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## a WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY: AND MANUFACTURES.



## NEW COMPOUND LOCOMOTIVE.

Without doubt, one of the most important engineer ing questions of the day is that of the economical use of steam. This has been a great problem since the days of Watt, and while from his time on gradual improvement had been made in the construction of steam engines and in the methods of generating and utilizing steam, the greatest strides have been made within a few years by compounding the engines and using the steam expansively to the greatest possible extent.
In marine engineering, where the condenser could be applied to great advantage, very high duty has been realized, and in the more recent ocean steamers the improvements as regards power are fully as great as the improvement in those details of naval architecture relating to speed. It has been found that non-condensing compound engines could be enstructed with great advant and many stationary engines of thi and many stationary engines of this type are now in use for various pur-
poses, notably for use in connection poses, notably for use in connection
with dynamos for electric lighting. Quite recently, the same principle has been applied by the Rhode lsland Locomotive Works to a passenger locomotive. Our engraving represents this engine during the experimental stage, showing the engineers taking indicator diagrams from the cylinders. With grams from the cylinders. With
the exception of the high and low


THE INTERCEPTING VALVE. pressure cylinders, and the mechanism peculiar to
them, the locomotive is of the regular type made by $\begin{aligned} & \text { meter, and the thickness of the stofl plates of which } \\ & \text { the boiler is made is } 5 / 8 \text { inch. The normal steam pres- }\end{aligned}$ them, the locomotive is of the regular type made by
the boiler is made is $5 / 8$ inch. The normal steam pres
the works before mentioned. The high pressure cylin-
sure is 180 pounds per square inch. Steam is admitted the works before mentioned. The high pressure cylinThe low pressure cylinder is 28 inches in diameter, with and valve motion, and exhausted into an intermediate the same stroke. The driving wheels are 78 inches in receiver, $E$, from which it is admitted to the low pres diameter ; the barrel of the boiler is 52 inches in dia
 sure cylinder by means of the intercenting valve shown in Figs. 1 and 2. This valve is constructed on the differential principle, and being entirely automatic in its action, it does not in any manner increase the work of the engineer.
The intercepting valve being in any position (that shown in Fig. 1, for example) and the throttle valve be ing opened, steam passes directly from the boiler to the high pressure cylinder in the usual manner. It also passes through the pipe, $D$, into the intercepting valve, A, causing the piston to move into the position shown in Fig 2 In this position, the receiver, $E$, is this position, the receiver, E , is
closed to the low pressure cylinder closed to the low pressure cylinder
by the piston, $c$, and steam from the pipe, $D$, passes through the ports, $d$ and $e$, and through the re ducing valve, $B$, into the low pressure steam chest, the pressure being reduced by the valve, $B$, from boiler pressure in the ratio of the high and low pressure cylinder areas. The piston, $a b c$, is so proportioned that it will automatically change to the it will automatically change to the


COMPOUND LOCOMOTIVE MADE BY THE RHODE ISLAND LOCOMOTIVE WORKS.
determined pressure has been reached in the receiver, E , by exhausts from the high pressure cylinder, as shown in Fig. 1. The engine thus starts with steam in both cylinders, and automatically changes at a cer tain recei
The engine may be changed from the compound sys tem to the simple system at any time at the will of the engineer, by opening a valve connecting the receiver with the exhaust pipe, and allowing the exhausts from the high pressure cylinder to be ejected through the exhaust nozzles in the usual manner.
The apparatus is so constructed that the operation of the exhaust valve permits steam at the receiver pres sure to enter into the space, $h$, to insure the movement of the piston to the position shown in Fig. 2, before the receiver is emptied through the exhaust. This prevent a lapse of continuous action in the low pressure cylinder during the change from the compound to the sim ple system while running. It is obvious that under bad conditions of starting the engine may be operated as a simple one, at the will of the engineer, by opening the exhaust valve before starting. Whenever this valve is closed, the piston, $a b c$, will automatically take the compound position shown in Fig. 1.
It is also obvious that an engine of this kind makes but two exhausts into the air, when running as a compound, for each revolution of the drive wheels, instead of four, as usual
This engine is the second of the kind, the first having been placed on the Brooklyn Union Elevated road more than a year ago, since which time it has been working satisfactorily and with great economy of fuel and oil, besides running with much less noise and without throwing cinders and sparks. Since the large engine here shown was built, the Rhode Island Loco motive Works have changed two more of the simple engines of the Brooklyn Elevated road into compound engines, and have built one new compound engine for a large ten-wheeled compound engine for the Jamaica Railway Co., to run on the island of Jamaica, and six very heavy freight engines of the four-cylinder type
of compound, for the Mexican Central Railway of of comp

The large engine which we illustrate was designed for making fast time on trains with few stops. It has been used on the New York, Providence \& Boston Railroad between Providence and New London, in general service on heavy and fast trains. By a comparison with simple engines of practically the same dimensions every way, it has been found that in point of cleanliness,
that is, freedom from cinders and black smoke, the that is, freedom from cinders and black smoke, the
compound engine is in marked contrast to the simple engine. In fact, it has been found that this engine needs no netting at the front end. It will thus be seen that this engine settles the question of the cinder and smoke nuisance. Although the bearings or journals are of ordinary size, none of them on this engine have ever exhibited any signs of heating, thus showing that the stress on the reciprocating and revolving parts is more regular than in the simple engine exerting the same power.
The builders of the engine place the saving of fuel on a conservative estimate from 15 to 25 per cent of tha required for a simple engine. This is certainly a sur prising gain, and one which would seem to indicate that we are to see in the near future a revolution in the construction of locomotives.
, Corsta ror convisions Dr. Leopold Roheim, of Budapest, publishes in the Gyogyaszat a case of eclampsia which he had, after the
failure of all ordinary remedies, successfully treated by failure of all ordinary remedies, successf ully treated by
compression of the carotid. The case, which is quoted by the Pester Medicinisch-Chirurgische Presse, was that of a robust man of fifty-six, who had been suffer ing for years from cancer of the bladder, with occa sional hæmaturia. The man had been attacked by a most violent eclamptic paroxysm, which was mainly confined to the left side. Dr. Roheim prescribed in vain musk, valerianate of zinc, bromide of potassium, asafœtida, hypodermic injections of morphia, ene mata of hydrate of chloral, and frictions with mustard, and at last employed compression of the carotid. After constant compression for some time of the right carotid the convulsions were suddenly arrested, the patient recovered normal respiration, and very soon felt quite well. Two or three slighter attacks followed, which were soon arrested by properly instructed attendants. The effect of the compression was so remarkable that Dr. Roheim earnestly recommends this treatment. He compressed the carotid with the index and second finger between the larynx and sterno-cleido-mastoid muscle backward toward the spine, just as Trousseau and Blaud had recommended. He was equally successful in the case of a girl nine years old. He considers the rationale of the treatment to be that by compressing the carotid and at the same time necessarily the sympathetic nerve fibers, which closely follow the course of the artery, the excitability of the brain is allayed. Lancet.

## Srientific Ammerican.

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"Every patent shall bear date as of a day not later than six months from the time at which it was passed and allowed and notice thereof was sent to the ap plicant or his agent, and if the final fee is not paid within that period the patent shall be withheld."
Section 4935 provides as follows
"Patent fees may be paid to the Commissioner of Patents, or to the Treasurer, or any of the assistant Patents, or the the United States, or to any of the de-
treasurers of the treasurers of the United States, or to any of the de-
signated depositaries, national banks, or receivers of public money designated by the Secretary of the Treasury for that purpose, and such officer shall give the depositor a reseipt or certificate of deposit therefor."
"The law, however, points out the specific officers authorized to receive such payments, and none other has any authority to act in the premises."
'It is in effect claimed that payment may be made to any officer or employe of the government, and this in the face of the specific provisions of law as to the places and persons, where and to whom such payments are to be made. The mere statement of the proposition without comment or argument is sufficient to show that it cannot be seriously entertained."
"It is further alleged that it has been the practice, well understood by those interested in the matter, to accept fees handed to the watchman at the door of the interior department building, as these fees were, after office hours or upon holidays, and to credit them as paid on the day they were handed to such watchman. There is no authority for such a practice, and if it has been allowed, the sooner it is discontinued the better. The policy of allowing any employe not under bonds to become a receiver of money is a dangerous one and should not be countenanced, even though it be not forbidden by the law."
"As a legal proposition, the decision of the Commissioner that this payment was not one under the law is, in my opinion, entirely sound."
"The law," says the Attorney-General, "points out the specific officers authorized to receive such payments, and none other has any authority to act in the premises."
This cannot mean that the receiving officer must personally stand at the counter and take money ; but he may provide clerks and assistants to do it for him.
Furthermore the patent law expressly authorizes the Commissioner of Patents to make, subject to approval of the Secretary of the Interior, such lawful rules for doing business with the Patent Office as he thinks proper.
It is, therefore, within the sphere of the Commissioner to make a special arrangement to accommodate belated inventors and save them from loss of standing on the records, and from the forfeits and extra costs, if they should happen to reach the Patent Office after the evistomary closing hour.
In his recent annual report to Congress, Commessioner Simonds stated that the Patent Office recempts last yes.r were over one hundred and thirty-one thousand dollars above the expenses; and that a little over four millions of dollars were now standing in the
treasury on account of the Patent Office fund, all of which was paid in by inventors. In the same report the Commissioner dwells at considerable length and with much eloquence upon the immense benefits conferred upon the country by patentees. Among other things, he says :
"There is no class or condition of men in the whole country which has not felt the blessings of American inventive genius, fostered into its fullest flower by wise and kindly patent laws."
As coincident with these generous sentiments we hope the Commissioner will do something practical by way of relief for the belated inventors. The effect of his recent ruling has been to drive them from the doors of the Patent Office, without remedy.
By a few strokes of his pen and without detriment to others, he can make a new and kindly rule that will assist them.
It is not asked nor to be expected that the Commissioner will personally remain at his office until 12 o'clock at night to receive fees; but it seems not an unreasonable request for inventors to make that he will authorize the expenditure of five hundred or a thousand dollars a year for the employment of a clerk whose special duty shall be to be present at the door of the Patent Office from 4 P. M. (the usual closing hour) until 12 o'clock P. M., for the express purpose of saving cases that must otherwise be forfeited. If this is not desirable, then some other way surely ought to be provided to receive the anxious applicants' money, if presented even so late as the fraction of a second be fore the limit of time specified in the law.

## EXCLUSION OF PHOTOGRAPHS FROM THE INTERNATIONAL POSTAL EXCHANGE.

Mr. Herbert Spencer, during his last visit to this country, felt called upon to speak to us some pessimistic yet wholesome words of caution relative to our intense love for the least permanent but most showy advances in social government. Yet, quick to see the good in us, he spoke most hopefully of that phase of our life which both enabled and impelled the man in the middle walks to surround himself with those literary, musical, and art luxuries which still remain far out of the reach of most Europeans. In his trip through the United States, during last year, the Earl of Rosse gave it as his opinion that the most observable manner
in which the American citizen was differentiated from the subjects of European powers was in the way in which he was able to live; the appearance of solid com fort, even luxury, with which it was possible for the artisan, for example, to surround himself. As the chief cause contributing to this condition, beyond that of the boundless wealth of our territory, he recognized the great inventive and resourceful qualities of "the Yankee mind"-qualities that keep busy a small army of experts and their clerical forces examining, classifying, and passing upon a multitude of improvements in mechanisms and processes such as no other country can show.

