination of a combustion chamber, and a circulating air chamber surrounding the hopper, as the substance of the invention, and further stated that, in whatever form of stove the said improvement was applied, both elements, namely the combustion chamber and the circulating air chamber, must be preserved. The Circuit Court holds, however, that a separate claim of the patentee to each of the elements can, nevertheless, be maintained, and that no inference of the abandonment of an individual element made the subject of a distinct claim can arise from the mere fact that the specification states the invention to consist of its combina tion with another feature.
The Supreme Court of the United States has lately rendered its decision in the equity suit of Russell vs. Place, for infringement of letters datent. The main question involved was whether the defendant could set up certain defensessuch as want of novelty in the invention, its use by the public for more than two years prior to the application for the patent, etc.-a judgment in an action at law for infringement of said letters patent having previously been recovered against them by the said complainant. The court decides that before the judgment of a court of competent authority, rendered in a prior action between the same parties, can pre vent the defendants from availing themselves of such defenses in a subsequent suit, it must be certain that the consideration and determination of the particular matter set up in the defense to the subsequent suit was necessarily involved in the verdict and judgment in the prior suit; and that if this did not clearly appear from the face of the record, extrinsic evidence consistent with the record might be admitted to establish the fact.

COPYRIGHT CASES.
A decision has lately been rendered by Judge Shepley, in the suit of Richardson vs. Miller for the infringement of a copyright for circular playing cards. The defendants contended that their prints were unlike the cards copyrighted by Richardson, and did not infringe the copyright. They further insisted that his copyright was invalid for the reason
that his prints were not the fit subject of a copyright. It appeared that there were certainmarked differences between the prints of the copyrighted court cards of the complainant and the court cards of the defendants. There was much less space in the center of the cards. The faces of the kings and queens were turned in a different direction. There was a difference in the spaces between the heads on the court cards. There were marked differences in color, also, so that the cards of the defendants were easily distinguished from those of the complainant. But on the other hand, there was a striking similarity in those distinctive features of the main design wherein the printed cards of the complainant differed from other playing cards previously used. In the court or facecards of both complainant and defendants, there was a suit spot in the center of a circular card, with five similar heads arranged at equal distances from each other around the central suit spot, with five smaller suit spots near the outer margin of the circle, at equal distances apart and intermediate between each pair of heads. The court holds that these distinctive features of the main design being thus reproduced in the impressions of the defendants' prints, it is no answer to the charge of infringement that the whole of the design has not been copied, if those features of it have been appropriated which substantially embrace the novelty of the conception and the value in the application of the art of the designer. The doctrine is as applicable to prints and
engravings as to books, that one cannot take the vital part of another's work, although it may be but a small part in quantity, or insert distinct and material portions of one wor into the general texture of another, constituting its chie value, without being chargeable with infringement.
In regard to the second ground of defense, the court, while admitting that it would not lend its aid to protect the authors of immoral works, says that there is nothing immoral or im proper in the complainant's playing cards themselves, and the fact that they may be used by persons to violate the law against gambling will not, of itself, deprive them of the protection of the law.

## GIANT LILY.

This huge lily is quite different in aspect from any ofher in cultivation. Leaves very broad, those near the root and lower part of the stem, stalked, oval-acute, with a heart shaped base; the upper stem leaves nearly stalkless, with a

rounded base, and diminishing in size; in size and shape very much like a catalpa leaf. Blooms in summer on a stalk from $7 \frac{1}{2}$ to $9 \frac{1}{2}$ feet high. The flowers are greenishwhite outside, tinged with violet on the inside, large, 6 to 7 inches long, funnel-shaped, with divisions slightly reflected, fragrant, pendulous, 8 to 15 (sometimes 20 ) on each, tall and fragrant, pendulous, 8 to 15 (sometimes
stout stem. Native of the Himalayas. Usually grown in greenhouses, but will grow in the open air if well protected A well drained position, good, deep, and very sandy soil, are indispensable. The best position for it is isolated, a few feet within the margin of a shrubbery, with a warm exposure. Also suitable for association with hardy subtropical plants. A box or barrel should be turned over the plant in the fall, and well filled with leaves.
Bulbs are very large, conical, with scales which are very broad at the base and narrow at the top, very fleshy, not compressed, and of a greenish-white color.

New Haven as a Manufacturing Center.
The New Haven Chamber of Commerce, through its Secretary E. S. Wheeler, is inviting the attention of manufac turers to the advantages offered by New Haven to manufacturing enterprises. These consist of a good harbor, ample wharfage, cheap and rapid communication with New York by water and rail, ample facilities for foreign exportation, direct rail communication with New England, the West and Southwest, with low freights, a large body of skillful mechanics, a smaller indebtedness than any city of its size in the Union, a low rate of taxation, a low rate of assessment, thirty-three miles of sewerage, an ample water supply with one hundred miles of water mains, an admirable fire depart ment, a healthy location, building cheap, and sales plenty and low priced, and educational advantages unsurpassed. Manufacturers wishing to escape excessive taxation and se cure a location for manufacturing goods economically and marketing them at home and abroad successfully, should go to New Haven. -N. Y. Tribune.

## Adulteration of Beeswax.

The recent adulteration of yellow beeswax with rosin has led to the invention of a new method for its detection. E Schmidt recommends the following process for the rapid and accurate detection of relatively small quantities of pine resin. He heats 5 grammes ( 75 grains) of the wax to be tested in a flask with four or five times the quantity of crude nitric acid, specific gravity $1 \cdot 31$ to 133 , until it boils; and it is kep boiling a minute, then an equal volume of cold water is added, and enough ammonia (which must be added very cautiously) put in and shaken to cause it to smell strongly of ammonia The alkaline liquid is decanted from the precipitated wax into a cylindrical vessel. If the wax was pure the liquid will have a yellow color; if the wax was adulterated with rosin the liquid will have a more or less intensely reddish brown color from the formation of nitro-products. This be ing a colorimetric test, it is well to have some perfectly pure was for comparison. The reaction is much more violen during boiling if rosin is present. Aslittle as 1 per cent can be detected in this way.

## A New Gold Salt for Toning.

by dr. J. schnauss.
Until now there have been used only the single and doubl chloric salts of gold for toning During the past winter Mr Neumayer, student of chemistry from Munich, visited m establishment and undertook under my directions the prepa ration of a gold bromide and a gold bromide of calcium, for the purposes of experimenting with these salts and their use in photography
Thin leaves of gold are readily dissolved in bromine wate and in bromine gas. But a more rational and less disagree able mode of preparation is by the action of hydrobromic acid, nitric acid, and aqua-regia.
During the evaporation of the gold bromide, which has dark appearance and smells strongly of bromine, great care is necessary, owing to the fact that the gold bromide vaporizes more easily than the chloride. Bromide of gold is dif ficult to crystallize. By the addition of an exact equivalent of bromide of calcium dissolved in water, and evaporated, small granite-red crystals of double salts are obtained. KBr $+\mathrm{AuBr}_{3}+\mathrm{oH}_{2} \mathrm{O}$ can be with difficulty dissolved in water; but a thin solution is of a deep red color, and effloresces in dry air.
I have tried these double salts, also the gold rromide, with several additions as a toning bath. In its general effect on silver copies it is analogous to gold chloride combinations, except that in the same proportions it acts more energeti cally.
The addition of soda bicarbonate gives a blue-black tone melted acetate of sodium a purple colored tone.
For a lasting gold bath, in form of a sel encaussé, these salts are recommended.-Archiv.

How to Prepare Photographs for Printing Blocks
In the Photographisches Archiv appear the details of a sim ple method of securing an outline photograph in metal suitable for printing with type in the ordinary printing press. It is necessary to be somewhat of a draughtsman, no doubt, in order to be able to do the work well and rapidly, although nothing is said on this head, but hardly any one could, haphazard, undertake the matter.
Only a well marked photograph with bold lines, and in which minor details are of no account, is suitable, and the negative is in the first place put into a camera or other apparatus to furnish an enlarged positive. Upon this enlarged positive are traced, in Indian ink, the bolder lines which it is desired to retain, a pen or brush being employed for the purpose, according to the nature of the work or the desire of the draughtsman. After all details have been in this way traced, with thoroughly black pigment, the lines of a thickness corresponding to the original object, and of such a nature as to be readily reproduced by photography, the print is treated with chloride of lime or other bleaching agent, and in this was the whole of the image obliterated with the exception of the block lines made by the draughtsman.
The picture is now photographed, and in this way a small negative secured, or one, at any rate, of the dimensions of which the printing block is to be. In this case the negative will be perfectly opaque in the lights and transparènt in the shadows, and from it may be easily produced, by any of the etching processes, an engraving upon zinc capable of being used in the printing press with type.
Chloride of lime is specially mentioned as the bleaching agent wherewith to render invisible the details of the silver image, after the draughtsman has done his work. We should think that a solution of bichloride of mercury would be much more effectual in making the original photographic image disappear.

## Aluminum

In a recent meeting of the Miners' Union at Freiberg, Professor Winkler described some experiments made to measure the power which aluminum possesses of resisting external influences. Tablespoons made of aluminum, of silver (75 per cent), and of German silver of best quality, were the subjects of experiment. They were in the same daily use, and were weighed at regular intervals. These spoons were purposely brought into contact with the greatest variety of food, and each time after using were rubbẹd with soap, washed in hot water, and rinsed with cold water. They were also occasionally washed with a dilute solution of carbo nate of soda, so that they were in daily contact with hot and cold. acid and alkaline liquids.
In the course of time there was a change in the appearance of the spoons. The aluminum, which at first was a beautiful white, lost its brightness and acquired a dead, bluish-grey color; the German silver also lost its brightness, while its color changed to a disagreeable greyish-yellow; the silver stood best, as it only lost its polish, but remained comparatively white. Repeated weighings showed an average annual loss in weight of:

### 0.630 per cent for aluminum, <br> $0 \cdot 403$ <br> German silver

so that if it were possible to use them until entirely used up, a silver spoon would last 248 years, one of aluminum 158 years, and one of German silver 99 years.
The spoon form was selected merely because it offered the best opportunity for measuring the amount of chemical and mechanical loss in comparison with other metals and alloys tested. The results of these experiments showed that aluminum is not nearly so easily attacked as has hitherto always
been supposed, but is more like zinc; and if it could be made at a low price, it might be employed for a great variety o purposes.