To electricity, with its glittering triumphs over time and space, and to steam, with its boundless energy, are usually given the dual honors of first mention when this century's advance in material prosperity is under consideration. The more regular and far more constant progress made in the graphic arts is generally overlooked in this discussion; yet in no way are we today further removed from the life of the early part of this century than in our improved facilities for enjoying, in our own homes, the reproductions of the earth's chief art treasures, or of nature's beauty and
grandeur. The wonders of the Yellowstone, the dread gloom of the trackless African forests, the terrors of the gloom of the trackless African forests, the terrors of the
Alaskan avalanche, the untrodden sublimities of the Alaskan avalanche, the untrodden sublimities of the
upper Himalayas, are brought to our library tables, upper Himalayas, are brought to our library tables,
and we commune with the powers of nature, thus shown forth with almost the same sense of mental elevation which our actual presence among them would produce. To-day we may, if we will, become more familiar with the racial characteristics of face and form of the man of the Kilima-Njaro mountains, or the with those of civilized Europe. To the camera and all that troop of following processes which have so improved and, at the same time, cheapened the reproductive graphic arts, are we mainly indebted for these enrichments of our library tables, our book shelves, and our walls.
Anything which is calculated to take from the public the immediate benefits accruing from such progress, a progress in which America has borne a prominent part, or any governmental action or restriction which shall add to the difficulty or cost of enjoying the edu cative results thereby brought about, is an unmixed evil. So when Mr. Secretary Foster, of our Treasury Department, promulgated his recent order excluding
photographs from the mail exchange, a blow was photographs from the mail exchange, a b
aimed at one of the sources of public culture.
This ruling of the secretary is based on the provisions agreed upon by the Universal Postal Union Convention, as quoted in the General Regulations under the Customs and Navigation Laws of the United States, 1884. Article 308. which reads as follows:
"The sending by mail of letters or packets containing
gold or silver substances, pieces of money, jewelry, or precious articles, or any packets whatever containing articles liable to customs duty is prohibited."
Article 310 of these regulations provides for tine ad mission of books "to the International Mail Exchange, and imported through the mail under the act of March 3,1879 ," but only books are therein specified. The secretary's contention is that the previous admission of such articles, now so long permitted, has been illegal, and he has instructed his assistants at the various ports of entry that only " on payment of a fine equal to and in lieu of the duty which would have accrued thereon had importation been legal" can such a pack-
age be delivered. If Secretary Foster be right, and the respectable line of his predecessors have permitted an infringement of law in the past, then the time is ripe for bringing the matter before the present Congress. A slight amendment of the law, to wit, the insertion of two words, "and photographs," after the word "books," would be greatly to the advantage of the people.

## The Production of Aluminum.

Taking into account the development made by the factories of aluminum in recent years, it may well be believed that the production almost equals the demand, although new uses for this light but ductile metal are being daily discovered.
The Bulletin de Musée Commercial, in a recent number, reviews the productive capacity of the principa aluminum factories now in operation. Since the closing of a large number of European works, by reason of
the difficulty they experienced in competing with the electrolytic process, the manufacture of aluminum is at present confined to four large factories. The most important is the Aluminum Industrie Actien-Gesellschaft, at Neuhausen on the Rhine, the daily produc tion of which is about $1,000 \mathrm{lb}$. of metal. Then comes the Pittsburg Reduction Company, with a daily production of 600 lb .; the Metal Reduction Syndicate, Limited (English branch of the Pittsburg manufacture), with 300 lb . daily; and finally, the Cowles Company, which has a daily production of from 600 lb . to 700 lb. , but of which the greater part consists of alloy of aluminum. It is thus seen that the present produc tion of aluminum in the world only amounts to abou 2, 600 lb . daily.
Hitherto the largest quantity of commercially pure aluminum seen at one time consisted of a stock of about 19 tons, to be found recently in the warehouses of the Pittsburg Reduction Company. Then may be mentioned, in order of importance, the Paris Aluminum Company, which ceased its operations at the commencement of 1890 with a stock of 10 tons; the Alliance Aluminum Company, of Newcastle, and the Aluminum Company, Limited, of Birmingham, which possessed,
at the time of the closing of their works, stocks of 8 at the time of the clos
and 6 tons respectively.
Toward the middle of last year American aluminum was quoted at the rate of $\$ 2$ per lb.; some few months later the price was reduced to $\$ 1$ per lb. The present prices of the Pittsburg Reduction Company are: For
No. 1 quality, 90 cents per lb. in small quantities and No. 1 quality, 90 cents per lb. in small quantities and
75 cents per lb. for orders of at least one ton; for No. 2 quality, of a purity of from 94 to 97 per cent, 85 cents per lb. for quantities of not less than a ton.
On the other hand, it is stated that a French com pany has just erected an establishment at St. Michel (Savoy) for the manufacture of aluminum by the Minet ment.

The Real Inventor of Telegraphy.
According to a writer in the Popular Science Monthly for February, Weber was the first who established a permanent workable telegraph line, and thereby
demonstrated the practical value of the electric teledemonstrated the practical value of the electric tele-
graph. Weber's house in the city was connected with graph. Weber's house in the city was connected with the astronomical and magnetic observatories by a line
between three and four kilometers (over two miles) in ength. The signals were made by the deviations of the needle of a galvanometer to the right and left, and were interpreted according to a conventional alphabet. The use of interrupted or reversed currents did not permit the transmission of more than one or two words a minute, but the speed was increased to seven or eight words by the use of induced currents. The following first notice of this telegraphic connection was published in one of the numbers of the Gottingen Gelehrten Anzeigen (or Gottingen Scientific Notes) for 1834 "We cannot omit to mention an important and, in its way, unique feature in close connection with the arrangements we have described [of the Physical Observatory], which we owe to our Professor Weber. He last year stretched a double connecting wire from the cabinet of physics over the houses of the city to the ob servatory ; in this a grand galvanic chain is established,
in which the current is carried through about nine thousand feet of wire. The wire of the chain is chiefly copper wire, known in the trade as No. 3. The certainty and exactness with which one can control, by means of the commutator, the direction of the current and the movement of the needle depending upon it
were demonstrated last year by successful application to telegraphic signalizing of whole words and short phrases. There is no doubt that it will be possible to establish immediate telegraphic communication between two stations at considerable distances from one another."

## Electrical Tanning.

The London Boot and Shoe Trades Journal describes the results of two experiments in tanning by aid of electricity, by "Groth's system," carried out at the tannery of George Hauenstein, at Verviers, Belgium
The apparatus used in these experiments consisted of a rectangular wooden vat, 6 feet 6 inches long, 4 feet 10 inches wide, and 5 feet 3 inches high, with two electrodes, framework and shafting, the cost of which was $£ 307 \mathrm{~s} .6 \mathrm{~d} .$, together with a dynamo, ampere meter, volt meter and shafting, costing $£ 24$; or, altogether, $£ 547 \mathrm{~s} .6 \mathrm{~d}$. This electric installation is capable of supplying electricity to six vats or pits.
Forty ond cow hides from
Forty ox and cow hides from the Brussels abattoir were experimented upon, weighing, without the horns, 1,380 kilogrammes. These hides, after having been put in lime, unhaired and fleshed, were swelled and colored. The forty butts derived from these hides were hung up in the vat on the 12th of October and taken out on the 16th of November; they were subjected to the action of electricity during four weeks, or twenty-four days, from six to seven hours per day, and the $w$
kilos.
The offal, bellies, throats and heads, hung up in the vat on the 16th of November, were taken out on the 7th of December. The parts were, therefore, subject to the action of electricity during three weeks or eighteen days, from six to seven hours per day, and the weight yielded, when finished and dry, was 344 kilos.
The forty hides, therefore, with a green weight of 1,380 kilos., gave a total weight of finished leather of 723 kilos., or 52.4 per cent
The tanning material employed to swell, color, and tan these forty hides was as follows: 880 kilos., of oak bark, costing 15 francs per 100 kilos., equal to $£ 55 \mathrm{~s} .6 \mathrm{~d}$.; 85 kilos. of mimosa bark, at 40 francs per 100 kilos., equal to $£ 17 \mathrm{~s}$.; 400 kilos. of oak extract, at 40 francs per 100 kilos., equal to $£ 68 \mathrm{~s}$. This makes a total of $£ 136 \mathrm{~d}$. for tanning 723 kilos. of leather, equal to 45.2 centimes per kilo., or $21 / 4 \mathrm{~d}$. per pound of leather.
The Journal adds :
At the Crystal Palace Electrical Exhibition there is much to be seen of great interest, but to us and our readers nothing of more interest than attaches to L. A. Groth's exhibit of various kinds of leather tanned by the aid of electricity. Mr. Groth's interesting exhibit consists of diagram of "complete tannage" in fourteen days of "green hides," each averaging 77 pounds weight, showing their daily absorption of tannin from the iquor, ascertained by analyses made on samples taken rom the hides and liquors every two hours during the whole time of the tannage, and showing that as soon as the hide has been tanned, no more tannin can be absorbed by it, even if kept in the liquor for ever so long.
Another diagram shows the comparative tannages, viz., with and without the aid of electricity, and demonstrates not only that electricity bears an important part upon the hastening of the tanning process, but also distinctly shows to what degree the electricity so acts.
As to the products exhibited by Mr. Groth, there are several "sole butts" tanned by him in four weeks. The color is good, the leather firm, and the finish very clear. To further show the quality of this leather, several pairs of boots made from the same are exhibited. An old pair of boots is also exhibited, with the right sole made from Groth's one month's tannage and the left from leather tanned in eight months by the old process, and constantly worn for six months by a person said to weigh 12 stone, in order to show the small wear of Groth's leather, as compared with flrst-class leather-the wear being equal in both.
There are some calfskins tanned in fourteen days. The belting made from Groth's leather, tanned in four weeks, seems also to be of first class, and the very samples tested by Professor W. C. Unwin, F.R.S., of the Central Institution, London, are also exhibited, in order to demonstrate their peculiar breakage, being in a straight line, whereas the ordinary belting generally breaks raggedly, which says a good deal for the uniform tannage of Groth's leather. Professor Unwin also says, in his report: "The leather generally is quite up to the strength of good leather intended for belting," and "the tenacity in this per inch of width of Groth's belting, as compared with English, is as follows :


We would advise our readers to have a look at Mr. Groth's exhibit, which will doubtless prove not only interesting, but instructive and valuable from a trade standpoint.


THE WORLD'S COLUMBIAN EXPOSITION.-Engravings from "L'Tllustration."

## Iron-Aluminum Alloys.

The advantages of an addition of aluminum to fluid iron are important. With moderate care absolutely pure and solid castings can be obtained capable of receiving a high polish. An addition of aluminum is especially to be recommended for the manufacture of steam cylinders, engine castings, press cylinders, and steam cylinders, engine castings, press cylinders, and
generally for castings which are to be subjected to a generally for castings which are to be subjected to a
high pressure. A few hints will serve to show how high pressure. A few hints will serve to show how
aluminum is best alloyed with iron. As aluminum aluminum is best alloyed with iron. As aluminum
only lends itself with difficulty to combination with only lends itself with difficulty to combination with
iron, it is not immediately to be introduced in the ladle which is to be poured into the mould; a smaller ladle is selected, in which is placed the heated aluminum; somewhat fluid iron is brought from the furnace, poured in the ladle, and stirred until the aluminum-iron compound begins to stiffen. The iron intended to be cast is now let out of the furnace into the ladle intended for it; the aluminum-iron mixture is poured in, the lot being intimately mixed. The molten metal should not be poured into the mould too quickly, as it does not solidify so rapidly as ordinary iron. Aluminum-iron in the fluid condition is very active ; small globules are formed, which gradually extend to the edge of the ladle, where they disappear. At first the iron is of a milk white color; then it becomes orange yellow, and forms a thin film on the top. When this moment has arrived, the film is removed and casting is proceeded with, care being taken that the mould is always kept full. For 100 kilogrammes the proportion of aluminum recommended is 200 grammes. Cost can be no drawback in view of the present cheapness of aluminum, particularly when it is considered with how much greater certainty clean castings can be obtained. Aluminum improves cast iron as phosphorus improves tombac and brass; the thin fluidity is increased and the oxide separated.Metallarbeiter.

## A CONVENIENT KITCHEN CABINET.

The cabinet shown in the illustration is adapted to contain nearly or quite all the articles commonly used in cooking, so arranged as to be protected from dust, and all within easy reach. For this improvement a patent has been allowed Mr. Charles Holt, of Walla Walla, Washington. The lower or base portion of the cabinet has a large number of drawers suitable to hold various articles or utensils, and this base carries on its top a sliding kneading board, readily pulled out for use and pushed inward when not needed. The top part of the cabinet is entirely removable, having recesses in its bottom portion which fit upon corre sponding lugs on the top of the base, while a swinging lid closes down over the kneading board. The top part is divided by vertical partitions into compartments, preferably three in number, the two end compartments for different qualities of flour and the center one for sugar. Immediately below the compartments is a hollow framework with depending flanges supporting a sieve under each flour compartment, as shown in the sectional view. Plates serving as floors to the flour compartments each carry a slide with an inwardly ex-


## HOLT'S KITCHEN CABINET.

tending rod terminating in a knob, on pulling which the flour is permitted to drop to the sieve below, the sieves being so secured in place that they may be removed from the frame by pulling downward upon a spring catch. Within each sieve is a swinging wire rod loop, the rod extending through the front of the sieve, where it is formed into a crank, by turning which the flour will be passed through the sieve. Centrally between the sieves is a cross plate forming the floor of the sugar compartment, and in this plate is a slideway in which is a hole adapted to register with a hole in a slide, by moving which the sugar is allowed to flow through. Beneath the central compartment is tinued.
a bin to receive the sugar, and on each side are smaller bins for baking powder, spices, etc., there being larger bins near the ends for the flour. A rolling pin, when not in use, may be kept on top of the bins. The entire sifting and regulating mechanism may be easily removed to be repaired or cleaned.

## AN IMPROVED FIRE ESCAPE,

The construction shown in the accompanying illustration is designed to be of a simple, durable, and inexpensive character, and adapted to be placed at the side


SCHWANNECKE'S FIRE ESCAPE.
of a building without detracting from its appearance It forms the subject of a patent which has been issued to Dr. Henry Schwannecke, of No. 1280 Fulton Avenue, New York City. The improvement consists essentially of two chairs or balconies, so connected that when one descends the other will ascend, the descent of the balconies being stopped at the bottom by spring cushions, so that the occupants will experience no shock. Two tubular standards are located at any desired point upon the building, connected at the top by a transverse tubular slideway, and each standard has a hollow base in which is located a coil spring, as shown in the sec tional view. Each standard has in its front face a ver tical groove extending from the base to the top, and a bar sliding in the standard has a flange or projection extending out through the groove, to which the chai or balcony is securely attached in any approved manner. The bars carrying the chairs have reduced lower ends, around which are springs carrying disks adapted to enter the hollow base of the standard, this arrange ment preventing any rebound, while forming a thoroughly effective cushion for the chair in its descent The chairs or balconies are connected by a cable, the ends of which are attached to the upper ends of the bars, the cable passing through the standards and over pulleys through the upper slideway. Each balcony has a brake, whose handle extends up within convenient reach, the shoes of the brake being normally held against the standards by a spring, and near the top of each standard is a keeper, adapted to engage and lock the brake shoe when the chair is in its most elevated position. Upon persons entering the upper chair, and disengaging the brake from the keeper, the chair descends by gravity, the other chair at the same time as cending to receive others desiring to descend.

The Harvard Astronomical station in Peru.
Dr. Edward C. Pickering, director of the Astronomical Observatory, Harvard College, in his last annual report, gives the following interesting information :
The expedition sent to Peru in 1889 under the direc tion of Mr. S. I. Bailey, having successfully completed the observations with the meridian photometer, re turned to Cambridge with that instrument, which has been remounted here and will be used yor a revision of the Harvard Photometry and for other photometric work. During the two years ending May 1, 1891, Mr. Bailey took 217 series of observations and made 98,756 photometric comparisons of about eight thousand
southern stars. These include all the staris of the sixth magnitude and brighter south of $-30^{\circ}$ and all known catalogue stars in a series of zones $20^{\prime}$ wide at intervals of $5^{\circ}$ in declination from $-25^{\circ}$ to - $80^{\circ}$ : also all known stars south of $-80^{\circ}$ and a miscellaneous list of variables, stars having peculiar spectra, etc. The reduction of these observations is nearly completed and their publication will be begun shortly. A large part of the work assigned to the Bache telescope has also been completed, and the instrument has been re-

An expedition under the direction of Professor Wil liam H. Pickering left Cambridge in December, 1890 and established a station about three miles northwest of Arequipa, where the thirteen-inch equatorial has been mounted. This station has an elevation of a little over 8,000 feet and has a nearly cloudless sky during a large part of the year. The air is remarkably steady, the images of the stars are small and round and the diffraction rings, seldom seen with large instruments, are clearly visible. Even with high powers the fluctuation of the images is very slight. In fact, at this station the limit to observation will probably be the size of the instrument instead of, as at other observatories, the condition of the air. Although the aperture of this instrument is only thirteen inches, it appears to be the largest refracting telescope in use in the southern hemisphere, while about thirty larger telescopes are mounted in the northern hemisphere Since all of these instruments are north of $+35^{\circ}$, nearly one quarter of the entire sky, and that containing one quarter of the entire sky, and that containing
many objects of the greatest interest, has never been many objects of the greatest interest, has never been
studied by a refractor of the highest grade. For both these reasons an excellent opportunity is afforded to add to astronomical discovery by the erection of a telescope of a large size at this station. It is hoped that patrons of astronomy will consider the advantages of erecting a large telescope where it will be kept constantly at work, where the sky is clear a large part of the year, where the condition of the air is probably more favorable than at any other existing observatory, and where a large part of the sky could be examined for the first time under such satisfactory conditions.
Photographs have not yet been obtained with the thirteen-inch telescope, but it is hoped that its advan tages for this kind of work will be as great as for visual observations. The expense of establishing this station was much greater than had been anticipated, since it was necessary to erect a stone dwelling house for the observers. A considerable advance from the future in come of the fund has accordingly been required. Important aid was rendered to the expedition by many residents in Peru. Mr. MacCord, superintendent of the Mollendo Railway, should be especially mentioned for his hospitality to the observers, who resided with him while the new house was in process of erection. Without his aid the establishment of the station would have been extremely difficult. Two interesting expeditions have been made in Peru. One of them by the courtesy of Mr. Anderson, American Minister to Bolivia, was to Tiahuanuco and the sacred islands of the Incas on Lake Titicaca, and led to results of much archæological interest. The other was to the summit of El Misti, a nearly extinct volcano about nineteen thousand feet high.

## AN IMPROVED HAND PLANER.

The accompanying illustration represents a compact, well made machine, designed to do exact work rapidly It planes 12 inches long, 9 inches wide and 8 inches high, and has a universal planer chuck. A second size is made to plane 24 inches long, 12 inches wide and 12 high. This machine, with a general line of foot and power lathes and drili presses, is manufactured by $\mathbf{H}$.


SHEPHARD'S NEW HAND PLANER.
L. Shephard, agent, No. 141 West Second Street, Cincinnatì, Ohio.

## Magnesium Flash Signals.

In 1889 some interesting experiments were made by Mr. W. P. Gerrish on distributing time accurately by lashes of magnesium powder. Signals were thus sent rom a station on Blue Hill, Mass., tweive miles distant. They were readily visible, and the exact time to within fraction of a second could be taken from them. These flashes were also seen from Princeton and Mount Wachusett, forty-four miles distant, and from numer lous nearer points.

## The Influenza Bacillus.

Authentic documents are now to hand which enable us to form an estimate of the accuracy and trustworthiness of the alleged discovery of a bacillus as the exciting cause of the influenza. It had already been surmised that the influenza poison resides in a minute bacillus, and there is now little doubt that this bacillus has at last been discovered, identified, separated, and cultivated by three different observers, all of whom have been working independently of one another. These bacteriologists are D. R. Pfeiffer, who has carried on hisinvestigations at the Institute for Infectious Diseases at Berlin, Dr. Kitasato, and Dr. P. Canon, of the Municipal Moabit Hospital at Berlin. Their results are identical, and although all new discoveries are received by the scientific and medical world with considerable reserve till they have been abundantly and independently confirmed, it is earnestly hoped that the discovery of the cause may lead to that of the cure of the disease.
Dr. Pfeiffer has found the bacilli in the saliva and the bronchial discharges characteristic of influenza. They exist in the form of tiny rodlets, strung together sometimes in chains; they congregate in minute drops as clear as pure water. They can be obtained in pure cultures-that is, separated from all other forms of bacilli-in pure agar and sugar, or glycerine agar. In the saliva of influenza patients, the bacilli are found in immense quantities; they may penetrate from the pus cells into the tissue of the lung, and even pass as far as the surface of the pleura. This fact will explain the
rapidity and fatality of lung complications in influenza. rapidity and fatality of lung complications in influenza.
Dr. Kitasato, the learned Japanese assistant of Prof. Koch, has obtained identical results with those of Dr. Pfeiffer, and has cultivated the influenza bacillus in glycerine agar with marked success. Dr. Canon comes striking discovery, at the same time with a stil more influenza bacillus in the blood of patients suffering from the disease, and, according to the opinion of Prof. from the disease, and, according to the opinion of Prof
Koch, the bacillus discovered by Dr. Pfeiffer in the Koch, the bacillus discovered by Dr. Pfeiffer in the
saliva is the same as that discovered by Dr. Canon in saliva is the same as that discover
the blood of influenza patients.
To the public these laboratory researches and discoveries are not merely matters of passing scientific in terest. They are of deep and practical importance. The power to cure disease may not be vouchsafed to the physician even after the most earnest and arduous study ; but to prevent disease is the crown of the medical art. The knowledge that a bacillus residing in the saliva causes influenza will not cure the epidemic; but the prompt and practicalapplication of this knowledge by complete disinfection of all bronchial and nasal se cretions and the isolation of influenza patients will stay the plague. It also indicates the reasonableness o what is known as the carbolic acid treatment of influenza, which has been practiced with considerable suc cess, especially in the early stages.-Daily Graphic.

## The Lacquer Tree of Japan.

A very interesting experiment has recently been recorded as having been conducted at Frankfort by Pro fessor Rein, of Bonn, so well known for his splendidly illustrated work on Japanese arts. One of the prin cipal of these arts is that of lacquering, in which no other nation can excel the Japanese. The art is one o great antiquity, and the old examples are very costly The lacquer, unlike the European varnishes and polishes, which are compound substances, consists of the juice of a small tree known to botanists as Rhus vernicifera, and this juice is drawn from the trunks by making incisions in them, from which it flows into bam boo pots placed to receive it. The juices of this and all other species of Rhus are extremely acrid and poisonous, blistering the skin severely if allowed to com in contact with it. Consequently the Japanese col lectors use thick gloves to cover the hands during the process of collecting. After the crude juice has been drawn from the tree, it is prepared in different ways by the Japanese experts, and the process of applying it to the wood or metal work is a very tedious one, and one which can only be properly effected by a native artist. The modern lacquer ware of Japan, however, is a totally different article from that of one hundred and fifty or even one hundred years ago. There is at present a great demand in the European markets for present a great demand in the European markets for
cheap lacquered articles, in consequence of which they cheap lacquered articles, in consequence of which they
have to be produced quickly and in large quantities, so that a very inferior article is produced, both in design and finish. Nevertheless, the process of lacquering has never been mastered by Europeans. It has been tried by practical varnish makers in this country, but always without success, and it is now thought by Professor Rein that if the trees could be established in Europe and the juice freshly drawn from the trunks, some of the difficulties of its manipulation might be overcome. Considering that several species of Rhus are hardy plants in our shrubberies, there is, perhaps, no reason why Rhus vernicifera should not be included among them. Indeed, this question seems set at rest by the fact that a number of healthy trees, some 30 ft . high, are now flourishing at Frankfort, the trees originally planted there having produced seed, from
which other trees have been raised. The next question seemed to be whether the changed conditions of growth and climate would in any way affect the nature or composition of the juice, and to prove this some of the trees at Frankfort have been tapped and the juice sent to Japan to be experimented with by the native artists. Besides this, the native and European juices have been analyzed by German chemists, upon whose reports, coupled with those of the Japanese artists, it is expected the fate of lacquering as an industry in Europe will stand or fall. If the reports on the quality of the juice from Japan be favorable, it is proposed to plant the tree largely and bring over some expert workers from Japan to teach their peculiar art to European students.
There is, however, another use to which the Japanese lacquer tree might be put should it prove to take so kindly to European soil as to produce its fruits abundantly. These individual fruits are small-not much larger than a pea, but somewhat flattened-and are borne in bunches or clusters. They are covered with a thin, light brown shiny skin, under which, and immediately surrounding the seed, is a deposit of white wax, which forms, together with that of an allied species (Rhus succedanea), the product known as Japan wax, which is used by the Japanese for making candles, and is also exported in large quantities to China and to this country to some extent for a simila purpose, as well as for making wax matches.-In purpose,
dustries.

## a great spot on the sun.

The largest sun spot that has made its appearance since 1883 became visible to the naked eye on Februar 10 , the observer, of course, having the protection of

smoked or deeply colored glass. The first careful ob servations of it at the Dudley Observatory, Albany, by Professor Lochner, indicated that the spot, or rathe group of spots, covered a disturbed area of 140,000 miles in length, and from 90,000 to 100,000 miles in width. The principal spot had, according to Professor Lochner, two nuclei, each having a diameter of about 14,000 miles, while the penumbra around the principal spot had an extreme width of 65,000 miles.
The accompanying illustration represents the appearance of the disturbed area of the sun's surface according to an observation made at the Scientific American office at 10 o'clock on the morning of February 13. In looking with the naked eye, one sees only what appears to be a single spot, a telescope being required to make the separation into several spots or groups.