## NEW BOOKS AND PUBLICATIONS.

Light-a Series of Simple Experiments, etc., by Alfred
M. Mayer and Charles Barnard. D. Appleton \& Co. 549 and 551 Broadway. 1877.
There have been so many attempts to popularize scientifc exper iment Ing, that we took up this little book with some curiosity as to the new guise in which we were sure Dr. Mayer would present his experiments. The way
in which that curiosity is gratifed is to us very satisfactory. The experiments are capitally selected and equally as well described. In fact the book is conspicuously free from the multiplicity of confusing directions clear enough to the writer but not to the reader, with which works of the
kind too oftenabound. Beginning with the heliostat and its simple con kind too often abound. Beginning with the heliostat and its simple con
struction, Dr. Mayer takes up the phenomena of reflection, refraction, and decomoposition of fighth, , ivining a few-and carefully avoiding too many-
experiments in each branch. which are the best suited to fix the particular experiments in each branch. which are the best suited to fix the particular
principle under study. Complicated and expensive apparatus is avoided, principle under study. Complicated and expensive apparatus is avoided,
and everything needed for the entire course may, we are told, be bought
for for 15 dollars. There is an abundance of excellent illustrations, and Mr.
Charles Barnard, who describes the various experiments as they were pro duced before him, has certainly ably supplemented Dr. Mayer's work. Al ogether the book is very com
of the ScIENTIFIC AMERICAN.
A Treatise on Engineering Construction. By J. E Shields, C.E. New York: D. Van Nost
Publisher, 23 Murray street.
A plainly written clear and readable little book, which owes its value to
the fact that it is claimed to be the results of the author's own experience gained in a professional practice of many years. It deals with practica subjects throughout. There are chapters on sand, concrete, caissons, pile
driving, etc., under foundations-a division is devoted to masonry, anothe to tungels, and the last to engineering geodesy. An excellent work for
young students in the profession, and a handy book of reference for any young students in the profession, and a handy book of reference for an The Railways of New South Wales. A report on their
Construction and Working from 1872 to 1875 inclusive. Construction and Working from 1872 to 1875 inclusive. By John Rae, A.M., Commissioner for Railwa
lished by the Government, Sydney, N. S. W.
Mr. Rae's report shows with much clearness the advantages accruin growing country to commerce. At the end of the four years noted there
were 437 miles of road in the colony in operation and an additional length of $2511 /$ miles in progress. The expeneniture for rolling stock, machinery
shops, etc., had been about $\$ 82,895$ per mile- $48 \cdot 18$ per cent of the earning were spentin maintenance and working. For every mile open the earn
ings were $\$ 7,495-$ the expenditure being $\$ 3,610$ and the net earnings $\$ 8,885$ ings were $\$ 7,495$-the expenditure being $\$ 3,610$ and the net earnings $\$ 3,885$
The net earnings show an increase of $10 i$ per cent for the year 1875 ove that of the year 1871. A supplement to the report gives detailed descrip
tions of the lines and works of construction, which will be found of value to railroad civil engineers for purposes of reference and study.

## Mandal of the Rail roads of the United States for

1877. By Henry V. Poor. 10th series. Publish
H. V. \&H. W. Poor. 68 Broadway, New York.

Poor's manual gives as usual a valuable and very full compilation of
statistics relative to all the railroads of the country, showing their present statistics relative to allthe railroads of the country, showing their present
status and also their history during 1876. The past year, we learn, has been one of great depression in the rail way business although the aggregate re sults of all operations has been "fairly satisfactory." The number of
miles of road opened during the year was 2,856 against 1,919 miles for 1875 , 1,911 miles for 1874 . This increase is due to activity in the Southern Pacifl lines and in narrow gauge lines in Ohio, Texas. and Colorado. No new
lines of any magnitude have been undertaken. The gross earnings of the business have fallen off $\$ 5,807,546$, and the net earnings have increased
$\$ 946,314$, thelatter owing to the economies practiced in operating the roads. $\$ 946,314$, the latter owing to the economies practiced in operating the roads. The information given regarding the various lines covers financial condi-
tion, property, etc., with much detail. There is avaluable ing State debts and liabilities.

## A Treatise on the Use of Beititing for the Transmis sion of Power. By John H. Cooper, M.E., Philadel phia. Claxton, Remsen, \& Haffelfinger, 624 Marke phia.

needed by mechanical compete treatise on the subject of belting has been needed by mechanical engineers for a long time. Information on the sub ject, of which there has been no lack, has remained scattered through the
fles of this and other journals or has appeared in the shape of chapter in works covering very much wider ground. Hence the matter of belting
has not obtained that exhaustive treatment which its importance really has not obtained that exhaustive treatment which its importance really warrants for it, and hence we are more gratified to see so well qualified an
engineer as Mr. Cooper undertake and carry the task to a successful completion. The only blemish-if it indeed be one at all-is that his work is too full; original papers are quoted in abundance where perhaps condensation would have better suited the needs of the practical reader while the risk
of repetition might have been avoided. But as a whole the of repetition might have been avoided. But as a whole the book is excel-
lently well compiled from a large number of sources. The best and newes lently well compiled from a large number of sources. The best and newest
of all on the subject has been culled. Practical hints and suggestions
abound, there is a multiplicity of rules, recipes, and useful tables, and an abound, there is a multiplicity of rules, recipes, and useful tables, and an ample supply of good woodcuts.

Inventions Patented in England by Americans. From July 31 to August 6, 1877, inclusive.

```
AxLes.-B. T. Babbitt, New York city
BARBED WIRE FENCE.-H. W. Putnam,
m, Bennington, vt
```

Extractivg Wort from Malt.-R. d'Heureuse, New York city.
FTLE ARMS.-E. T. Starr, New York city.
GAS APpARATUS.-W. W. Batchelder N.
Gas Apparatus.-W. W. Batchelder, New York city
PLumber's Traps, Etc.-J. E. Folk, Brooklyn, N Y.
Puncting and Shearing Machine.-D. Brickner, New York city
Sewing Machine.-L. R. Blake, Boston, Mass.
Shoe Machinery.-H. G. Thompson, Milford
Shoe maciinery.-H. G. Thompson, Milford, Conn
Telegraph Instrument.-T. A. Edson, Menlo Park, n. J.
Tooo holder.-E. F. Bengler, Williamsport, Pa.

## getent Ambriata and forcign ceatemts.

## Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it Inveatly to their advantage to have them illustrated in the Scievtific AmerICAN. We are prepared to get up first- class wood Engravings of inven-
tions of merit, and publish them in the ScIENTIFIC American on very easonable terms.
We shall be pleased to make estimates as to cost of engravings on receip of photographs, sketches, or copies of patents. After publication, the
cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

## NEW HOUSEHOLD INVENTIONS.

IMPROVED SHADE HOLDER.
Gristarus H. Reck, Bethlehem, Pa.-This invention relates to an improved shade holder that adapts itself to any shape of burner, with iron, brass, lava, or other tip of a larger size than the body; and the invention
consists of a shade holder having arms and springs fastened by their bent ends into a U-shaped collar or ring. The springs produce a firm fitting of
the shade holder to the burner without the shade holder to the burner without being liable to get shaky or loose, as the arms and springs are attached without solder, and retained firmly
by the binding action of the collar or ring, forming thus a strong, durable and tightly fitting shade holder.
improved lamp bracket.
John Forster, Coal Valley, Ill.-This invention relates to an improved afety lamp stand for sewing machines, pianos, organs, and other purposes, nachine or other object, and provided with a detachable standard and oil cup stand, the standard having an adjustable stand and collar for the lamp,
and a pincushion at the top.

## improved reciprocating churn

Daniel A. Fiske, St. Louis, Mo.-When the dasher of this churn is raised the wings turn down, permitting the dasher to rise easily through the cream. When the dasher is forced downward the wings are thrown up, ream to rotate surfaces of the various portions of the dasher cause the The intermittent rotary motion of the cream is milk and butter, and the same motion tends to unite the particles of milk an
tmproved wringer.
Edwin Banfield, Jermyn, Pa.-This machine is designed for use as a wringer and as a mangle upon table linen, bedclothes, and other plain artiles that are free from buttons, hooks and eyes, and other fasteners. The transfer the waste waterwhere it is guided by cleats into a tub, and inclined tables or levers, to which the guides and cleats are attached. When the machine is to be used as a mangle, the table, with the cleats, is inverted, and the tables are adjusted in a horizontal position.

## IMPROVED ROTARY CHURN.

William Knaggs, Richview, Ontario, Canada.-The object of this inven as to bring the butter very quickly, and gather it quickly and thoroughly. he dasher rod is made square, passes through square holes in the cente crossbar, and its end revolves in a step or socket attached to the botto bearing inserted in a hole in the of the rod is enlarged, passes through or formed upon a in a hole in the top of the churn body, and atastruction when the dasher is turned forward the milk is drawn inward by the bars forced through the opening between theirinner edges, and strikes again When the dasher is wich is divided ars sides of the bars act as pad dles or ladles for gathering the butter.
improved rotary churn.
Honoré G. Fougeu, Cape Girardeau, Mo.-This invention relates to new motive power which is especially designed for mixing liquids, for motion is found useful. The aperture may be made small enough to fit an ordinary tumbler, or can be constructed on a scale large enough fo churning butter or washing fabrics. The upper end of a spindle has bearing in a handle, which is screwed fast upon the cap. The lower end of the spindle is screw-threaded to receive the shaft of a dasher, whic may be of any desired form. Between the upper end of the dasher shaf the spindle, and confined by friction, so that in the event of the dashe meeting with eristance which would be liable to injure the machine the said wheel will slip. Inside of the cap is fitted a collar which may be made of sheet metal, and which is constructed with a circular flange that receive pon it a cylinder. The collar will prevent fluids from getting inside o the cap. The cylinder is designed to prevent fluids which are being ag ta ed from flying out of the vessel containing them. The machine is op rated by means of a strong chord, which is wound around the pulley on
 mixing all kinds of fluids, for churning, making ice cream, beating eggs, washing fabrics, and for many other purposes.

## NEW MECHANICAL AND ENGINEERING INVENTIONS.

## IMPROVED CORN PLANTER.

William M. Steel, White Day, W.Va.-This invention consists in the com ination of the U -shaped iron bars with the axle of the sulky, to adapt it to receive the operating parts of the machine; and in the combination of nd the block or blocks with the U-bars and the axle and wheel sulky. To the rear side of the axle are bolted the forward arms of two $U$, shaped iron bars, withnn which is secured a wooden bar. Tothis bar is at tached a long hopper, or two short hoppers, to receive the seed, and from
which the seed is removed by dropping slides which have holes formed in them of such a size as to contain enough seed for a hill, and pass thed slots in the front and rear sides of the hopper. The forward ends of the dropping slides are pivoted to a spring bar, one end of which is attached to a stud attached to the axle near one wheel, and its other end projects so as to be struck by a block or blocks attached to the spoke or spokes of th other wheel. The slides are kept from carrying out any more seed than
enough to fill their dropping holes by rubber blocks attached to the forward side of the hopper. The seed drops from the slides, through holes in th bar, into the conductor spouts, attached to the lower side of the said bar and upon the lower ends of which are formed, or to them are attached points to open the soil to receive the seed and points to cover the seed. The spouts are connected by a rod, so that their lower ends may be adjusted
to plant the rows wider apart or closer together. The distance apart of the to plant the rows wider apart or closer together. The distance apart of th hills is regulated by the number of blocks attached to spokes of the wheels,
The amount of seed dropped for a hill is regulated by using slides with The amount of seed dropped for
arger or smaller dropping holes
improved stone-quarrying machine.
John B. McRae, Mount Holly, Ark.- The object of this invention is to work the large quarries of soft whitestone which are found in Texas and other States, and which produce a very useful building material, by a ma
chine which is designed to cut the stone in the quarry directly into block chine which is designed to cut the stone in the quarry directly into block
of the required size in a quicker and more economical manner than with the present slow and tedious methods of quarrying them; and theinvention consists of a car with a steam engine or other motor driving a vertical and adjustable front saw, a horizontal and adjustable saw back of the same and a third vertical rear saw, at right angles to the front saw, to divideth long pieces of stone cut from the bed into blocks of the required size. Th ment. A car of suitable size is propelled to the place of work on a track laid in the quarry. The car is provided with a steam engineor other moto by which the cutting saws are revolved and the car moved forward while the machine is in operation. The car is moved up along the bed of stor as the cutting progresses. At the front part of the car is placed a vertical saw, of suitable diameter, that cuts down into the bed of stone.