The Advance of Chemical Science in 1891
Vast additions have been made to the science chemistry during the year; new combinations of ele ments have been discovered, new properties of existing elements, new relations between physical and chemical action, and especially between the latter and those other forms of the all-pervading force which we call electricity. One of the latest announcements in this connection was that made at the Royal Society, in the beginning of December, that Prof. Dewar, of the Royal Institution, had "placed a quantity of liquid oxygen in the state of rapid ebullition in air (and therefore at a temperature of $-181^{\circ}$ Centigrade) between the poles of the historic Faraday magnet in a cup-shaped piece of rock salt," and to his surorise Professor Dewar saw the liquid oxygen, as soon as the electro-magnet was stimulated, "suddenly leap up to the poles and remain there permanently attracted until it evaporated." Dr. Gladstone has been as busy as usual investigating the molecular refraction and dispersion of various substances. Professor Crookes has been as busy as Dr. Gladstone, and his experiments on electrical evaporation have attracted special attention.
The burning question of "solutions" has been at-
tracting much attention in the chemical world, giving rise to nearly as much difference of opinion, if not quite so much bitterness, as that of evolution in the biological world. It is strange to find a name intimately associated with English literature figuring as that of the author of an able address on the subject of solutions at last year's meeting of the Australian Association for the Advancement of Science. Professor Masson, of Edinburgh, has not deserted his old love, but his son in Australia, who has chosen the severer path of chemistry, proves, we are glad to say, that in the matter of careful and hard work he is a true son of his father Professor Judd has been again dealing with his favorite subject of crystals, and, though he approaches it from the geological standpoint, it really belongs to the domain of chemistry. Professor Judd treats these products of nature as if they really lived and moved and had being, just indeed as if they were organic bodies. He talks of the "rejuvenescence" of crystals, and at tributes to them other properties, which hitherto we have associated only with life. His researches are important as bearing on the very foundation of geological science. Professor Roberts-Austen's discovery of the most brilliant alloy known (75 per cent of gold with 25 per cent of aluminum) is of curious interest. More important are Mr. T. Andrews' researches on the passive state of iron and steel, which take us to the borderland between physics and chemistry. Two French chemists, MM. Cailletet and Collardeau, have been working at the critical point of water vapor. M. Moissan's researches on the element fluorine have yielded interesting results, owing to the intense chemical activity of this element. Another French chemist has been carry ing on quantitative investigations as to the chemica action of light.
A research of interest, as showing the intimate relations between chemistry and biology, has attracted some attention during the year. It has been carried out by a young chemist, Mr. Cuthbert Day, who superintends the scientific work in Younger's brewery in Edinburgh. It deals with the sprouting of barley, and Mr. Day has by means of an ingeniously contrived apparatus endeavored to ascertain the precise influence of temperature on the process, with results that ought to be of both scientific and practical value. The chie point to be noticed is that, though there is a consider able falling off in the increase of the quantity of carbon dioxide produced when the temperature rises above 55 Fah., yet the effect in diminishing the increase in the weight of dry root is much more marked. To this almost random selection from the chemical work of the year must be added as an event of importance the jubilee of the Chemical Society on February 24, when, among others, Lord Salisbury gave an address full of suggestive skepticism, if not pessimism; in science.Chem. Tr. Jour.

Government Trials of Magazine Firearms.
We learn from Capt. S. E. Blunt, Captain Ordnance Department, U. S. A., that the Secretary of War has lately given orders to the board on magazine arms "not to receive, unless authorized by the War Department, arms for trial after June 1, 1892, and for the board to then complete its labors and forward its report as oon as practicable."
All inventors or others who have corresponded with the board have been notified of these instructions and that the board's next session would be held at this armory, commencing on February 23.
Other sessions will be held as frequently and for as ong periods as there may be guns on hand awaiting trial.
The trials are made at the National Armory grounds, Springfield, Mass.
It is understood the government is desirous of adopting the latest and best invention in magazineguns, and is looking for something superior, if possible, to the new European guns. Engravings and descriptions of those adopted in the armies of England, France, Germany, Austria, and Russia will be found in Scientific american Supplement, Nos. 591, 597, 744, 783, 798.

## Husiness Maxims.

The elder Baron Rothschild had the walls of his ank placarded with the following curious maxims : Carefully examine every detail of your business. Be prompt in everything.
Take time to consider, and then decide quickly. Dare to go forward.
Bear troubles patiently.
Be brave in the struggle of life.
Maintain your integrity as a sacred thing.
Never tell business lies.
Make no useless acquaintances.
Never try to appear something more than you are.
Pay your debts promptly.
Learn how to risk your money at the right moment.
Shun strong liquor.
Employ your time well.
Do not reckon upon chance.
Be polite to everybody.
Then work hard and you will be certain to succeed!

## Sorrespondence.

## occupation for Old People

To the Editor of the Scientific American
In vol. 66. No. 4, page 55, you have a piece copied from Chautauquan on " Occupation for Old People." I am not a writer nor much of a scholar, but I would like to read more written on the same subject by some one who has given the same more thought.
The above piece is most wholly written with a person in view who has been engaged in some occupation that was light-mostly brain work. I would like to have some one point out new work for men who have been machinists, masons, engineers, jewelers, blacksmiths and similar trades.
I know a man who is past 60 . He has been a good machinist and locomotive engineer ; at one time a master mechanic (20 years ago) in railroad shops in Indiana. He is one of my daily callers. ( I am a jeweler, 27 years old.)

He enjoys pretty good health for one of his age; but he is too old to work at his trade-is not strong enough, his eyes are not sharp enough. Some days he is happy, other days he is the "bluest" man I ever saw. He is always wishing he had something to do. He has plenty of money to keep him the rest of his life; but still he is discontented.

I think he would live longer if he had something to busy his hands with.
Of course the other tradesmen are about like the one I have told of : too old for the trade they have worked at all their life, and need something new to keep their hands and minds in better shape than will idleness, not so much for what they earn, but to keep them from seeing their age and-looking for death.
I am young, have worked at watch repairing for nine years, my eyes are fine, and nerves good; but what am I going to do when I get too old for this work

John W. Blinn.
Antigo, Wis., Feb. 1, 1892.

## Population of Alaska

According to Census Bulletin 150, the population of Alaska is classified as follows :


The enumeration was compiled under the directio of Mr. Ivan Petroff, special agent in charge of th Aiska Division of the Census Office.

Bound to Head it off.
A young woman of Chicago has tabulated a list of symptoms of la grippe as follows

Headache
Pain in the back.
Can't taste anything.
Can't smell anything
Can't eat anything.
Don't want to anyway.
That tired feeling.
Don't want to speak to any one.
Don't want any one to speak to me
Don't care.
High fever.
Chills.
Craving for ardent spirits.
No craving.
Want to die.
Don't want to
Whenever she feels the approach of any of the foregoing symptoms, she checks it off on her list and asks her mother to send for a doctor.-Bulletin of Pharmacy.
[The above faithfully describes the symptoms of the same complaint prevailing in our Eastern cities and towns.-ED.]

## Hllegal Telegram Contract.

The Court of Appeals of Montreal has rendered a decision in the case of the Northwestern Telegraph Company vs. Laurence, in which it declares illegal contract printed on the blanks furnished by the tele graph company. The proof established the fact that the error was due to the negligence of the employes of the company. The appellant set up the plea that the dispatches were sent under a contract which declared that it (the appellant) would not be liable for damages resulting from errors unless the dispatch was repeated, and then only to the amount of fifty times the sum paid for the message. The Court of Appeals declared that this contract was contrary to public policy.

## What should be the marks of a liberally educated

 man? I assume that, in common with strong characters who are not liberally educated, he has a vigorous will, by which the downward tendencies of his nature are resisted, and the upward aspirations of his soul are sustained and developed. I say nothing further in re gard to his moral qualities, although they are closely related to those of the intellect. Five intellectual pow ers, as it seems to me, should be the property of every liberally educated man.First, he must have the power of concentration; that is to say, he must be able to hold his mind, exclusively and persistently, to the subject which demands his at tention. If this power is exercised in the domain of natural or physical science, it implies the most accurate observation of phenomena-the finest discrimination of the eye; in mathematics, it implies close analysis of all the conditions of the problem considered; in
language, it implies the most attentive regard to the language, it implies the most attenti
significance of terms and propositions.

The second power of an educated man is that of distribution. The knowledge that he acquires by close at tention is of little value unless it is arranged and classi fied. His possessions must be placed in the group where they belong, so that by association they may be at command whenever required. The man who knows a hundred thousand facts which have never been reduced to principles is like a millionaire whose fortune consists in tons of copper cents.
Third, the man of liberal education must have the power of retention; that is to say, he must tenaciously hold and remember that which he has learned. It is not enough that he can look up his acquisitions with effort; he must recollect them readily as occasion arise for their use.

Fourth, the liberally educated man must have the power of expression; that is to say, he must know how to state his thoughts so as to reach the minds of others and this utterance should be equally good whether the pen or the voice be the instrument of communication.
Finally, the educated man must have the power of judging; that is to say, he must be able to make sharp discriminations between that which is true and that which is false, that which is good and that which is bad, that which is temporary and that which is perpetual, that which is essential and that which is acci dental. In other words, he must have the power to lay the emphasis where it belongs, and this will soon bring with it the allied moral power of decision, of making a choice between the one side and the other. All this may be summed up in the one word wisdom.

But again, it is not enough to have these powers The liberally educated man must also have certain pos sessions, which will be like the capital of a merchant useful to him for the promotion of his own enjoymen and for the increase of his usefulness.
First among the branches of knowledge which he should possess, I would name the knowledge of his own physical nature, especially of his thinking apparatus, of the brain and the nervous system, by which his in tellectual life is carried forward. This implies that he should also have a knowledge of the lasting effects o bodily habits upon mental vigor. He ought to know how best to lead an intellectual life, how best to discipline his body by the proper laws of sleep, diet, and exercise, and by the right employment of
ports which may be helps or may be curses.
Second, he should have a knowledge of his own tongue, of its history and development, of its laws, its idioms, its capabilities, its use. If he knows all the idioms, its capabilities, its use. If he knows all the
languages of Babel and has not the command of his languages of Babel and has not the
own, he is most imperfectly educated.
Third, in these days it is important that he should also have a knowledge of other modern tongues. Mor than two of these would be advantageous, but a liberal education absolutely requires that every English-speaking person should have a knowledge of French and German also.
Fourth, the liberally educated man should also be acquainted with the principles and methods of scien tific inquiry.
Fifth, a liberally educated man should know some thing of the great literatures of the world. Whether he acquires that knowledge by the study of the original tongues or through translations, he should become ac quainted with the masterpieces of poetry, eloquence, history, the drama. Isaiah and Paul, Homer and the Greek tragedians, Dante and Petrarch, Shakespeare Cervantes, Goethe, should be his familiar friends; not because he has "read about them" in the biographical dictionary or in the annals of literary history, but because in hours of repose he has read their pages, re flected upon their thoughts, and given himself up to heir inspiring influence.
Sixth, the liberally educated man must have a know ledge of the experiences and opinions of mankind. He must know the intellectual history of his race, the slow and wearisome steps by which civilization has advanced from the dawn of our institutions and ideas down to "libiscussions of our own day. It is obvious that a dever education is not to be limited by the period

It begins in the nursery, it goes on in the domestic cir cle, it continues through school, college and university only ends with life.-Prof. Daniel C. Gilman, in the Educational Review for February.

## The Transport of Ammonia

Ammonia has been carried in considerable quantities on the upper decks of steamers, but in many vessel the bottles, carboys, or tins are stowed in the between decks. In fact, they are sometimes stowed in vacan cabins of cargo vessels. The recent explosion of one of hese receptacles has awakened attention to the plac ing of such substances dangerously near heat. The master of the vessel on whose ship the explosion happened unscrewed the tops of all those undamaged, and thus allowed the gas to blow off. Restrictions on cariage of dangerous goods were imposed under the Mer chant Shipping Act, 1873 , section 23 of which provides that if any person sends or attempts to send by, or, no being the master or owner of the vessel, carries or attempts to carry, in any vessel, British or foreign, any dangerous goods, such as aquafortis, vitriol, naphtha gunpowder, lucifer matches, nitroglycerine, petroleum, or any other goods of a dangerous nature, without distinctly marking their nature on the outside of the packages containing the same, and also giving written notice of the nature of such goods and the name and address of the sender, he shall be liable to a penalty not exceeding $£ 100$; but if the person sending the goods on board is merely an agent and ignorant of the con ents, the penalty is not to exceed $£ 10$. False descrip tion makes the sender liable to a penalty of £500. The master or owner of a ship may refuse to take on board a vessel any suspicious package, and $r=2 y$ require it to be opened to ascertain its contents. Clause 26 in the act has always been looked upon as a mistake in legis ation. The mastor of a ship is empowered to throw overboard goods of a dangerous nature which have been sent without being marked or notified of their true character, and neither the master nor the owner of the vessel shall be subject to any liability for such casting into the sea, civil or criminal, in any court There is no reason for denouncing the carriage of ammonia by sea, but it is of the greatest importance that each special compound should be accurately deined, and that it ought not to be exposed to heat. If everything that expanded on submission to heat were interdicted, the shipping trade would be sadly hampered. For example-yeast is shipped for conveyance, and is usually carried on deck. In hot weather the casks have been broken and hoops burst from exposure to the sun, although no material damage is done. We could name other breakages, but enough has been urged to bring home the necessity for understanding what to carry and where to stow it.-Chem. Tr. Jour.

## Pathological Anatomy of Insanity.

In the Journal de Medecine de Paris, March 1, 1891, Dr. Luys states that in examinations of brains of patients suffering many years from excitement, there is hypertrophy of certain special regions of the paracentral lobules. These lobules are the point of confluence of cortical psycho-motor convolutions and one of the regions where accumulate specially psycho-motor innervations. Hypertrophy would, therefore, indicate a focus of continued excitation, absorbing undue vitality, and leaving other regions to undergo more or less marked atrophy. This hypertrophy is usually symmetrical in both hemispheres. In the brain of a woman who had a visceral delusion, that was almost her sole idea, to the effect that a tape worm found a lodgment within the internal organs and came and went at pleasure, there was unilateral hypertrophy of the paracentral lobules, those in one hemisphere remaining perfectly normal. The patient was perfectly lucid and rational on all subjects except this one delusion, though it was difficult to induce her to speak of any other. Anatomically, Dr. Luys explains the coexistence of clearness of mind and a delusion. She was insane in one hemisphere of the brain and sane with the other. For such cases, the colloquial term "unbalanced" would seem to be literally true.-Medical Record.

## Manganine, a New Alloy.

Manganine is the name of a new alloy, consisting of copper, nickel, and manganese, which has been brought on the market, says Iron, by the German firm Abler, Haas \& Angerstein, as a material of great resisting power. The specific resistance of manganine is given as 42 microhm centimeters, that is, higher than that of nickeline, which has hitherto passed as the best resisting metal. Another advantage of manganine is its behavior under variations of heat, the resistance, it is claimed, being affected only in a minute degree by high temperatures. It is therefore adapted for the manufacture of measuring instruments and electrical apparatus in general, which are required to vary their resistance as little as possible under different degrees of heat. A further interesting fact is that, while other metals increase their resistance by the raising of the temperature, that of manganine is diminished.

THE ODD FELLOWS' TEMPLE, CHICAGO.
The new temple soon to be built in Chicago by the Odd Fellows of the State of Illinois is to be one of the most imposing structures of its kind in the United States, and the tallest building in the world. Rising to a height of 556 feet, the tower will. be visible at a ance of sixty miles, and every available foot of space will be utilized. Upon the ground floor the area covered will be 43,000 square feet, and the total area inclosed by the various floors, exclusive of walls, partitions, corridors, etc., will be something over 350,000 square feet.
Twenty stories of the building will be included in the main structure, while the tower is to be fourteen when down, say from two to four feet in diameter? them with the ax, as it is so laborious.


THE PROPOSED ODD FELLOWS TEMPLE AT CHICAGO.

Some Results of New Inventions. T. F. O'Rourke, President of the Hat Finishers' Association, asserts in a late address that "some districts
have suffered from the introduction of improved machinery." He adds that "it is not desirable to oppose machinery, yet many shops are putting in machines which, with the assistance of the boy system prevailing in Philadelphia, will work great injury to us."
The readjustment of laborers consequent on the per petual invention of improved machines is a source of perpetual disturbance everywhere, and always has been in civilized societies. So are changes of fashion-as when shoe buckles went out, a large body of buckle makers were brought to destitution. Both, however, are only a part of the general social movement, which is incessant and eudless. No fixed status is possible in a universe of evolution. The only way the individual can keep his place is by evoluting also and enlarging his range of industry. The workman
and quick to learn new things. He and quick to learn new things. He
must cease to think of stopping the flood of novelties and learn to swim in it. Business men of all kinds are troubled by the same instability of affairs. He who will not change is submerged, he who changes with the times gains by the time's changes. It is hard and requires activity, but there is no other way.
New machines cannot be prevented; nor should they be, since they enrich the world and have made the workingman's progress to be what it is already. He never had a fraction of his present comfort till steam machinery began to do his work for him. House, clothing, good food, education, clubs, newspapers, all his advances are the result of modern machinery. are the result of modern machinery. welfare on its shoulders; every bit of work it does is so much lifted from the strain and drudgery of the laborer as well as of the rest of us. By cheapening production it increases consumption, which calls for more labor, which new labor is easier than before the machine went to work. Think of the toil of the old-fashioned farmer in harvest, compared with that of him who now sits on his reaper and binder in comparative ease all day! The workman who learns to understand new machinery rapidly and helps to work it is the man of his time, and this should be the model and ambition of all. The times reward the nimble and quick-witted-which all should make haste to become. And the duty to do so is laid upon them by nature, not by society. Society cannot prevent men from thinking out improvements which nature puts into their heads. And therefore the workman must keep himself right with nature, as indeed he is learning to do.-The.Social Economist.

A Versatile Gunboat.
A new gunboat, the Svensksund, has been added to the Swedish navy. It has been built by the Kockum Engineering Works, of Malmo. Her dimensions are : Length, 120 feet ; breadth 21 feet; draught, 9 feet. The armament consists of four Nordenfelt guns and torpedoes. The vessel will, however, be more useful in time of peace than in war, as, first, she is a powerful ice breaker, fitted with water tanks for sinking to the desired depth; secondly, she is furnished with heavy gear for towing or hauling off stranded vessels; thirdly, she is equipped as a fire steamer, having ten large suc tion hoses and a centrifugal pump capable of delivering 22,000 cubic feet of water per hour ; fourthly, she is fit ted with condensers furnishing 800 gallons of water per hour ; and fifthly, she is equipped as a torpedo repairing vessel. The engines with which this combined ice breaker, tugboat, fire engine, water supplier, torpedo repairing shop, and man-of-war is equipped are of 150 indicated horse power, giving the vessel a speed of $123 / 4$ knots.

The Highest Electric Central Station
Pontresina, a locality of the Grisons Canton, Rhætia situated at an altitude of 6,000 feet above the level of the sea, in a vale running parallel with the Inn Valley, on the road leading to the celebrated Bernina Mountain and Pass, is understood to claim the possession of the highest electric central station. The motive power for generating the current is furnished by a torrentia stream of the same name, the cascade of which is of immense advantage to the district. The inhabitants of


## THE SNOW PLANT OF THE SIERRAS. (SARCODES SANGUINEA, TORR

this sequestered nook, who exhibit greater evidence of business aptitude than one might expect from simple
mountaineers, have formed themselves into a-not exactly a limited company, but into a kind of Lancashir co-operative society, to the end that each lowly shepherd's hut is supplied with electric light and power almost for the mere asking. The water falls from a height of 430 feet, producing a cascade, the utilization of which to the extent of 300 liters only yields a source of energy giving theoretically, without loss, 520 horse power.

## THE SNOW PLANT OF THE SIERRAS.

We present herewith, from a photograph taken by Mr. Taber, of San Francisco, a figure of the California snow plant (Sarcodes sanguinea, Torr.), so called because it thrusts its stem up through the snow to a ause it thrusts its stem up through the snow to a veight of nine or ten inches, and flowers when no other
vegetation is to be seen. This curious plant, which bevegetation is to be seen. This curious plant, which belongs to the order Ericaceæ, is allied to the pine drops

Pterospor a), but has much larger flowers, an elongated style and wingless seeds. There is but one species (the one here figured), which is an erect herbaceous parasite with succulent, scale-like leaves, and a long raceme of pend

A Simple Process for Coloring Photos.
The following is a process by which colored photographs can be made without any knowledge of drawing or painting.
Take any unmounted photographic print which it is desired to color, and place it on a pane of glass, the face toward the glass. In this way the image will be seen through the back of the paper.
With an ordinary pencil mark on the back of the print a rough tracing of the outlines of the photograph, marking the places where the colors must after ward be applied. When this tracing has been made, remove the photograph, lay it on blotting paper, and apply the colors to the back of the print. The colors should be spread on in flat tints, it not being necessary to use demi-tints. For example, a flesh tint is put on the face, and black or brown on the hair; if the picture is a landscape, the trees are colored dark green, the sky part blue. It is important to use strong col-
ors, which will show through the paper better. After this operation is finished, and when the colors are dry, the photograph is rendered transparent, as follows: First prepare the following solution:

## Essence of petroleum or benzine

The vaseline is dissolved in the liquid, and then the mixture is ready for use. Then the photograph, which has been colored previously, is placed on some sheets of white paper, and the back of the picture is saturated first, pouring the solution on it, and rubbing with the finger to cause the mixture to penetrate, first the color and then the paper. The print is then turned face upward, and this side is saturated in the same way.
After this operation the paper becomes oily and transparent, and the color begins to show through.
It is left to soak thus for an hour or two, then both aces are rubbed with linen until no oily spots can be een, when the proof is placed on white paper.
The operation is then completed, and the proof has only to be pasted on cardboard, the same as other photographs. But, as the paper is still saturated with vase line, water paste will not answer, and some kind of varnish will have to be used.
This process of painting, which can be used by any one, gives very beautiful effects.
Colors which are thus applied to the back of a photograph give it a tone of admirable freshness, and the vaseline mixture brings the image out. Be sides, as the colors have the thicknes of the paper to pass through, they are greatly softened, and thus approach nature. The variations of the tints will be seen, by transparency, when looking at the picture.
As to the colors, any that are at hand can be used, whether water col ors or oil colors. The essential point is to choose the most strong colors, rose, green, etc., and to put on only a very thin layer, as otherwise the vase line cannot pass through it. If oil colors are at hand they will be better and the result obtained will be much prettier, for they are more striking, and the vaseline passes through them better. Pastels or colored crayons can be used, but oil colors are greatly to be preferred to any others.
If it is desired to save, and not to color, the photograph, its outline can be traced off on ordinary white paper and the colors applied to the white paper as before described. Then it is only necessary to paste it on the mount behind the photograph, care being taken to render the latter transparent, and the two must be so placed that their outlines will agree. The effect obtained is the same, and give very pretty results, not showing in the least how they are done.

## Fractional Currency Scrip

A movement in favor of the issue of fractional currency is in progress. Business men who conduct a larg business by mail are much annoyed by the want of some mailable form of currency. Silver coins are too heavy and bulky for transmission by mail and are far from safe, as any one who handles the letter can ascertain their presence. Postage stamps have come into extensive use for the transmission of small amounts, and this has become, in many cases, a positive annoyance, owing to their accumulation on the hands of merchants. They are also bought at post affices which, under the law, are also bought at post ing them. We believe that, from these points of view alone, the reintroduction of "fractional currency" would be an excellent enactment on the part of the government.

## A Large Glove Industry.

At Grenoble, France, it is said that $1,200,000$ dozen pairs of gloves are manufactured annually. This represents a value of $\$ 7,000,000$ to $\$ 7,200,000$, and gives employment to 25,000 workpeople of both sexes. There are 4,000 men and 21,000 women residing in a rayon of 38 miles around Grenoble who live by this work. Glove making, then, is interesting from a social point of view, as it is one of the few callings open to female labor in which they can earn respectable wages without abandoning husbands, homes, and little ones. The writer adds that out of the $\$ 7,200,000$ worth of gloves made in that region at least $\$ 3,000,000$ are distributed in wages among an almost infinite number of families New York Recorder.