## IMPROVED HYDRANT VALVE.

Frederick Shriver, Grand Rapids, Mich.-The object of this invention is construct a hydrant valve that cannot freeze or become obstructed so
a to be inoperative. Above the valve seat openings are made through the ides of the part of the valve that projects into the supply pipe and pass ages are formed in the projections on opposite sides, which extend down ward below the casing to permit the escape of waste water. The valve con sists of a follower. which is reduced in diameter to receive the packing which caps over its end and extends upward to the shoulder, which is undercut to retain the edges of the packing. Below the packing a centrally edge that projects downward. Below the disk there is a leather or rubber
packing disk, and a serew passes ihrough the disks and packing into the follower, holding all of the parts together. Above the shoulder the follower is reduced in diameter to permit the waste to escape through the passages
when the valve rests on its seat. A rod is screwed into the valve forsperatwhen the valve rests on its seat. A rod is screwed into the valve for operat-
ing it. The part is connected with a supply pipe, and the casing with the ing it. The part is connected with a supply pipe, and the casing with the
upper portion of the hydrant by a pipe. When the valve is raised it closes the waste passages and allows the water to pass from the passage through the openings to the chamber, and thence through the pipe. When the
valve is closed the water remaining in the pipe escapes through the waste valve is closed the water remaining in the pipe escapes through the waste
passages, and should one of the passages become clogged the other is sufpassages, and should one of the passages become clogged the other is suf-
ficient for the escape of the waste water. The valve casing may be made ficient for the escape of the waste water. The valve casing may be made
partly from pipe fittings, or it may be cast entire from steam metal or other partly from pipe fitti
suitable machinery.

IMPROVED MILLSTONE-DRESSING MACHINE.
Frank Miller, Lapeer, Mich.-The object of this invention is to furnish a device for dressing millstones which will keep a perfectly true surface
upon a stone, and will feed the cutter forward automatically as each cut is made. The invention consists in a combined frame and slotted arm, pivoting bolt, pivoted slotted lever, sliding crosshead, cutter, pawl, ratchet wheel, and a swiveled screw adapted for use in dressing millstones. A small rectangular frame is planed perfectly true, from the inner end of
which an arm projects which is slotted longitudinally to receive a bolt, by which an arm projects which is slotted longitudinally to receive a bolt, by
which the inner end of the lever is pivoted. The inner end of the lever is slotted longitudinally to receive a pivoting bolt, so that the said bolt may be adjusted to cause the cuts to approach each other at a greater or less the frame and desired. The lever rests and vibrates upo has long itudinal flanges formed upon its upper and lower sides, to serves as ways
for a crosshead to slide upon. To the crosshead is pivoted the end of a for a crosshead to slide upon. To the crosshead is pivoted the end of a stop attached to the said crosshead. The cutter makes the cut as the crosshead is drawn inward, and as the said crosshead is pushed outward the engaging end of tee pawi strikes against the the screw is turned by the outward movement of theel and head the lever will be moved laterally to bring the cutter into the proper
position for making another cut. With this construction the stone will be position for making another cut. With
dressed from the eye to the skirt, just the same as a stone will wear, facing the stone at the eye or center, and cracking it at the skirt.

IMPROVED ADJUSTABLE GAUGE FOR SAWMILLS. Franklin Wheeler, Berlin, N. H.-This invention has relation to gauges or guide applied to a bar which is ad justable between guides, and provided with a handle and a latching device. The bed plate of the gaugeis secured upon a solid foundation, and arranged at right angles to the plane of the is a sliding gauge bar. A gauge roller is applied on a post, so as to rotate pendicular to it. A handle is secured to a bar at the end bearing the roller and which is perpendicular to this bar. To this handle is pivoted a latch bar, to the free end of which a shouldered latch pin is loosely applied, which passes freely through the bar and enters one of a number of holes
made through the bed plate between the guides. Rising from the pivoted made through the bed plate between the guides. Rising from the pivoted
end of the latch bar is a tongue, between which and the handle is a spring that acts to keep down the latch pin. By firmly grasping the handle and justed endwise will be raised out of its hole, and the gauge the stuff to be sawed. The top of one of the guides is'graduated by marks corresponding to the holes, and a pointer fixed to the bar opposite to the latch pin is used to indicate the position of the roller with respect to the saw.
improved twisting spindle for making cordage.
Charles E. Brownell, Moodus, Conn.-The object of this invention is to furnish an improved spindle for twisting twine and other three or more
strand cordage, which shall be so constructed as to enable the twist to be made tight or loose, which shall be evenly balanced, and which will stop
itself automatically should one of the strands break. To the spindle is atitself automatically should one of the strands break. To the spindle is at-
tached two plates. In the plates are formed holes to receive the journals formed upon the end plates of the fliers. To the upper side of the upper plate are attached the ends of springs which have bends formed in them
near the hellow journals of the fliers to receive the strands. The springs are so formed that when left free their bends will be upon the outer sides of the hollow journals, and their outer ends will project beyond the periphery of the plate. By this construction the tension of the strands will
draw the free ends of the springs inward; and, should the said strands break, the elasticity of the said springs. will throw their outer ends outward, to strike against the frame of the machine or against stops, attached to said frame to stop the device and prevent waste of material. The springs
thus act as tension devices and as automatic stops. The tension upon the strands may be varied by regulating the force of the springs and increasing or diminishing the number of coils of the strands around the arms. The ring plate on the spindle can be driven at different velocities, thusim-
parting to the fliers any relative number of revolutions to one of the spinparting to the fliers any relative number of revolutions to one of the spin-
dle. In this way the twist of the strands can be exactly adjusted to the dle. In this way the twist of the strands can be ex
kast twist, so that the completed cork will not kink.

## IMPROVED DREDGE BUCKET

James McSpirit, Jersey City, N. J.-The object of this invention is to
provide a device for operating dredge buckets and grapples by means of provide a device for operating dredge buckets and grapples by means of
levers and connecting rods, and to dispense with the usual windlass and other objectionable devices. This arrangement of the lever and connecting rod forms a pair of toggle joints for each half of the bucket, which are
capable of forcing them together against great resistance. A roller is capable of forcing them together against great resistance. A roller is
journaled in the upyer part of the frame for guiding the chains that operate the buckets. A chain is attached to the sheave, and winds partly around it when the buckets are closed, and extends upward to the crane that supports the buckets, and a chain is attached to the upper end of the lever, and passes under the roller and upward to the crane before mentioned. It
is obvious that the levers and devices described in connection with dredge is obvious that the levers and devices described in connection with dre
buckets may be employed with equal advantage to operate grapples.
improved indicator for mining shafts.
Calvin O. Richardson, San Francisco, Cal.-This invention consists of a bell having a spring tongue or clapper that vibrates easily, so that when
the bell is attached to the hoisting rope of a mining shaft, and the tub or cagedescending, the clapper will strike the bell when there is a sligh checking or variation in speed, which is caused by the momentum of the clapper overcoming the slight resistance of the spring tongue. Thus warn-
ing is given of the descent of the cage or tub. A more violent ringing is caused as the tub approaches the cage or tub. A more violent ringing is sudden pressures upon the brake, thus warning the workmen tostand from under.
improved steam engine.
William Walker, Bury, England.-This is a tri-cylinder engine of the vertical pattern. The pistons have reduced extens in its cylinder the ex tensions uncover the live ports and admit steam to the contiguous cylinder which thus acts on the contiguous piston and forces it down. When this
last-named piston rises, an aperture in its extension registers with the last-named piston rises, an aperture in its extension registers with the live steam port and the exhaust of the contiguous piston then takes place
down through its bored passage. Thus, as each piston descends, it opens the port of a contiguous piston, and, as it rises, it opens the exhaust for the port of a contiguous piston, and, as it rises, it opens the exhaust for
the piston on the other side. The engine is reversed by a suitable rotary valve.
improved hoisting machine.
Henry Batt, Kentish Town, London, Eng., assignor to Leonard G. Tab-
fast and loose pulleys, short shafts, sliding gearwheels, large gear wheels,
and clutches with each other. When certain wheels are in gear the ma chine works with great power and slow movement. When other wheel wheels are in gear it will work as a single purchase hoist and with medium power and speed. Brake straps are arranged for controlling the movement of the apparatus, which are attached at one end to the frame, passing ove a drum wheel, and their outer ends are attached to the short arms of bent levers, which are pivoted at their angles to the frame, or to supports at-
tached to said frame, and are provided with catch bars to hold them in place when adjusted

## new miscellaneous inventions.

improved horse-detaching apparatus.
Warren Jones, Berlin, Wis.-The object of this invention is to provide
an improved horse-detaching apparatus for vehicles, designed to enable the an improved horse-detaching apparatus for vehicles, designed to enable the
driver to entirely disconnect the team without getting out of the vehicle driver to entirely disconnect the team without getting out of the vehicle,
either for convenience in practical every-day use, or for special emergencies in the event of a runaway or fall of the horse. To this end the im of a locking stud for the trace combined with tree, so as to be moved outwardly from the end thereof to release the tracer; and it also consists in the combination with the detaching device of a peculiar form of brake designed for simultaneous and joint operation
with the detaching devices, to stop the momentum of the vehicle and pre with the detaching devices, to stop the momentum of the vehicle and pre
vent accidents which might occur, after the horse is loose, in going dow hill or over dangerous roads.
improved handle attachment for carpetbags, etc. Abraham Kaufmann, New York city.-The object of this invention is provide for satchels, traveling-bags, pocketbooks, and similar articles an
improved spring clasp for holding the
jaws of the satchel frame rigidly in improved spring clasp for holding the jaws of the satchel frame rigidly in
closed position, the spring clasp being used in connection with the handl or separately at the ends of the satchel frame, as desired, and forming neat and reliable closing device in addition to the lock. The pivot clasps at present in use on satchels and bags bind sometimes too tightly on the jaws so as to chafe the leather of the same, or work too easily so as not to
close the frame reliably, or get bent or broken, or present otherobjectionclose the frame reliably, or get bent or broken, or present other objection-
able features, which this clasp is intended to overcome, as it will always able features, which this clasp is intended to overcome, as it will always
fit the frame, lock the same rigidly, and be operated especially when confit the frame, lock the same rigidly, and be operated especially when con-
nected to the handle by the mere raising of the handle, without separately taking hold of the clasp for closing. The invention consists of a clasp, of aner shape, pivoted to posts of the outer jaw and binding the other jaw. The clasp is retained in locked position by a spring pi the clasp by a sliding thumbpiece. The swing clasps are provided wit sockets, into which ferrules at the ends of the satchel handles are inserte and locked by a kind of bayonet join