Morocco Manufacturing.
Though so much has been learned in respect of the methods of manufacturing glazed kid, there seems to be room for the acquisition of more knowledge. An acquaintance with the chemistry of various drugs used in the process is essential. Chemical purity is an absoulute necessity in the production of high quality stock.
In regard to the strength of the tanning chemicals primarily used in the chrome tannage, there is this to be said: Muriatic acid should have an inherent strength of 21 to $22^{\circ}$; yet quantities of a debilitated variety, registering only 16 to $17^{\circ}$ test, are disposed of. This ingredient is used as well with the combination as with the chrome tannage, but in the latter performs the major part of chemical action. In connection with the chrome and hypo. it creates a gas, producing a glutinous substance in the chrome tannage. Oil of vitriol standard is $66^{\circ}$; below that it is generally vended as sulphuric acid and so billed. This quality stands from 60 to $64^{\circ}$ test. Water, not thoroughly eliminated, is the cause of the depreciation in quality. Oil of vitriol is used for plumping heavy leather as well as all morocco tannages. Muriatic acid will perform the same function, but it requires longer time to attain the result. Oil of vitriol is worth, ex store, $1 \frac{1}{2}$ c. by the carboy.
White sugar of lead is now little used; the cheap variety rules at 20 c. per pound, being improperly crystallized. Damp weather prevailing during its manufacture is one cause of inferiority, diminishing the quality and marring its appearance. In employing the lower qualities, one-third more must be used to accomplish the same result, and even then the inherent strength is lacking. Makers of bridle, saddle and rein leather use white sugar of lead very extensively to bleach or whiten their product.
Borax crystals in barrels sell at 12c., the cheaper grades vending as low as $83 / 4$ to 10 c ., conditional upon the proper removal of the impurities. These crystals, while generally used only in the chrome tannage, are occasionally worked in the combination process. In powdered condition its dissolution in water is naturally almost instantaneous. And as the crystals are very solid, the saving in time by using the powdered variety is important. Borax crystals are used both to soften water and cleanse the skins.
Imported Chinese nutgalls are worth 21c. per pound. In casks they are sold at from 20 to 23 c .; ground or finely powdered makes the best black coloring. Copperas and sulphate of copper, combined with these nutgalls, produce wonderful results by greatly intensifying the brilliancy of the jet black. Some tanners, and also dyers, use ammonia for the same purpose.
Hyposulphite of soda in cheaper grades sells at $23 / 4$ to 3 c .; fine grades bring $33 / 4 \mathrm{c}$. The value is dependent on the amount of soluble sulphur contained; low grades having only 25 per cent are really no better than Glauber salts. Hypo. is used somewhat in combination, but largely in chrome tannage. Hypo. of soda is used to strengthen the fabric and at the same time soften it. Hypo. is also popularly supposed to make the finished leather impervious to water when on the foot.
Glycerine, chemically pure, should stand $30^{\circ}$ test. " $B$," or Baume, is temperatured at $60^{\circ}$, and is pure white and of good body. Nitrate of silver is commonly used in an analysis of quality. The common quality sells simply as glycerine, but is off in color, displaying a yellowish cast. Glycerine is used to render the leather pliable.
Sulphate of iron or green dry copperas is the best to use. It sells at one cent per pound, and in lower grades at one-half off ruling price, and contains 35 to 40 per cent of water, quite an expensive economy. The best quality is of brighter hue and the crystals more perfectly formed. This sulphate creates the desirable intense black color, and is used in all tannages.
Sulphate of copper, or blue vitriol, in its pure state, contains 25 per cent of metallic copper. The common appears whiter and will be permeated with iron and cent. This sulphate is used for the same purpose and as an addition to sulphate of iron. Ex store this sells a as an addition to sulphate of iron. Ex store this
$\$ 4.30$ for the best and $\$ 3.75$ for lower qualities.
Logwood comes in five grades, and of course the
Lost expensive gives the best results. It is excellent most expensive gives the best results. It is excellent for blacking the skin and is particularly efficacious when used with nutgalls, as is also sulphate of copper. Logwood is popular with all tannages.
Campeachy logwood, if coarse cut, takes longer to boil, but is purer and the sap is more thoroughly extracted. Sappy wood creates a resin on the surface of the skin, which is difficult to eradicate. Best quality is on sale at 2c. per pound.
Bichromate of potash is powerful in its effect, and alone would burn and destroy the fiber of leather and rotit; fine hyposulphite of soda neutralizes its strength and keeps the whole cool. It is from the bichromate of potash that the chrome tannage derives its name. It is in the form of large four-sided prisms, orange red in hue, devoid of odor, and to the tongue imparts a bitter, disagreeable taste. The bichromate, while
soluble in 10 parts of water, is insoluble in alcohol. With alum there are the ground and lump varieties. Common alum contains only 17 per cent of alumina. Pure sulphate of alum contains 58 per cent of pure alumina and is devoid of both acid and iron, which is Too meous; the cheaper grades are possessed of both. oo much acid is likely

## harshness in texture. Sig : this ingredient,

Sig : this ingredient, which is really human urine, has recently been largely substituted by a chemical compound, which has the same effect and dispenses with the unpleasant handling of the original substance. Sig is used to assist the mordant or bottom, and permit the color to more readily adhere thereto. Sulphate of alumina is another ingredient used in both the combination and chrome tannages, many manufacturers believing that .ts incorporation results in an improvement to the leather.-Shoe and Leather Reporter.

## Photographing on Wood, using Dry Plates.

Gelatine, 2 drachms; white curd soap, 2 drachms water, 16 ounces. Soak gelatine for some hours, then dissolve in a bath of hot water. Add the soap in small shavings, stir with a glass rod or slate pencil till completely mixed, then add powdered alum until the froth produced disappears; strain through muslin. The block is now coated with this mixture and a little zinc white, rubbed well into the wood, with the thinnest coating possible, and finished off smoothly and evenly all over, and left to dry. It is then brushed over with the following composition, a camel hair brush being used. It is advisable to use a wide one, to prevent streaks in the finished block :

| Albume | 1 ounce. |
| :---: | :---: |
| Water. | 6 drachms. |
| Sal ammoniac | 18 grains. |
| Citric acid | 5 grains. |

Beat the albumen to froth and allow to settle, using the clean portion, add the water, then the sal ammoniac, mixing well with rod; finally the acid. One coating with the brush from end to end of the block in one sweep is quite sufficient. When the block is dry pour over small quantity of silver solution, made by dissolving