IMPROVED BOOKBINDING
Oswald Routh and John S. Routh, New York city.-This invention re gether by means of metallic clips which take the place of the usual tape. The invention is especially applicable to schoolbooks, but 1 may be applic with advantage to books of other descriptions. The common difficulty with
tape-bound books is that the tape becomes torn or broken by the constant and usually careless opening of the book and the leaves of the book be come loose, and are soon lost or destroyed. Another difficulty with books bound in usual manner with tape is that the cover must be formed on the ficulties are avoided, and the book is made stronger and more durable, an may have applied to it an em
improved bale tie.
Robert G. Stewart, Augusta, Ga.- This invention relates to means fo
astening bands around bales of all kinds of material; and the nature of the invention consists in a novel way of uniting the lapped ends of a bal be made with of a screw, whereby a substantial and safe fastening can be made with great facility. A screw is passed through one of the hoie of the end of the band until heck comes within the hole. The upse to be removed, but will allow it to turn freely. The screw thus permaare lapped ad to the band will not get lost. When the ends, and a firm fastening is made. By means of a wrench of a suitable kind, the ends of he hoop can be very forcibly drawn together and held fast.
improved coffee cleaner.
Patrick McAulife, New York city.-This invention has reference to an improved machine for cleaning and polishing coffee in superior manner, power, and producing a very satisfactory result, as all the skinny particles are screened off anl the appearance of the coffee greatly improved The invention consists of revolving scoop-shaped wings or stirrers, in con-
nection with a drum or cylinder mounted loosely on the stirrer shaft, and following the motion of the stirrers, the drum being made of sheet metal, with laterally alternating perforated and not perforated sections. The weight of the coffee and the motion of the stirrers impart to the loosely miderably slower than the same. This produces continuous changes in the
metind position of the coffee in the cylinder, so as to exert an additional cleaning and polishing influence upon the same. The influence of the lifting and
dropping of the coffee by the stirrers, in connection with the difference of the motions of the stirrers and cylinder, produces the effective polishing of the coffee by a machine of simple construction and operation.
improved copying press.
Elias Gill, San Francisco, Cal.-This invention relates to an improved copying press, of simple and effective construction, that combines economy, utility, and convenience with lightness and facility in handling, the same
requiring no extra stand, but being placed, without fastening, on any table requiring no extra stand, and readily put away when not required for use. The press is readily operated by bringing the cam handles toward each other, allowing the top board to remain for a short time in this position, and then revers ing the cams, so that the rubber springs raise the top board and admit the taking out of the copying book. The press may be furnished at less cost
than any one of the common screw presses in use, while it furnishes just han any one of the common screw presses in use, while it furnishes just
as good copies. It needs not to be screwed or fastened down to keep in place, as the pressure is exerted at the same time at both ends of the same. enough for all the purposes required.
improved concrete pavement compound.
Edwin Jacques, Great Falls, N. H., assignor to himself and Raphael otier.-The object of this invention is to construct street pavementa be liable to crack nor to be injuriously affected by frosts or extremes of temperature, and which will be cheap and require only ordinary skill to lay it down. Formula: For about twenty-seven square yards of pavement mix together, in about the same proportions named, 1 barrel of gas tar, 20
lbs . of "gum " tar, 1 lb . of alum, 1 lb . of washing soda, $1 / 4 \mathrm{lb}$. of brown potash, 19 ordinary sized wheelbarrow loads of sharp sand. The gas tar is boiled with the gum tar about one hour and a half. Then add the potash
alum, and soda, dissolved in about one gill of water. The sand is then alum, and sode, dissolved in about one gill of water. The sand is then
added by making alternate layers of it with the first named ingredients. The concrete is then run through 2 machine suitably adapted to the pur pose, which thoroughly mixes the ingredients. The bed or ballast for the
pavement is composed of small stones. properly tamped down, and the the hot concrete is spread on the gravel to the thickness of about thre inches, and
boiled tar.
improved tool stock for dental engines.
Edwin Telle, New Orleans, La.-This stock is formed by coiling a wire
spirally and then coiling another wire around it in the other direction spirally and then coiling another wire around it in the other direction
This construction makes the stock flexible, and prevents the wires from uncoiling when in use. The stock may be made of steel or other suitable for the entire length, or may be made partly flexible and partly solid, a may be desired. With this construction the various operation of smooth ing rough surfaces upon teeth, and of shaping, smoothing, and polishing
complicated gold filling, will be much more pleasant to the patient than when said operations are performed with the wheels, tisks, and point when said operations are performed with the wheels, disks, and points
mounted upon rigid stocks, and there will be much less liability to break mounted upon rigid stocks, and th
thin and delicate corundum disks.
improved measuring device for filling cartridges, John D. Wilkinson, Plattsburg, N. Y.-The object of this invention is to furnish to sportsmen and others an improved cartridge loading implement by which the charges of powder f the required size are obtained in quick and accurate manner, and the loader consists of two cylinders, one sliding
within the other and turning between top and bottom plates, to which they within the other and turning between top and bottom plates, to which the are pivoted. The top cylinder has an opening and changing tube, registering
with an opening of top plate and funnel, and the lower cylinder a connect ing tube and opening registering with exit opening and spout of bottom plate. When the loader is clamped to the table, adjusted to the charge de sired, and thepowder placed in the funnel, the drums or cylinders requir only to be turned from the supplyhole to the discharge hole and back, and a charge is furnished with each forward turning of the drum, so as to pr
duce the rapid and accurate charging of the shells in uniform manner.

## NEW AGRICULTURAL INVENTIONS.

## IMPROVED RIDING PLOW

James L. Florance, Plano, Texas.-The object of this invention is to
furnish an improved riding or sulky plow which is so constructed that th plow may be readily lowered into, raised from, and adjusted to that the desired depth in the ground, and which may be adjusted to take or leav land, and to hold the carriage levelwhen both wheels are running upon un plowed land, and when one wheel is running in a furrow. To the rear par bent outward, or have hooks to catch upon a crank when the plow is raised out of the ground to pitc the plow forward and prevent the forward end of the beam from interfer ing with the tongue or its brace frame.

IMPROVED CORN HARVESTER.
Washington B. Mayfield, Seneca, Mo.-The object of this invention is to from the stalks while standing in the field; and the invention cone ear the combination of strippers, bales, levers, and a box made with an incline bottom, a vertical flange or apron, and a detachable back, with the wheel and axle and the frame work of the machine. The strippers are formed of a number of parallel fingers, placed about an inch and a half apart, an made about an inch and a half wide upon their upper sides. The finger are made thinner upon their lower sides, so that the stalks cannot wedg
themselves while being drawn through. The ears, being thicker that the spaces between the fingers, will be stripped from the stalks and left upo the said fingers. The strippers are made to move up and down verticall by guide pins attached to their rear ends, and which pass through vertica slots in the apron or flange. The strippers are hung with their forward ends inclined upward so much thatwhen the said strippers are raised above
the level of the forward side of the box the ears will slide from them into the level of the forward side of the box the ears will slide from them int
the said box. When a sufficient quantity of ears has been collected the the said box. When a sufficient quantity of ears has been collected the
sliding back of the box is raised and the ears are allowed to slide out, and left upon the ground in a heap.
improved device for depositing feed in troughs Andrew J. Rush (Simpson's Store P. O.), Nineveh, Pa.-The object of his invention is to furnish an improved device for feeding grain to shee troughs, which is so constructed as to spread the grain evenly throug ing around of the sheep. The invention consists in the combination of bars, wheels, sliding bottom, and lever with the feed box; in the combina tion of regulator and its lock with the feed box, the lever and the sliding bottom, and in the combination of the curved rods; and the sliding stroke board with the sliding bottom, the lever, and the feed box. To the oute corners of the sliding bottom are pivoted the ends of two rods, which pass through the guides attached to the forward parts of the sides of the box up and down upon the rear side of the lower part of the box. The rodsa so curved that, when the sliding bottom is drawn outward to allow the grain to flow out, the sliding board will be lowered to stroke off or level the grain in the trough, so that it may be of uniform depth, giving all the sheep an equal chance at the feed.

## IMPROVED MILK COOLER

Charles W. Loller, Unionville, Pa.-This invention has reference to a milk cooler that admits the action of the cooling medium on the bottom to the level of the milk in the pan. The invention consists of a milk pan with bottom inclined from the sides toward the center line. The pan is set into and connected to an inclosing water tank, having adjustable exit pipe to regulate level of water in the same. The cold water enters at on corner and passes around the pan in the surrounding space to an exit pip pipe to correspond to the level of the milk in the pan a vertically pan is made dishing by being inclined at suitablan. sides to the center line of the pan. This produces triangular spaces be tween the bottom of pan and vat, into which the cold water may enter, that the bottom of the milk pan is cooled off in the same manner as the sides. The connection of pan and vat forms a connected cooler that is
conveniently handled. The vat may be readily cleaned by taking out the conveniently handled. The vat may be readily cleaned by taking out the
sliding tube, and the milk drawn off from the pan by an exit pipe and suit sliding tube, and the milk drawn off from the pan by an exit pipe and suit
able stopper, in the customary manner.
improved tobacco plant planter.
Robert A. Knox, Ghent, assignor to himself and Darrall Brothers, Louis ville, Ky.-This is a hand-machine for setting out tobacco plants, and is so constructed as to open a hole to receive the plant, guide the plant into the hole, and press the soil around it. In using the machine, it is carried
by the handle, and is placed upon the spot where the plant is to be planted, and the other hand is pressed down upon the knob of a rod, which force the head into the soil and opens a hole to receive the plant. The operator then removes his hand from the rod, allowing the head to be withdrawn from the ground by a spring, takes a plant from a sack that he carries cal plate guiding it into the hole opened by the head. The operator the presses two handles together, which forces sliding bars downward and ing the spring to raise the bars, and with the thumb of the hand that grasps the two handles the operator presses the rod, which swings the lower part of the plate back and allows the machine to be raised, leaving the plant standing in the ground.

## cetusiutss and edersual.

 The Charge for Insertion under this head is One Dollar $a$ line for each insertion.Yacht and Stationary Engines from 2 to 20 H. P. The
best for the price. N. W. Twiss, New Haven, Conn. The Complete Practical Machinist, by Joshua Rose,
price 2 2.50. Address Joshua Rose, P. o. Box 544 , N. $\mathbf{Y}$. price 82.50. Address Joshua Rose, P. $\mathbf{O}$. Box 5546 , N. Y.
New Steam Yacht for sale: 18 feet long, 4 feet 3 inch beam. Geo. F. Shedd, Waltham, Mass,
Manufacturers of Novelties and Oddities send circular
to Toronto Novelty Agency 7 Adelaide st.,Toronto, Ont. For Sale-One 11 ft . Planer \$390. One 3 foot do. \$165.
 For best and cheapest Cider and Wine
dress $H$ Sells $\&$ Son, Port Huron, Mich.
managing fore man in a highny successsfup Tool and Machine shop, de-
sires employment. For particulars, address A. Foreman, Philiadelphia,
Screw cutting Foot Lathes, W.E. Lewis, Cleveland, o. Patent Salesmen Wanted-We will employ a number
of men that can come recommended as to character and of men that can come recommended as to character and
ability who have had experience in selling patents oy counties-good pay to good men. F. F. Adams \& Co.,
Erie, Pa.
Nickel Salt and Anodes of superior quality at lowest
market prices. L. Feuchtwanger $\&$ Co., 16 Dey st.N.Y.
Arbors or Mandrels hardened, ground perfectly true and durable. For machinists, jewelers, and others us
Send for circular. A. A. Pool \& Co., Newark, N. J.
Steam Yacht for sale, 31 ft . long, $61 / 2$ beam, new. Bar-
gain. John Howard, No. 1720 Rittenhouse st., Phila. Parties who can electro-gild iron or plumbago in pow
der, send address. A. Gottschalk, Milwaukee, Wis.
600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Wood working Machines,
Grist Mills, Lathes, Planers, Machine Tools, Yachts and Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc, Send stamp for copy, stating fully just what is wanted.
Forsaith \& Cor, Machine dealers, Manchester, N. H. For Solid Wrought Iron Beams, etc., see advertis ment. Address Union Iron Mills, Pittsburgh, Pa., fo

John T. Noye \& Son, Buffalo, N. Y., are Manufactur-
ers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour \& Co.'s Bolting Cloth Send for large illustrated catalogue.
Power \& Foot Presses, Ferracute Co., Bridgeton, N. J. For Best Presses, Dies, and Fruit Can Tools, Bliss \& Lead Pipe, Sheet Lead. Bar Lead, and Gas Pipe. Send or prices. Bailey, Farrell \& Co., Pittsburgh, Pa.
Hydraulic Presses and Jacks, new and second hand Lathes and Machinery for Polishing and Buffing metals.
E. Lyon \& Co., 470 Grand St., N. Y.
Solid Emery Vulcanite Wheels-The Solid Original Caution.-Our - name is stamped in full on all our best
Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Pack ing Company, 37 and 38 Park Row, N. Y
Steel Castings from one lb. to five thousand lbs. In-
valuable for strength and durability. Circulars free. Pittsburgh Steel Casting Co.. Pittsburgh, Pa.
Silver Solder and small Tubing. John Holland, Cin-
Best Glass Oilers Cody \& Ruthven, Cincinnati, $o$.
For Boult's Paneling, Moulding, and Dovetailing Ma chine, and other wood-working machinery, address B.C
Patent Scroll and Band Saws. Best and cheapest in Chester Steel Castings Co. make castings for heav is required. See their advertisement, page 155.
Hand Fire Engines, Lift and Force Pumps ndall other purposes. Address Rumsey \& Co., Sene alls, N. Y., U. S.
Diamond Drills, J. Dickinson, 64 Nassau St., N. Y. Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumaties, Steam Engines, and
Boilers, by A. F. Nagle, M.E., Providence. R. I.