Nitrate of silver................... 50 grains.
Water, distilled..................... 1 ounce.
Move the solution over the surface by the aid of a glass rod, and pour off the surplus into another bottle for filtering for further use. When dry, print the block under a reversed negative to just the depth you require as there is hardly any loss in the finishing. When printed, hold the block face down in a dish of strong salt and water for three minutes. This will cause the print to fade a little. Wash under a spray of water and fix in a saturated solution of hypo. by holding the block face down on the bath for about five minutes; this will bring back all detail; finally wash for about ten minutes, stand on end to dry; the block is then ready to be engraved. The picture may be toned, but this is not necessary. In order to make the reversed negative it is only needful to take the photograph through the film, care being taken to have the glass quite clean. Another method would be-strip and turn the film by means of a solution of hydrofluoric
acid. In case you make a negative through the film, acid. In case you make a negative through the film, remember to turn the focusing glass round. I have
mentioned these two ways as calling for no out of the way apparatus ; the mirror or prism can, of course, be used if preferred.-R. K. F.
Another Method.-First make a negative from your drawing, and from this make a transparency upon a Thomas's transparency plate of the required size. When dry, you may strip the film and transfer to oood. The best method is that proposed by Mr. W T. Wilkinson, and is as follows: Thoroughly clean the back and edges of your plate, level it, and coat the film side with thick, plain collodion, allow to set for on hour, place in cold water until the film no longer appears greasy when lifted, then immerse (in an ebonite dish) in dilute hydrofluoric acid ( 1 of acid to 20 of water), and allow to remain until the corners of the film can be lifted away from the glass. Do not hurry it, wash under tap for a few seconds, put the plate into clean water (film up), and detach from plate, leaving film floating upon water. Coat your wood face with gelatine solution (gelatine, one ounce ; water, twenty ounces ; chrome alum, five grains; and filtered), let it dry and slide it under film, adjust.in position and lift from water, cover the film with tracing cloth and
squeegee down. When dry it is ready for use. It will dry quickly after immersion in methylated spirit.
Another--For photographing on wood, Wilkinson recommends the following : Make a solution of chloride of ammonium 10 grains in 1 ounce of water, to this add the white of one egg and stir well, then add sufficient zinc white to make a thickish paste. Take the wood block and free it from grease by rubbing with a soft rag dipped in spirits of wine, and apply the paste in as thin a layer as possible, rubbing with the ball of the hand, and stand it on end to dry. Dip the prepared surface in a 60 grain nitrate of silver solution for two minutes, and blot off lightly with filter paper. It
prevent the silver solution and fixing solution from touching the wood. When dry, expose under a reversed negative, and just dip the exposed surface in a weak hypo. solution to fix the image, blot off, and rapidly remove any hypo. by blowing a stream of water across the surface; blot off, rinse in methylated spirit and stand on end to dry. The best plates to use are the special photo-mechanical plates supplied by Mawson \& Swan or J. D. England. These are slow plates, giving great density with clearness in the shadows and clear lines. For the former use the following developer, as recommended by the makers of the plate :

```
A.-Pyrogallic acid.
Meta-bisulphide of potash. .
Bromide of ammonium
Water -Ammonia (liquid)............ \(21 / 2\) drachms
Water...................... 20 ounces.
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Equal parts of each.
For England's plates use : Hydroquinone, 150 grains; sodium sulphite, 1 ounce ; bromide of potash, 20 grains water to 20 ounces. With equal parts of carbonate of soda, 2 ounces ; carbonate of potash, 2 ounces ; wate to 20 ounces. - Photography.

White Ink for Marking Lantern Slides.
W. Edison can use ordinary Chinese white for marking his lantern slides, or the following solution can be employed for writing on the film :

> Iodide of potassium. 10 parts.
> Water
> Iodine...
Gum arab

se an ordinary pen, writing on the dark portions of the film. The solution converts the silver into silver iodide, thus producing white letters on a black or dark ground.-Sigma Delta.
I have made a white ink that answers very well, by grinding zinc white (oxide of zinc) with water till quite smooth, and adding a little clean gum arabic, enough to give it a body and bind it. Try 4 parts of picked gum to 120 parts of water, adding enough zinc to give good brilliant white. I send a bit of black paper written upon with ink made as described.-R. K. F.
The following is an excellent formula :

| Chinese white. . . . . . . . . . . . . . . . 1 ounce. |  |
| :---: | :---: |
| Isinglass... | 2 drachms. |
| Alcohol. | 1 |
| Water. | q. s. |

Soak the isinglass in a little water until soft, then heat on a water bath until dissolved. When thoroughly dissolved mix into a paste with the Chinese white, well stirring it around with a piece of stick. When well mixed, add water in small quantities, well stirring at each addition, and trying it with a clean steel pen uneach addition, and trying it with a clean steel pen un-
til it writes satisfactorily, then add the alcohol ; or use :

$$
\begin{aligned}
& \text { Sulphate of baryta } \\
& 1 \text { ounce. } \\
& \text { Isinglass } \\
& 2 \text { drachms } \\
& \text { Water. } \\
& \text { q. } \mathrm{s} \text {. }
\end{aligned}
$$

Mix as above. The worst of all white inks is that they rub off when touched. This can only be prevented by civing the writing a protective coating of varnish The best to use for the purpose is that known as "water varnish ;" it can be bought at most photo. dealers or made by boiling :
Shellac
Borax
16 ounces.
3
ogether until dissolved. When thoroughly dissolved may be thinned with water if too thick.-Wide Angle. -Photography.

## Great Power and Light weight.

Speaking at the annual meeting of the Aeronautical Society, a few days ago, Mr. Hiram Maxim vouchsafed some particulars with regard to the motor which he has designed to actuate his flying machine, that afford some clew to the care and thought he has devoted to the problem, and which indicate that he has in one direction at least made a great advance on the efforts of previous workers in this field. The steam engine which he is employing is so highly developed and carefully designed that he assured his audience he could obtain a brake horse power for each 10 pounds of weight of engine, boiler, and condenser. This, as Sir James Douglas remarked, is a remarkable attainment, and means nothing more nor less than the equivalent to the strength of a full-grown man being exerted by a piece of mechanism weighing but $11 / 2$ pounds at most.

In a memoir to the Academie des Sciences, M. Blondot has given the results of his researches on the velocity of propagation of electricial waves. Using Hertz's method, he has obtained waves varying from 8.94 meters in length to $35 \cdot 36$ meters; twelve different wave lengths in all being experimented with. The results are very concordant, giving a mean velocity of propagation of 297,690 kilometers per second, which is pracically the same as the velocity of light, and the ratio of the electro-magnetic and electro-static units.

RECENTLY PATENTED INVENTIONS. Engineering.
Rotary Engine.-George H. Graham, Ridgeland, Ill. This engine is designed to be simple
nd durable in construction while being very effectiv in operation and utilizing the motive power to th fullest advantage. The invention provides principall a spring-pressed valve within a casing in which a extends, a lever being pivoted on the stem and springs pressing against the lever, there being a lubricat-r valves, arranged radially and sliding in suitable bear ings in the rim of the cy linder, are located on the peripheral surface of the piston, between the vanishin
points of curved flanges arranged near the ends of radially extending head of the piston, close to the inne

Boiler Feeder. - Heinrich Rauser Charles Wieber, and Alexis sokolor, Moscow, Russia in combination with the boiler and feed pump is an jector connected with the boiler and in communicatio with the valve chamber of the pump, a foat arranged with the boiler. The invention also comprises other novel features, the improved boiler feeder being com letely automatic in operation, prev filling of the boiler and also giving a signal in case the
water should sink to a dangerous level, while the con-
aerial Tramway. - Emilio Prunett and Giambattista Avignone, Sierra City, Cal. This in ention relates to suspension tramways operated by grato a lower plane in a speedy and safe manner, as in the conveying of ore from mountain deposits to reducin ight frames on which are mounted two horizontal grooved pulleys, with a brake mechanism, while in connection therewith are two wire rope trauways, and windlass supports therefor, cars being mounted on the
tramways and oppositely connected to the endless

Dredge.-John H. Kuoni, Marysville, Kansas. This invention provides an improvement in what are known as "clam shell dredges," simplif ying
their construction and making them more easy to operate, the dredge being more particularly adapted bottomless receptacle to the opposite sides of which are hinged shovels, while to opposite ends is secured a arched ball having a central loop or aperture through which passes a rod, chains connecting the shovels and
the rod, and a locking bar pivoted to one of the shovels

Gravel Screening Machine. Franklin T. Gilbert, Walla Walla, Washington. continuous treatment of gravel is provided for by this
machine, whereby a number of separations of the coarser from the finer grades will take place. The mahe coarsest receiving water and gravel direct from the flume or hopper, which serves to throw aside the coarsest gravel but allows to pass the water and finer
grade of gravel, which is led to the next finer screen, where the same operation is repeated and so on wit he remaining screens, the waste water being utilize to drive the screen-operating shafts. According to an-
other patent granted the same inventor, the machine ther patent granted the same inventor, the machin over which receiving troughs are mounted step by step, each trough having a closed receiving and an open discharge end, the discharge end of one trough being over he receiving end of the next succeeding one, while eries of screens of different mesh is interposed be tween the meeting ends of the several troughs, to sucdeflect them to their respective receiving bins. In by a reciprocating bar.

## Railway Appliances.

Air Brake. - Ray G. Coates, Punta Arenas, Costa Rica. In this brake the cut-off and ex
haust of the brake cylinder pressure is controlled by the action of the brake cylinder pressure and the train pipe pressure on the one hand and the ausiliary rese voir pressure on the other hand, each acting on a suitable flexible diaphragm. A governing or a triple valve pressure in the brake cyliuder, to assist the pressure o he train pipe acting upon the principal diaphragm harge of the cylinder, for the purpose of maintainin in the cylinder any desirable pressure. Another invention, for which also a patent has been granted the same inventor, relates to antomatic air brakes in which the rain pipe. This a reduction of the pressure in the riple. This invention provides an improved riple valve by which the brake cylinder may be sup ny part of that pressure, any loss due to leakagure the brakes are set being restored from the auxiliary reservoir pressure, the valve being used in connection with a reservoir of such size that the pressure in it
does not noticeably fall by the loss of one csarge of air with a reservoir of such size that the pressure in it
does not noticeably fall by the loss of one charge of air
to the brake cylinder. The triple valve hasan auxiliary to the brake cylinder. The triple valve has an auxiliary
governing piston connected to and moving the main governing piston connected to and moving the main
governing piston of the valve, the cylinder of the governing piston of the valve, the cylinder of the
auxiliary piston being connected by proper ports with he brake cylinder.
Car Coupling. - William P. Clark Elberton, Ga. This improvement is desigued to afford an extremely simple and efficient device, easily secured can be readily converted into an old fashioned coupling if necessary. It consists of a hollow drawhead in which is pivoted a protruding latch with beveled head and a
side recess, a locking pir with an inclined shoulder on side recess, a locking pir with an inclined shoulder on
one side being held to move vertically through the
drawhead, while an adjacently mounted crank rod has
$\left\lvert\, \begin{aligned} & \text { ling is practically a double one, and should one of the } \\ & \text { latches be broken by a strain, the other one would hold }\end{aligned}\right.$
o prevent the separation of the cars.
Railroad Switch.-Clifford E. Nowin, Battle Creek, Mich. This switch is designed to be
conveniently operated from an engine or car to facilitante the switching of trains and allow them to make siding quickly and with perfect eafety. The switch rails are supported by a movable switch plate to which are secured cables extending parallel with the track and extending over guide pulleys and sprocket wheels, above which are mounted spring-pressed castings, conSide rails arranged parallel with the track are pivote o the castings, and means are provided for depressing of side rails from the train, the mechanism consisting ressed shaft carrying a contact wheel, there being cushion for the shaft and a screw mechanism for adjusting it.

## Mechanical Appliances.

Flax Hackling Machine. - John Erskine, Wolfhill Mill, Ligoniel, near Belfast, Ireland. or ending the flax or fiber, a finishing hackle operating on the fiber in conjunction with the nipping device. The fiber holder has a vertical sliding motion, and
gripping or clamping plates open and close on the ascending and descending of the holder, clamping the iber held by it, the nipping device below the clamping pates consisting of two revoluble rollers adapted to
pass the projecting fiber for ending it. Combs operate pass the projecting fiber for ending it. Combs operate
to comb the fiber when the holder ascends, brushes operating in conjunction with the combs, while tow catchers arr
Wool Carding Machine. - David Lamson, Elmira, N. Y. In this machine the parts are arranged around the main cylinder in a manner designed to rapidly and nicely straighten the fibers without any orward motion to the stock operated upon, delivering he doffer. A licker-in is placed in ang of labor, to main cylinder and a doffer is placed behind it, tumbler and fancy being disposed one above the other between the licker-in and the main cylinder, a worker arranged between the tumbler, fancy and main cylinder, and a series of workers and strippers arranged around he upper part of the main crlinder, the workers being
Punching Machine. - Robert H. Ireland, New York City. A punch especially adapted
for punching plate iron, beams, channels, and other tructural shapes is provided by this invention. The machine can be controlled to carry the punch to enengaging with it, as the operator may desire. The frame has upper and lower girders separated by transhere being a stationary casing in which is journaled crank shaft between the upper girders, a blozk in the casing having vertical movement and having an openng throush which the crank arm of the crank sha
passes. The blocks are adapted to receive a punch rame sliding vertically in the opening of the block while
pivotal shaft. The machine is designed to accomplish the peration of punching as rapidly as the pull rod can be Sawmill Attachment. - Thomas J Williams and Tiberis S . Murray, Ironton, Ohio. Th ttachment is designed to be conveniently applied to any kind of a circular, band, or veneer sawmill, enable the mill to rapidly and accurately saw beveled
lumber, as weather boards, shingles, etc. On the front face of a frame adapted to be connected to the sawmill carriage is a rock shaft on which a series of sawmill having adjustable teeth projecting beyond their front aces to grasp the timber to be sawed, while the frame is provided with means for rocking the shaft and its series of dogs. The thickness of the beveled strips is regulated by adjusting the sawmill head blocks in the

Hamper Arthur Chambers, William
Hammer.-Arthur Chambers, William Bridge, N. Y. The head of this hammer has side opening extending through to the eye and having
beveled walls, and an elastic or slightly elastic plug of rubber or leather or similar material is fitted in this opening, the inner face of the plug being beveled, and the handle securing the plug in postion. This forms a
hammer having a side striking face with some elasticity, and combines in a measure a mallet and a hamme mind

## Miscellanéou

Oxides of Metals Mandfacture.William H. Birge, Franklin, Pa. This invention prorom readily oxidizable metals at a low cost. A nozzle comprising a disk extending into a spraying recess has a central aperture for the passage of molten metal to o the recess under the disk. As the apparatus is ar ranged, an air compressor is not required for forcin he necessary amount of air into the oxidzing chamber only such force of hot air blast being required as i
necessary to spray the molten metal on top of the disk and force the sprayed metal up into the oxidizing

Rifle Sight. - Robert W. Parker Camp Huachuca, Arizona Ter. This device has a bae dapted for attachment to a barrel and a supplementa swinging sight leaf provided with a projection extend ing at right angles therefrom and having a peep nole
vertical portion at its rear, on the front edge of which
is a series of gauge marks to serve as a wind gauge, and is a series of gauge marks to serve as a wind gauge, and
indicate the degree to which the supplemental base should be moved to one side or the other. The sight is esigned to be easily brought to any desired anjustmen
Capodastro. - Henry Dahlman, Cambriage, Min., and Meodor Blomgren, Stanch dapted to extend across the strings on the neck of the nstrument, a yoke pivotally connected with the plate clamping arm pivoted ou the yoke and adapted to en age with its free end the under side of the neck, and a and lever to press the arm into contact with the neck fhe instrument. The device can be quickly and con eniently place and locked in position, and is designed to uniformly hold, quickly tighten, and shorten the higher key.
Watch Improvement. - Roswell E
W ATCH IMPROVEMENT. - Roswell E. E. stem winding and setting mechanism in which the