## 

It has been our custom for thirty years past to devot a considerable space to th answering of questions by
correspondents; so usef inave these labors proved that the Scientific American office has become the factotum,
or headquarters, to which everybody sends, who wants specialinformationupon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants
and supply correct information, that we are obliged to experienced writers, who have the requisite knowledg or access to the latest and best sources of information. For example, questions relating to steam engines, boil-
ers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Inquiries relating to electricity are answered by one of the most
able and prominent practical electricians in this country Astronomical queries by a practical astronomer. Chemi-
cal inquiries by one of our most eminent and enced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent-
they pour in upon us from all parts of the world-renfrom the mass those that he thinks most likely to be of general interest to the readers of the Scientific AmeriCAN. These, with the replies, are printed; the remain-
der go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact, hundreds of cor-
respondents desire a special reply by post, but very few respondents desire a special reply by post, but very few
of them are thoughtful enough to inclose so much as
postage stamp. We could in many cases send a brief
reply by mail if the writer were to inclose a small fee, a dollar or more, according to the nature or importance of
the case. When we cannot furnish the information, the he case. When we cannot furnish the inf
money is promptly returned to the senael.
(1) F. R. asks: How is liquid bluing made? . The greater part of the laundry blues in the market consist of Prussian blue dissoived in water by the aid siate). The quantities are about 17 per cent dry oxalic siate. The quantities are about 17 per cent
acid, or 18 per cent potassium ferrocyanide.
(2) G. L. D. says: Why can a person turn a screw easier with a long screw driver than with a little and so gives more leverage on the screw than the rew driver
(3) G. W. S. asks: 1. Will eosine make a reliable ruling ink that will not fade? A. No. 2. What
is used for setting aniline colors, so as not to copy when is used for setting aniline colors, so as not to copy when
dampened? A. You will not succeed in making an eosine ink that will not copy more or less when moist(4) W. H. T. asks how to make collodion of dark purple color for the purpose of insulating fine copper wire? A. Collodion may be made by dissolving
gun cotton (the low grade) in equal parts of absolute alcohol and ether. It may be colored or tinted to suit by slight additions, to the solvents, of the various coal tar
dyes. The drying may be expedited by the use of hot
(5) J. S. B. asks: 1. How can I electro-plate with gold and have the deposit have the appearto give fine results when properly worked; Make the anode of an alloy composed of 1 part silver, 9 parts copper, and 30 parts gold. Immerse this, connected with the positive pole of a strong battery, in a hot
aqueous solution of potassium cyanide contained in a aqueous solution of potassium cyanide contained in a
small porous cup, and place the cup in a large vessel of mall porous cup, and place the cup in a large vessel of
copper. Fill up around the cup with water to which as been added a little ammonium nitrate, connect the to about $110^{\circ}$ Fah. on a stove, while the current is passing. When the solution has taken up enough of the alloy (which may be determined by means of an hydrometer, or by weighing the dry plate before and after),
remove the solution and plate from it in the usual man remove the solution and plate from it in the usual man-
ner, using the alloyed anode. 2. By what means can I best solder small pieces of steel together? A. Heat the oint sufficiently, flux with acid zinc chloride solution,
and use a plumber's solder. 3. How can I best nickel plate on zinc? A. Give the zinc a good coating of copper, using a strong battery, and then plate on the nickel
from an ammonio-nickel chloride bath.
(6) S. A. S. asks: Of what dimensions should I make a tank to hold 1,200 gallons, height and
width to be the same, length onethird longer? A. Th wroportions (inside mengurement) should be 4 feet nches width and depth, and 7 feet 4 inches length.
(7) R. E. M. B. asks: Can you give me a recipe for making a varnish impervious to water, to use
on a fishing rod? A. To make it, put gum shellac in a vessel, with alcohol sufficient to cover itf and keep it in
a warm place until the gum is dissolved. If too thick, eadily
(8) $\Lambda$. S. says: I have been trying to solder zinc, but cannotget the solder to adhere. I have used here. A. Use as a flux, muriate of zinc. To make it here. A. Use as a flux, muriate of zinc. To make it,
dissolve zinc in muriatic acid and use after ebullition
(9) F. B. H. asks: Would an apparatus constructed of india rubber lose its efficiency (strength
and elasticity) if required to work in steam in a boiler, nd would it lose this if immersed in water? A. Yes
in time.
(10) J
(10) J. G. says: I am running a corn mill by water. I notice that attimes my leather belt, which
runs on a wood pulley at one end and an iron pulley at runs on a wood pulley at one end and an iron pulley at
the other, gives off sparks of electricity. What is the cause? A. Friction of the belt upon the pulleys.
(11) J. J. H. asks: Why is it that the shadows of two objects appear to protrude and meet
each other when the objects are moved toward each each other when the objects are moved toward each
other, and that the protrusion proceeds from the shortest shadow? A. The effect is produced by the overlap-
ping of the penumbra at the sides of the shadow. The ping of the penumbra at the sides of the shadow. The
penumbra of the long shadow or the shadow of the object the farthest away is the largest, and reaches the shadow of the nearest object first, making that side that side first.
(12) H. H. asks: Can a spindle be made to run 32,000 revolutions per minute? A. It does not seem
(13) H. S. W. says: I find in using varnish hat numbers of small bubbles rise on the surface of the work and seriously detract from the smooth appear-
ance. What is the cause? A. It may be due to roughness of the surface varnished, presence of moisture in the wood, unevenly cut brush, imperfect fluidity of the
varnish, or poor spirit solvent, etc. Use a well co fitch or fine varnish bristle brush, see that a we wood is dry, and do not lay on the coatings too heavy. With shellac varnish, per ect smoothness in the coating is
with difficulty obtainable unless the first coat is rubbed down properly with pumice.
(14) W. H. G., Quebec, asks for a recipe for waterproofing cloth? A. In one vessel dissolve 1 lb .
of the lead acetate in about a gallon of rain water, and in another dissolve 1 lb . of alum in 3 gallons of water. the alum solution, and finally wash in water, and dry Another common method of waterproofing is the fol lowing: Boil $41 / 2$ ozs. of white soap in $21 / 2$ gallons of
water, and separately dissolve $53 / 4$ ozs. of alum in $21 / 2$ gallons of water. Heat these two solutions to $190^{\circ}$ Fah., and pass the goods once through the soap bath, and af he open air. The alum causes the precipitation of an the open air. The alum causes the pr
insoluble alum soap within the fiber.
(15) I. F. B. asks: Will it be safe to run a
ix feet fly wheel up to four or five hundred revolutions mix feet fly wheel up to four or five hundred revolutions im about four or five inches wide. A. You do not send sufficient data, but if the wheel is well propor-
(16) W. G. says: I have a velocipede of the hree wheel kind; how is it I cannot make it go advan-
tageously on a good level and solid gravel road? A. If, as we suppose, the trouble in the gravel road is cause by the wheels cutting in too
make them with wider treads.
(17) J. N. J. asks for a recipe for making citrate of magnesia? A. Take carbonate of magnesium reduce to a thick paste, which dry at a temperature of about $75^{\circ}$ Fah. To make the effervescing mixture take of the above 14 parts, and mix with bicarbonate of so-
dium 13 parts, citric acid 6 parts, and powdered white dium 13 parts, citric acid 6 parts, and powdered white
sugar 3 parts. Moisten the mixture with a sufficient quantity of alcohol and pass it through a tinned iron sieve to form a coarse powder. Dry in a moderately
warm place and keep in a well closed jar.
(18) L. E. says: Will you give me the best ethod of casehardening iron? A. Pack the articles to be casehardened in an iron box filled with bone dust or
nimal charcoal made of burnt leather. For small articles short pieces of gas pipe will do instead of an iron box. The ends must be stopped and luted with clay The leather may be burnt in a pan or in a stove, and it must be reduced to powder before being packed around the work. Heat the receptacle and the contained work
red hot, in a furnace, for a length of time proportionate red hot, in a furnace, for a length of time proportionate
to the size and thickness of the articles. Thin articles will require to be kept at a red heat only a few minutes, When sufficiently heated, quench the work as soon as possible in cold water.
(19) E. M. asks how malleable iron is bonizing cast iron by a process of cementation by means of hematite, which imparts a portion of its oxygen to the carbon in the cast iron, forming a chemical union
and extracting the carbon from the castings. Scales and extracting the carbon from the castings. Scales times used. The castings are packed in iron boxes, carefuly lute
(20) F. T. M. asks: How can I weld mal eable and wrought iron together? A. Try a high heat, use powdered borax as a welding flux.
(21) G. W. D. asks for a method of separating iron ore in fine grains from common sand, and also asks if the mass can be passed than the silicate porion, but not too dense to allow the iron particles to pass through? A. Metallic iron and many of its oxide and other combinations may be cleanly separated from sand by means of powerful magnets, preferably grouped into batteries the poles of which form part of the surall the requisite qualities to be of practical value in the way you suggest.
(22) H. V. asks: What is the method of di lating tinctures, etc., that is, what quantity of spirits the 30th and highest dilution? A. The rule is, we be lieve, to reduce the strength of the tincture one hundred times at every dilution, thus: 1 part (by weight) of standard tincture $(=a)+100$ parts diluent $=a^{1} ; 1$ part $a^{1}$
+100 parts diluent $=a^{2}$, and so on. The diluent is +100 parts diluent $=a^{2}$, and so on. The diluent is
usually either water or a spirit just strong enough to old the substances in solution.
(23) S. T. asks: Was a post mortem examination ever held on the bodies of the Siamese twins?
What was the result of the investigation? A. Yes. The form cartilages, which were joined very near the median line of the band. There were three pouches, the ower one being separated from the skin by a very delicate layer of tissue, and passed from the abdomen of Chang and was lost in the duplicature of the suspensory
ligament of the liver of Eng. Above this was a similar ligament of the liver of Eng. Above this was a similar pouch belongir.g to Eng, and between this and the unand largest pouch, also prolonged from Chang's abdomen, untili it reached the peritoneal cavity of Eng, but was not continuous with it. Thus two of the pouches belonged to Eng. A connecting band was also found
between the livers. The two portal circulations were between the livers. The two portal circulations were
connected and the peritoneal process extended across the ligament.
(24) L. K. says, in answer to E. C. H., No. 7 (22), who asks how to make a good Babbitt box: When sprinkle on some powdered rosin. When the metal is poured in on this rosin it burns, causing the metal
fow, by keeping it hot, into all parts of the box.
(25) Gas, Pittsburgh, asks: What was the process employed for the manufacture of oxygen gas by the company which attempted to introduce it into use in
conjunction with the ordinary gas? A. It was produced by the union of a jet of oxygen and a jet of common streetgas, the street gas supplying the hydrogen. The oxygen gas was made by subjecting a quantity of manganese, placed in a retort, to a heat of $850^{\circ} \mathrm{Fah}$. in combination with a steam jet whereby the ox,
liberated and carried intoa gasometer for use
(26) W. H. B. asks: Will you give me the ame of some good work on optics and lens grinding?
(27) C. H. J. S. asks: Will you give me directions for making putty? A. Glazier's putty is
made by working up whiting with drying oil. Polisher's putty, or putty powder, may be made by keeping molten tin exposed to the air at a strong red heat, in an open crucible, till it is converted into a white powder.
How can I make the magic water pens? A. Triturate How can I make the magic water pens? A. Triturate
any of the aniline colors soluble in water with enongh this in the hollow part of the pen with a tight spring to
keep it in place when dry, and to direct the flow of
(28) C. H. K. asks: 1. How is caustic ammonia used for rheumatism, as recommended in the about 20 parts of water and applied externally. 2. I am somewhat confused by the different names: "Caustic ammonia," "liquor of ammonia," "aqua ammonia," etc. Are they not different names for the same thing?
A. Yes. It is a solution of gaseous ammonia in water. The proper name for it is ammonium hydrate.
(29) A. L. L. asks how far apart to space eholes in a pantagraph, and by what mathematical rule it is figured? A. There is no rule for spacing the holes. Make them as close as consistent with the
strength of the instrument. The scales of the drawings are to each other as the distances of the pencil and (30) D. N. B. C. asks: Is there any simple method by which to determine whether well water, still palatable, is contaminated with sewage or other dangerous material? A. Add to a small sample of the water enough of an aqueous solution of potassium permangaappears shortly, itmay be concluded that the water is unfit for drinking purposes. Add to another sample about $\frac{1}{10}$ th its volume of a saturated, cold aqueous solution of tannic acid, and allow to stand covered for 24 hours. Any notable quantity of organce matter in the water will be indicated by the formation of a precipi-
tate.
(31) T. R. asks for a preparation that will keep white holly (wood) from getting soiled? A. Use a
thin varnish made of bleached shellac dissolved in althin va
(32) A. H. W. asks for a recipe for a ce ment to be used cold, for cementing pieces of glass to-
gether without heating the glass? A. Boil isinglass in gether without heating the glass? A. Boil isinglass in Warm before using.
How can I make the best dark bronze for cast iron? A. Melt together equal quantities of sulphur and white xide of tin.
(33) Enquiring Reader asks: What is the best and cheapest process for manufacturing table salt
from rock salt? A. Ordinarily it is simply washed and ground. All qualities are not sufficiently pure for table
(34) W. B. asks: Can I obtain glass that will melt in an iron ladle over a common coal fire as lead is melted? A. Soliffle glass, composed of 1 part silica and 2 parts potassi
low temperature.
(35) W. F. R. asks for the number of stars stripes, and arrangement of the American flag? A. The stripes thirteen. The first stripe at the top red, the next white, then the colors alternately, making the last stripe red. The blue field for the stars is square, of the width of the first seven stripes, namely, four red and three
white. The proportions of the flag should be as three
(36) W. S. F. asks: Will you tell me how to galvanize hoop iron? A. Clean and scour the iron,
and dip it into a bath of melted zinc covered with a (87) B. W.
(37) B. A. W. says: I have a quantity of brass chain, and I want to give it the color of gilt or
gold that will not tarnish? A. Boil the articles in a digold that will not tarnish? A. Boil the articles in a di-
lute solution of terchloride of gold, to which some binote of soda has been added
(38) D. R. K. asks: Why is it necessary to have a siphon to a steam gauge? A. The siphon is used
for the purpose of keeping water in contact with the gauge.
(39) I. M. B. asks: What is the modus operandi of washing brass and copper vessels with lead without a battery? A. You probably refer to what is
known as tinning, which is effected by dipping the arknown as tinning, which is effected by dipping the ar-
ticles into a tin bath, having first washed them with a ammoniac.
(40) P. W. asks: What is the duty required of the fusible plugs placed in the crown sheet of ing. There might be no water in the crown sheet when the plug melted.
(41) E. W. D. asks; How are buggies polished? A. After the varnished surface is fully dried, rub down with rottenstone and a piece of woolen cloth,
wet with water. Raise the polish by rubbing with the bare hand on which a few drops of sweet oil have been
(42) T. E. B. says: A. contends that by taking a given point as a center and with any radius, describing an arc. you obtain an angle as of $20^{\circ}, 45^{\circ}$,
$90^{\circ}$, and so on until an angle of $360^{\circ}$ is reached, when $90^{\circ}$, and so on until an angle of $360^{\circ}$ is reached, when
you have described a circumference. B. claims that you obtain arcs and not angles of those degrees, although the angles are measured by the intercepted arcs. B. considering an angle as the space included between
any two lines running from a given point. Which is ght? A. A. has the correct idea.
(43) W. A. K. says: Can you give me an effectual method of dispatching house crickets? A. Iṇ-解 (44) F. H. asks: Why are the sunset tints colored red and gold? A. Little is known of the causes
that produce the brilliant and varied colors assumed by that produce the brilliant and varied colors assumed by the sky, particularly at sunset. They are unquestion-
ably, however, connected with the aqueous vapor contained in the atmosphere: and the reddish hue, the most common of all, is probably owing to the greater the watery particles.
(45) C. J. F. asks (1) for the analysis of the springs of Seltzer, Vichy, Carlsbad, Kissingen, and drug stores that will give you an analysis of these waters.
2. Can I combine the different salts together so as to
resemble the true waters, to bottle and charge in a fountain with carbonic acid gas? A. Yes. 3. How is the extract made that is used in ginger ale? A. It composed of ginger extract with a little wild cherry lemon, or other flavoring, and water.
(46) E. M. H. says: 1. Having a two horse power engine making 200 revolutions per minute, I wish o use it to pump where I want 30 lifts of the pump oucket per minute. The pulley on line shaft of engine inch pulley on a 5 feet in diameter pulley, would it giv he required number of lifts in the pump? A. Yes, if here is no slip. 2. There being a crank 9 inches lon he rod of pump is fastened, what is now the power he engine on the pump? Is not the power increased by thus decreasing the motion? A. You have not in creased the motion, but the mechanical effect per stroke will begreater, in the proportion of the pulleys, ne cting friction
(47) M. C. asks: What can I use to take oal tar off greenhouse pipes? A. We think a solution potash will answer very well
(48) S. C., of Mexico, asks: What advantages are there in the short-horned cattle over those of other classes, that make such great difference in their
value? A. They give better milk, and their flesh is value? A. They
(49) O. M. M. asks how to make gold lacquer? A. To 1 gallon of methylated spirits of
wine, add 10 ozs. seed lac and $41 / 2$ ozs. of red sanders; wine, add 10 ozs. seed
(50) O. P. asks: What per cent of 1 horse power willit take to run a sewing machine, as it is run
by any one sewing in the ordinary way? A. About 10 per cent.
(51) R. S. B. asks: What preparation can be used for painting the chimneys of steamships with does with common paint? A. We think it is difficult to ake this color permanent, under the circumstance dd red lead sufficient to bring to consistence of com mon paint.
(52) J. B. says: What is the best method
(53) I. N. D. asks: Will ripe tomatoes
(54) J. W. D. McC. asks: Can copper be gal anized with gold? If so, what is the most simple but effectual method? A. A hot aqueous solution of the th, cith ise gola and potassium is used for the Or the gold solution may be poured into pormall wor mersed in a quantity of salt water contained in a smal opper cup. The whole is set on a fire until the gol olution hasattained a temperature of about $110^{\circ} \mathrm{Fah}$ A rod or plate of zinc is then placed in the salt bath, nd the article to be plated. previously thoroughly leaned, is immersed in the gold solution, and connect by means of a copper wire with the zinc. Unde
(55) W. T. R. asks: Can steam be intro aced in a steam boiler from a pipe ( 1 inch) 400 feet long nd used from boiler same as if made in boller? We are using a rotary engine direct on to pipe. I want to pur a oiler in case supply from pipe fails us at any time. A. es. In tead of passing steam intothe boiler before use, connect the engine directly to the pipe. You can easily ttach' a branch so that the boiler can be used when de-
ired. Felt the pipe well, and provide a trap to carry of ired. Felt the pipe w
(56) C. C. H. asks how "fraud" vinegar is made? A. It is probably a cheap, weak vinegar, the ttle oil of vitriol or acid lime sulphate. Vinegar of ke properties has been made from pyroligneous acid product of the distillation of wood
(57) M. M. asks how silk is dissolved with a iquid? A. Dissolve 16 parts (by weight) of copper su phate in 144 to 180 parts of pure water, ada 8 to 10 par flycerin (specific gravity $1 \cdot 24$ ) and mix by shaking
 aja, while slining, liquid. This fluid dissolves silk readily
(58) C. G. C. says: I have a large, square -glass inkstana, wich is broken. Can you give m nd which will withstand theaction of the ink? $A$ strong solution of best gelatin in warm aceticacid As ordinary inks contain tannic or gallic acid,the gelati will only be rendered more insoluble if the ink comes in ontact with it at the joint. The cement may be ob ined at most druggists-one of the latest names un
(59) C. H. asks: Of what is belt lacing (ad) M. A. is made of calf skins.
(60) Mc. Bros. ask: What is used for filling the letters of zinc signs? A. Use pitch 11
black 1 lb., turpentine $q$. $s$. Mix with heat
(61) S. R. R. asks: What does the foundaion of the towers of the Brooklyn bridge rest upon? A. Upon b
(62) J. P. F. says: I wish directions for neiting brass in crucibles in an ordinary blacksmith re? Also directions for brazing iron or steel? A. Hea melted, cover the surface with a layer of powdered char , carefully, and retain them in place by riveting or by where the anion is to be made, heat carefully in a clear re (charcoal is best) and flux with borax.
(63) C. M. asks: 1. What is the best method of making vinegar from grapes? A. Provide two wood-
en vats, made of oak. At a little distance from the botom of each fr a mall grape twigs, leaves, and stems. Press the juice from the grapes. Fill one of the vats and half fill the ther. As soon as fermentation begins in the half filled vat, fill it from the full one, and every day fill the one
that has remained half full with a part of the contents of the other. By this daily transfer of half of the contents of one vat to the other, the vinous liquid brought into contact with the air until acetification ompleted. 2. Is there any inexpensive and effectiv keep in a dry cool plaee. 3. If wood ashes are a Yeo application to the soil of a grape vine, why would not a weak solution of commercial potash answer the same prpose? A. It would.
(64) E. W. D. asks: 1. For the period of he comets 1680, 1811, 1843, Donati's, Coggias, and 1556 ? A. 1680, 10,000 years; $1811,3,065$ years; 1843, 376 years; Donati's, 2,000 years; Coggia's, 10,000 years; 1556 wa predicted for 1860 . 2. If the form of the earth is due To its being thrown from the sun in a hot state? A, hind portions which condensed and formed planets, etc., these planets taking on a rotary motion before they fully solidified naturally become globular.
(65) R. \& W. ask for a recipe for making best varnish for household furniture, and best process rying oil 1 gallon, turpentine $13 / 4$ gallons. Boil the gum and oil until it strings well. When somewhat cooled, add the turpentine. To make it dry quicker, dryer may be added during the cooling. To polish, afte! an even surface is produced by rubbing with powdered pmicestone applied with a woolen cloth, rub with rot enstone and oil, and inish by rubbing with the bar
Minerals, etc.-Specimens have been re ceived from the following correspondents, and examined, with the results stated:
G. W. E.-It is a combination of iron with sulphurcalled pyrites. Ycu can find something about it on p. nly quartz pebb.-The package marked A. contains pre silicic acid-a combination of the element silicium with oxygen. B. is a calcium phosphate, chloride, and tennantite-a aulphide of copper, iron, and arsenic. ielspar No 3 is partially deco posed orthoclase, with oxides of iron and a little copper.
No. 4 contains clay, mica, and oxides of iron. No. 5 is yrites. No. 6 is felspathic rock, the coloration which is due to iron oxides. No. 7 is partially degen rated syenite. No. 8 consists principally of lime car
bonate. No. 9 is gypsum. No. 10 is hornblende with
per pyrites.-A. K.-It is iron pyrites.-R. L.-It is a quartzose

## COMMUNICATIONS RECEIVED.

The Editor of the Scientific Americanacknowledges, with much pleasure, the receipt of original papers and ontributions upon the following subjects:
On Electrical Experiments. By F. J.M On Curving a Base Ball. By R. D. W. On Remedy for Poison Oak. By H. F. On Labor and Capital. By A. B. W
On the Silver Mud Springs of Oregon On the Silver Mud Springs of Oregon. By B F. J. A.-D. C. H.-C. C. H.-W. T. \& Co.-T. P.-
C. R. M.-A. L.-I. A.-E. H.-A. P. A.-J. O. R.C. R. M.-A.L.-I. A.-EE. H.-A. P. A.-J. O. R.-
I. M. D. McC.-C. E. T.

HINTS TO CORRESPONDENTS We renew our request that correspondents, in referring name the date of the paper and the page, or the numbe of the question.
Correspondents whose inquiries fail to appear should epeat them. If not then published, they may conclud hat, for good reasons, the Editor declines them. Th address of the writer should always be given.
Inquiries relating to patents, or to the Inquiries relating to patents, or to the patertability here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address given.
Hundreds of inquiries analogous to the following Bessemer steel wire? Who makes and sells miniature engines? Who makes a good composition for covering team pipes $\%$. All such personal inquiries ar winted, as will be observed, in the column of "Busi 3 and Persunal," which is specially set apart for that pur pose, subject to the charge mentioned at the head his way be Amost any desired information can his way be expeditiously obtained.

## official

INDEX OF INVENTIONS for which


Granted in the Week Ending July 31, 1877 ,
ND EACH BEARING THAT DATE.
[Those marked (r) are reissued patents.]
A complete copy of any patent in the annexed list, urnisngboth the specincations and draw, arnished from this office for one dollar. In ordering, and remit to Munn \& Co., 37 Park Row, New York city. Animal flber, process of treating, J. F. Greene.... 193,649
Barbers' shears, W. Reed............... Bedstead, F. Caulier (r).

Beehive, o. Colvin......
Bell call, w. J. Cowing
Billiard cushion rails, H. W. Collende Bit brace wrench, C. H. Amido
Bolt machine, G. Dunham
Boot edge burnishing machine, c. H. Soutiall Boring machine, J Simpson (r)
Bottle stopper, D G.Hubbard Bracelet, etc., C. H. Graef.. Braiding machine, A. Wietlisbac
Burglar alarm, F. M. Swallow. Button fastener, M. R. Kenyon Can, rawhide waste, A. Holbroo Canal boat,towing, Cole \& King Car axle box, T. A. Bissell.
Car doors, J. Capron.
Car, Powers \& Gilma
.
Car seat, C. Houghto
Carriage seat, G. J. \& C. L. Tucker
Cartridge belt, A. Mills...
Cartridge, T. T. S. Laidey.......
Chimney, J. Browell
Churn, A. D. Ferris
Clay, machine for tempering, W. H. Smith
Cloth measuring machi
Cloth measuring machine, A. W. Barker.
Clover, thrashing and hulling, Stocking \& Lippy
Cock box, G. P. Bowers
Cock box, G. P. Bowers :.............
Condenser for
Corks, C. Bell ..............
Cotton gin, L. C. Glover.
Cotton harvester, C. E. G
Coltinator teeth, B. B. Town.
Curry comb, M. sweet (r) .......................... .... Cutter head, J. W. C.
Doll's hat, C.
L. Slade.
Door spring, A. P. Yates
Drafting ship's lines, R. Duthie
Eave trough, F. A. Walker


Faucet, A. W. Sperry.......................
elting machine, J.Keats
Fence, post attachment, G. J. Barnhart. . Fermenting vat. C. Klein
Fifth wheel, J. J. Black
Fiiter and cooler, Peter \& Walte
Filter, J. C. Nichols.
Fire arm, J. Farquharson.
Fire arm, W. S. Smoot (r)
Fire arm, G. W. Schoffeld.
Floor cloths, R. Hoskin (r)
Fruit picker, J. C. Stribling
Fuel machine, E. P. Davis
Furnaces, H. C. Richmon
Gas burner, C. S. Ford
Gas burner, J. G. Hanning .
Gate, J. F. Read..........
Grain binder, H. H. Bridenthal.........
Grain steamer, E. C. Jones..
Grinding calender rolls, Latham \& Binns
Grinding machine, C. A. We
Grinding mill M. P. Squire
Grinding mill, M. P. squire ..
Harrow, Coddington \& Frenc
Harrow, F. Dyer.
Harrow, A. Reag
Harrow teeth, for, J. M. Crawford.
Harvester, McCormick, Baker \& Erpelding
Harvester, J. L. Owens
Hinge $J$.
Hinge, J. Bau
Hoe, G. B. Ely
Hoork, safety, W. E. Murray.
Horse detaching
Horseshoe, R. B. Hugunin
Hub boring machine, Rowe sd Edington
Hydrocarbon oils, J. Merrill (r).
Ice making machine, P. Giffard.
Incubator, E. S. Ren wick
Ingot mould, J. Baker
Ingot mould, J. Baker.
Insect guard, J. Young
Insects, appara tus for destroying, J. R. Duke
Ironing board, w. M. Kepler ........
nitting machines, atachment, J. J. Fitzpatri
Lamp, F. Rhind
Latch for carriage doors, F. P. Pflegha
Latch, gate, J. D. Cameron.
Latch, gate, A. C. Woolman
Lathe dog, North \& Norton
Lathes, slide rest, C. Hop
Lawn seat, J. R. Wherry
Leaf turner, c. Schwerdtfeger..
Leather, machinery, W. Panton
Leather, machinery, W. Panton
Lightning rod, J. Hewitt........
Links, die for welding, J. H. Helm
Locket, C.A. Faas...................
Loom harness, J. Shinn
Lubricating compound, J. Johnson
Meal, block machine, Andrews \& Tucker (r)
Meal, machine for crushing, F. Wegmann (r)
Measure, liquid, L. B. Heals
Milk cooler, $R$. Smith (r)
Millstone driver, A. Cunningham
Molder's facing powder, W. Kling
Motor, T. H. Smythe ..
Mower. W. W. Edgarto
Nut lock, W.Lyon.......
Nut lock, J. J. Walden.
Oiler, pucket, C. Hauck
Pitman rod, R. Sc
Plaiting machine, J. H. Rowe
Planter, corn, "King \& Funk..
Planter, corn, W. J. Nicholson
Planter, hand, S. P. Babcock
Planter, tobacco and cabbage, J. C. Tennent
Planters, check row attachment
Preserving apples, J. Walker
Pressure regulator, G. H. W
Projectile, B. B. Hotchkis
Pump, Cammack \& Ray
Pump, S. R. Dawson
Pump, W.S. Laney
 designs Patented.
10,131.-CASSIMERE.-D. D. Bowen, Adams, Mass.
10,132.-CARPETS.-J. H. Bromley. Philadelphia, Pa. 10,133.-HEATIN
tor, Peoria, II
10,134.-GLASS SHADES.-W. W. Lyman, Meriden,Conn 10,135 and 10,136.-CASSIMERES.-J. Perry, Dudley, Mass.
10,137 .-CASINGS OF SODA WATER APPARATUS.-J. W. Tufts, Medford, Mass.
[A copy of any one of the above patents may be had by
remitting one dollar to MUNN \& Co., 37 Park Row, New York city.]
Saluentisemfuty.

 as striag morring to otppear in nect iserve

 Lightest, Strongest and Best Belt Pulley made. Secured
to Shaft without Keys, Set Screws, to Shaft without Keys, Set Screws,
Bolts or Pins; also, Adjustable Dead Pulleys and Taper-
Sleeve Couplings. Send for TAPER FEEVE PULLEY WORKS,

## MEN OF PROGRESS.

|  |
| :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Important Mechanical Books.






 Who will furnish hisadaress. BAIRD \& CO,

VINEGAR. $\begin{gathered}\text { How made in in in houro } \\ \text { Hin }\end{gathered}$
NO MORE SLIPPING BELTS. MY NEW

 SPRING MOTORS.-A SERIES OF VAL



 COUNSELLEOI S. BOUTWELL, CAUSES, 25 ELEGANT CARDS, no two alike, , ith name, LADIES can make fos a day in their own city or town SMALL STEAMBOATS AND YACHTSS-


 - $=$ W= $=$ E




MADE TO ORDER.

Baker Rotary Pressure Blower:

硽WILBRAHAM BROS,


CIVIL AND MECHANICAL ENGINERING AT THE

 AGENTSS WANTED

 MEW WANTED


The union iron Mdils, Pittsburgh, Pa., Manu.







THE NEW GERMAN PATENT LAW,


## The Wonderful Pen-Holder!


N. F. BURNHAM'S

WATER WHEEL
STEAM PUMPS



## (1)

W ANTED Sal esmen no sellito Merchants, spo sal.

## 




Lathes, Planers, Shapers, Drills,
Superior Wor cont. Disoount on Price List of orking Machinery


Wood-Working Machinery,
 Re-Saw Machines, and Wood-Working Machinery' gene
rally. Manfuetured
WITHERBY. RUGG \& RICHARDSON, WITHERBY. H 26 Salis bu
(Shop formerly occupied b

JOHN C. MOSS, SUP'T
$\mathrm{A} \mathrm{U}^{\text {ratition }}$ WESTON DYNAMO ELECTRIC MACHINEC


## CONDIT, HANSON \& VAN WINKLE

HOME-MADE TELESCOPE STANDS.-


MECHANICAL DRA WING.-BY PROF.





## EUREKA SAFETY POWER!



 Stationary Eninep and dobilere, Asond
Spark Arresting Portable EnSpark A rresting Portable En-
gines for plantation
ous. send for B. W. PAYNE \& SONS,



 GROUND-AIR IN ITS HYGIENIC RE-



##  <br>  65 Muxed CAR DS, with name 10 C . and stamp. <br> GO:NHOLINAND'S


WATER SUPPLY FOR TOWNS AND







## gavertipuments

##    WANTED-CHEAP FOR CASH.  <br> OLD ROLLED SHAFTING

 RON AND STEEL. BY Dr. C. W. SIE
 , Coals,


 THE FLOW OF SOLIDS.-BY LEWIS $S$


LeCOUNT'S

## Machinists' Tools.



## MiMMENTS <br> CAVEATS, COPYRIGHTS, TRADE

Messrs. Munn \& Co., in connection with the publica Ion of the Scientific American, continue to examin Inventors.
In this line of business they have aad over trirtr years' experience, and now have unequaled facilities nd the Prosecution of Applications for Patents in th United States, Canada, and Foreign Countries. Messrs, Trade Mark Regulations, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringement of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.
We sen
We send free of charge, on application, a pamphle containing further information about Patents and how Copyrights, Designs, Patents, Appeals, Reissues, Inringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.
Foreign Patents.-We also send, free of charge, a method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in Five patents-embracing Canadian, English, German, French, and Belgian-will secure to an inventor the ex lusive monopoly to his discovery among about on people in the world. The facilities of business and steam communication are such that patents can be ob Ther by cilizens an ons asily as \$75; German \$100; French, $\$ 100$; Belgian, $\$ 100$; Can ian, 850 ian, $\$ 50$.
Copies of Patents.-Persons desiring any paten sued from 1836 to November 26. 1867, can be supplie ending upon thes at reasonable cost, the price pecifications.
Any patent issued since November 27,1867 , at which time the Patent office commenced printing the draw

## ngs and spec

will be furnished for $\$$
ies, please to remit for the same above, and state name of patentee, title of inven ion, and date of patent
A pamphlet, containing full directions for obtaining United States patents, sent free. A handsomely boun Reference Book, gilt edges, contains 140 pages and entee and mechanic, and is a useful hand book of

Address
MUNN \& CO.,
Publishers SCIENTIFIC AMERICAN.
BRANCH OFFICE-Corner of $F$ and 7th Streets,
BRANCH OFFICE-Corner of $F$ and rth Streets,

COARDIOLA'S COFFEE \& SUGAR MACHINERY
 Macinine. Heilix iugar Evaporator.
 Nit geve aroment atention to all ortaers for any of the
NEW AIR COMPRESSOR OF M DUBOIS


## Working Models







METALLIC MINERALS-THEIR PRO



$A^{\text {ICorts }}$ dates. Lehigh university.-Tutton Free



Wheels
Guaranteed.
 Send for
Illustrated Circular, Weissport,

## THE BIGELOW

Steam Engine.
both portable and stationary. The CHEAPEST AND BEST in the market

## H. B. BIGELOW \& CO.,

 New Haven, Conn.

1872, 1873, 1874, 1875,
SCIENCE RECORD





 Geoloor and mineralugy,
Astiono
BIOR
Each yearly volume contains about 60 octavo pages
nolduing a large number of handome engravims
nher ney ware bound in substantial and hand some bind angs



NEWSPAPER FILE




## JOSEPH C. TODD


 na price. Madares. C. TODD,
COMPRESSED AIR MOTIVE POWER-

ehalefoot lathes,

8



COMPRESSED AIR PNEUMATIC DIS


## Steel Castings,



## MaChinists' TOOLS.

Lathes, Planers, Drills, \&c.
 ROCK DRILLS WORKED BY COM.


## HARTFORD

## STEAM BOILER

Inspection \& Insurance COMPANY
W. B. Pranklin, V. Pres't. J. M. ALLEN, Pres't.

## J. B. PIERCE, Sec'y.

Torpedo vessels. Br Mr. donald





STEEL - ITS MANUFACTURE AND


HOW TO BUILD BOATS CHEAPLY.-A


THE TANITE CO., STROUDSBURG, PA.
 HOME-MADE TELESCOPES - DIREC-


## H. W. JOHAXS' PATENT. ABESSTOS

 87 MAIDEN LANE, NEW YORK. Mill Stones and Corn Mills.


## Diamonds ${ }^{2}$ Carbon




## Stientific Americaur.

The Most Popalar Scientific Paper in the World THIRTY-SECOND YEAR.

Only $\$ 3.20$ a Year, including Postage. Weekly.
This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixoriginal engravings of new inventions and discoveries epresenting Engineering Works. Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, ArchiAll Classes of Peaders find All Classes of Readers find in The Scientific ormation of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind,
this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.
Terms of Subscription.-One copy of The ScienTIFIC AMERICAN will be sent for one year- 52 numbersor Canada, on receipt of thitee dollars and twenty cents by the publishers; six months, \$1.60; three Clubs.-One extra copy of The Scientific AmeriAN will be supplied gratis for every club of five subscribers rete. Postage prepaid.
One copy of The Scientific American and one cod or one year, postage prepaid, to any subscriber in the United States or Cas. pubins
tis by Postal Order, Draft, or secures. M sealed, and correctly addressed, seldom goes
stray, but is at the sender astray, but is at the sender's risk. Address all letters, MUNN \& CO., 37 Park Row, New York.
NOTICE TO FOREIGN SLBSCRIBERS. The new Postal Union now offers special facilities for
he regular and speedy transmission of the ScIENTIFIC AMERICAN direct from the ottice of publication in New York to subscribers inforeign countries. The subjoined SIENTIFIC AMERICAN and SUPPLEMENT int the principal

| The prices are for one year's cluding the post- age. age. | FOR SCIENTIFIC AMERICAN. | $\begin{aligned} & \text { For } \\ & \text { SUPPLE- } \\ & \text { MENT. } \end{aligned}$ | $\begin{aligned} & \text { AMERTICAN } \\ & \text { AND SUP- } \\ & \text { PLEMENT. } \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| Austria. | S. F1..... ${ }^{9}$ |  |  |
| Degmark. | Francs..... 15 |  | 46 |
| France ${ }^{\text {German }}$ Empirio.: | Francs ... 20 | ….... | $\ldots$ |
| Great Britain.. | Shillings 16 |  |  |
| Italy. | Francs.... 20 |  |  |
| sil | Kro..... 15 |  |  |
| Sweden. |  |  | 35 |
| zerl |  |  |  |

The best way to remit is by Postal Order. Make the
order payable to MUNN \& CO., New York, United States, and forward the order to us with the name of the sender MUNN \& CO.,
$\qquad$
THE "Scientific American" is printe with CBAS.
EANEU JOHNSON \& CO." SNK. Tenth and Lom-
bard Sts., Philadelphia, and 59 Gold St., New York.