winding pinion is capable of both a rotary and end novement, remaining in gear with the crown wheel in any position. Means are also provided whereby the winding stem or arbor may be expeditiously and conveniently attached to the winding pinion, the entire mechanism being so constructed that the pendent setcase, and can be attached to any ordinary winding stem or arbor, such as commonly used in stem-winding

Shears.-Anton Prohaska, Hoboken .J. The cutung blades of these shears arc preferab made of sheet steel, by stamping or otherwise, while the andles are preferably of cast metal, A spring plate held in position by a screw screwing into a pivot inte gral with one of the members, presses the catting edge ine cut can be made at all times, and the cutting edges re self-grinding.
Row Boat Foot Rest.-John J. Sherman, Traverse City, Mich. This device consists of a entral stationary inverted T shaped rail secured longi-
udinally in the bottom of the boat, and a sliding tran verse foot board adjustable on or along the upright web f the rail, the whole forming a center slide adjustable筑 rest or brace. By the support of the foot board sure of the feet is more directly conveyed to the center or keel line of the boat instead of to either side, making he steering easier, while the central fixed rail form ballast in the bottom of the boat.
Gate Hinge.-Gabriel Rohrbach, Del tion mays. applied to any swingiown in this inve specifically adapted for use in connection with gates for yard and park inclosures, the hinges being adapted to hold the gate in open position. The hinge consists wo brackets having overlapping leaves and having pintle connection, the leal of the bracket a alached he gate having inwardy inccued shae fanges, in com o the gate post and to engage the flanges. The gate when hung normally rests in closed adjustment, owing to the relative inclination of the bearings or leaves o the hinges, but when the gate is opened in either dire ion it is slightly elevated, and will close with a sligh Door SECURER.-Columbus F. Card well, Bridal Veil, Oregon. This device consists of adapted to engage the door jamb, bearings being formed on one side of the plate in which slides a bar having an angular arm extending from its inner end and hav ng notches in its outer end to engage the outer bearing brace being pivoted to the plate on the opposite side from the bar, and the brace having points to engage the door jamb or casing. This fastener is designed fo ready and temporary attachment to any door for se
curely locking it, and may be folded up for conve curely locking it,
niently carrying it.
Caster.-Caughey S. Fleming, Shelby ville, Ind. This invention relates to two-wheeled casters for furniture, trucks, etc., providing therefor caster capable of tilting in its support, thereby The spindle or support has a horizontally ranging nember on which is a loose sleeve, the axle of the wheels passing through the sleeve and spindle, while
the axle hasits bearing in the sieeve and is capable of Harness. Willia H Violt Grand Harness.-William H. Violett, Grand Jnction, Col. By this invention a snap connection yoke ring and at its other end with a loop and a adjacent thereto, there being a double spring ongue for closing the hooks, and one of the hold backs
being secured in the loop and the other in the adjacen hook. By this improvement the wear on the holdback trap resulting from its sliding back and forth in the may be easily and quickly made
SLING Cinch.-Denis O'Sullivan spokane Falls, Washington. This is a device for se nd buro the pack to be quickly and securely attached and a strap having at one end a metal fastening consisting of a hook having a lateral outlet, with an anti-frictio roller in the bend of the hook, a cramping pawl closing the outlet and having at its other end a plate or at
animal Shears.-Charles and Harry Burgon, Malin Bridge, near Sheffield, England. This shenting or clipping sheep or other animals, having for
shearig its object to enable the crosshead or forked end of the ibrating lever, by which the reciprocating motion
mparted to the apper cutters, to adjust itself freely to the plane of the cutting surface of the lower cuttera,
upon which the upper cutters work. An improved
means is also provided of applying prest means is also provided of applying pressure to the
upper cutters to maintain a constant steady pressure sufficient to insure efficient cutting action without requiring great nicety or cuting action without re ment
Pneumatic Tire.-William R. Foster, Bermondsey, England. A tubular tire with closed ends wrapped around the wheel rim, the ends tapered to lap
over each other and make a scarf joint, is combined with a jacket or cover in the form of a complete annulus of nearly tubular cross section, but with a slot extending around its inner circumference, the jacket being adapted to envelop the tire and its edges, and being detachably secured at intervals to the back of the wheel rim. With this improvement the tire may be readily removed and replaced by another in case of
injury without entirely removing the cover of the tire from the wheel, and without dismounting the wheel from the machine.
Temporary Binder.-Adolph A. Hunziker, St. Louis, Mo. This is designed to be a simzines, loose pamphlets, blank books, etc. To the back support to which the covers are attached, at one end, are fixed hooks adapted to be entered between the
eaves of the pamphlet as the latter is placed in the binder, a spring-held double hook, sliding in guides, being at the same time drawn out from the other end of the back support, the pointed ends of the double hook

Roll Paper Holder and Cutter.George M. D. Manahan, New York City. This is an upright knives ere frames being hinged to a yoke or frame, while cords and elghts operate to keep the knives up against the roll and instead of being carried by a main frame, and standing by itself a way from the wall or in the middle of the floor, may be
to save room.
Knitting and Forniting Hose.-Frederick W. Simons, Philadelphia, Pa. This invention stocking has its heel, foot, and toe knit continuously on a circular knitting machine without removal, transer, or addition of any fabric knit on any other ma-
chine, the heel being knit continuously with the foot, nd afterward cut, readjusted, and looped together Any ordinary circular seamless knitting machine suffices

Game Board.-Edgar L. Williams, Rocheile, Ill. This board consiets of a case having pins of uniform size grouped in opposite ends and projectranged between the groups of pins, and sliding lids held in the upper portion of the case, in connection with a series of rings to be thrown upon the pins. The game to be played on the board is designed to afford elements of chance about it to make it interesting and exciting.

Notr.-Copies of any of the above patents will be furnished by Munn \& Co., for 25 cents each. Please
send name of the patentee, title of invention and date of this paper.

## NEW BOOKS AND PUBLICATIONS

## Geological Sketches at Home and <br> Abroad. By Archibald Geikie, LL. D., F.R.S. With illustrations. New York: Macmillan \& Co. 1892. Pp . York: Macmillan

The delightful story of what Professor Geikie considers the turning point in his life, his first geological tractive work. We then travel with the distinguished author over Scotland, England, France, Sweden and America, with most fruitfui results. The subject is presented from the more popular side, and gives a graphic aspect of the world's history as pictured in the mind of a leading geologist. The work is largely a reprint of scattered essays, and will be a welco
addition to the general as well as scientific library.
Heroes of THE TELEGRAPH. By J.
Munro. London: The Religious Munro. London: The Religious
Tract Society. Fleming H. Revell
Co., New York and Chicago, sole
agents. Pp. 288. Price $\$ 1.40$ (No index.)
The lives of Wheatstone, Morse, Sir William Thomson and other notabilities in the electric world, past and present, are treated seriatim in this work, with many portraits of the subjects of the memoirs. It is a grace-
ful tribute to the practical world's workers in electric cience, to those who have shown how closely internected theory and practice may b.
Deafness and Discharge from the Ear. By Samuel Sexton, M.D., as-
sisted by Alexander Duane, M.D.
New York: J. H. Vail \& Co. 1891. Pp. 89.
The treatment of the ear for its troubles by the more cal methods, is advoceted by the upon modern surgishort manual. Dr. Seston appears as a a trong advocate of these methods, and a number of cases successfully treated are detailed.
Methods of Gas Analysis. By Dr.
Walter Hempel. the second German edition by from L. Dennis. London and New York:
Macmillan \& Co.
1892. Macmilian
Dr. Hempel's methods of gas analysis have won for him a place comparable with that of Professor Robert
Bunsen. The introduction of his absorption pipette reansen. The introduction of his absorption pipette a new step in the difficult work of ac really marked a new step in the difficult work of ac
curately analyzing commarcial gases. The present man-
ual, with ite very numerous and elegant illustrationsdition to the literature of the subject since Bunt ad work was published. The earlier book marked the work was publishec. The earlier book marked the
creation of an exceedingly accurate standard analysis that has never been displaced and has hardly been improved in the many years since it was published. The present book describes the far quicker and almost as accurate methods first introduced by Dr. Hempel. The work in every way is a worthy presentation to the Eng-clash-speakic researches.
Die Praxis der Moment-Photogra PHIE AUF DEM GEBIETE KUNSTLERI SChER UND WISSENSCHAFTLICHER
 Knapp, publisher, Halle a. d. Saale, Germany. 1892.
This publication, printed in German, treats in a very
comprehensive manner on the practical workings of intantaneous photography and the results obtained hereby relative to artistic and scientific research. The volume is divided into sixteen chapters, which give a
complete descripton of the preseut state of the art, and with the help of 16 plates-reproductions from original photographs-fully illustrate the results obtained by he best apparatus and methods in use. The variou apparatus and the practical arrangements necessary for producing good work are amply illustrated and de scribed in an excellent manner and testify to the authors' thorough knowledge of the subject under conderation. The chapters treat on the result obtaine hutters, methods for measuring exposures, means for btaining correct exposures, finders, illumination of ob jects, production of negatives, methods for obtaining series pictures, the stroboscopes or instantaneous
figures, instantaneous pictures of various kinds, inluding projectiles, sound waves, balloon photography ghting, etc., detective cameras, stereoscopic appar

Thirteenth Annual Report of th and Industrifs of New Jerser For the year ending October 1, 1890 Trenton, N. J.: The Trenton Elec${ }_{\text {tric }}$ Pri, 474 .

## SLIENTIFIC AMERICAN

BUILDING EDITION.
FEBRUARY NUMBER.-(No. 76.)

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Colored plate illustrating a cotage at Great Dis mond Island, Me., erected at a cost of $\$ 900$, com lete. Floor plans, elevations, etc
2. A residence at Portland, Me. Cost, $\$ 11,000$ complet ion, etc.
The very attractive residence of E.T. Burrows, Esi., Portand, Me. Cost, $\$ 9,500$
3. A dwelling at Augasta, Me., erected at a cost of $\$ 3,200$ complete. Floor plans and perspectiv handsome dwelling at Carthage, Ill., designed in Perspective and floor plans.
. A residence colonial in treatment and recently rected at Belle Haven, Greenwich, Conn., for Mr wo perspective elevations, floor plans, etc.
A colonial residence recently erected at Brookline Mass, at a cost of $\$ 18,000$ complete. Wm. T.
Sears, architect, Boston, Mass. Perspective elevation and floor plans.
. An architect's home, with sketches showing the hall, drawing room, terrace, entrance front, dining room, together with ground plan. A
thoroughly cozy, comfortable, and complete dwelling.
4. Sketch for a suburban chapel. Submitted by 0 M. Hokanson in the St. Paul Architectural Sketc Club competition
5. View of the Washington Street tunnel at Chicago 2 Miscellaneous contents: Architecture and poetry.Waterproof wall coatings.-Colored woods.The planning and construction of American fram Simplicity in furnishing and decorating.-Utility and art. Improved door hanger, illustrated.The Madison Square Garden weather vane, the hantress Diana, illustrated.-Schmidt's window frame, illustrated.-Sackett's wall and ceiling
board.-An improved mitering machine, illus-board.-An improved mitering machine, illus-
trated.-A combination folding bath tub, illus-trated.-A combination fol
trated.-Japanese interiors.
The Sclentitic American Architects and Builder dition is issued monthly. $\$ 2.50$ a year. Single copies cents. Forty large quarto pages, equal to about cally, a large and splendid Magazine of architre rure, richly adorned with elegant plates in colors and with Gne engravings, illustrating the most interestin xamples of Modern Architectural Construction and allied subjeets.
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HINTS TO CORRESPONDENTS.


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ienifice Ammericai. Supplements referred
tomay be had artheoffic. Price eno cents eech.
ooks referred to promptly supplied on receipt of
price.
Nineras sent for eramination should be distinctly
marked or labelod.
(4013) W. E. W. asks about crystallized boron, its demand and price per gramme or ounce. If
here is a concern that makes a specialty of manufacaring it, would it be enough in demand to take the place of the diamond in some of its uses in the arts? A.
Boron hitherto has been only a chemical curiosity. If Boron hitherto has been only a chemical curiosity. If
produced in quantity it might have value, but nothing ould be safely predicated concering its introduction. o the diamond.
(4014) B. P. B. asks : Please inform me if at any period of the year the sun setting in Alaska
will be rieing in Maine. Also if the south pole is as cold as the north pole, and if a compass be taken below the equator, will it still point north? A. From the 10th of June to the 2 d of July the sun shines on the most northern parts of Alaska during the whole twenty-fou hear the horizon when rising in Maine. We have no means of knowing the difference in temperature at the poles. The probablity is that the south pole is the
coldest. The needle points the same or has the same polarity north and south of the equator, but dips in opposite directions; the north end dips in
and the south end in south latitudes.
(4015) B. A. C. writes: I have contructed a telegraph line abont a mile in length, but me unable to tell how many batteries to use. There give me information? A. The rule is to make the reline including that of instruments.
(4016) A. D. D. asks: 1 . What is the cause of the detonation when a fuse burns out in the fuse box of an electric car? A. The fusion is so sudden as to amount practically to an explosion. The noise is
produced by the impact of the air, as in the explosion of a fulminate or of powder. 2. If the mechanism of the hrottle valve ho could the engine be in any way ge if running at the rate of about 20 miles an hour? Could the air brakes stop it? A. The engine could be re-
versed, or the reversing lever could be put in a central versed, or the reversing lever could be put in a central
position, thus preventing the valves from acting and教
(4017) J. S. writes : I have been making a magnetic key similar to one described in "Experimental Science," Fig. 465, but cannot make it induce any unticeable current in a detector such as described
on page 395. What points is it likely that $I$ have overey. A. Possibly you expect too much from the key. Try it in connection with a magneto bell. . It
your magnets are strong, and if you have used a suffcient length of fine wire, the key should operate. 2. How and by what means can this key be made to give a
shock? Should the circuft outside the key be of same resistance as the two bobbins, and should the terminals
be connected to handles? A. Connect the terminat of connected to handles? A. Connect the terminals
of coils with handles formed of metal tubes.
(4018) W. Mc.P. asks: 1. What is the
bonate. Above it a corked bottle of sulphuric acid 18 supported. A short hose with stop cock and nozze
connects with the liquid. To use it a handle is turned, breaking the acid bottle. The acid falls into the solution and sets free enough carbon dioxide to generate high pressare in the vessel, which is tightly closed.
turning the stop cock a jet of water is expelled which is a little more efficacious than ordinary water on account of the sodium sulphate dissolved in it and the carbon dioxide carried with it. 2. Do chemists in general be
lieve that there is but one element ? lieve that there is but one element ? A. It is hard to
(4019) E. R. E. asks : Can you explain
(4019) E. R. E. asks: Can you explain
he phenomeron of a wagon or carriage wheel turnthe phenomeron of a wagon or carriage wheel turn-
ing backward when it passes over an icy or slippery place? I have witnessed it many times, and to-day, as a heavily loaded coal wagon passed along, one of the rear wheels, as it touched a slippery place, several times reversed about one-eighth of a circle. I can easily see how it might stop when the friction of the tire on the
ice or soft clay was less than that of the hub on the axle. but why should it rotate backward? A. The only exbut why should it rotate backward? A. The only ex
planation we can make is to suggest that the wheel was not round or a perfect circle or that the axle was not central, when in very slippery places
ward or back upon its shortest radius
(4020) F. H. R. asks : What amount of cric current would be required for heating 100 f of No. 30 German silver wire up to $212^{\circ}$ Fah.? A. 0.43
mpere, requiring a difference of potential of 59 volts or its maintenance. These figures are necessarily only (4021) J. S. H. asks for the method of finding the mantisse of logarithms. Most mathenat1tables of logarithms, but not the construction. A. The original calculations of Briggs and his collaborators are still at the basis of our tables. The calculation are very laborious and cannot be explained within our limits. In the Encyclopædia Britannica, 9th edition,
14. page 777, you will find the explanation desired.
(4022) C. H. M. asks : 1. Has there eve been any theory advanced in respect to the significance of Bode's law for planetary distances? A. Bode's law
is only an a poroximate relation, and breake down in is only an approximate relation, and breaks down in the case of Neptune. It is regarded as a mere coinci-
dence, there being no reasonable explanation of tts nu dence, there being no reasonable explanation of its nu
merical relation to the distances of the planets. 2 mhat is the explanation of the fact that whirlwinds are in their direction of gyration contrary to watch hand hands in the southern hemisphere? Is it attributable to magnetic influences ? A . The equator is the central line dividing the relative directions of the winds and whirl winds in the northern and southern hemispheres. Th tion of the winds. Hence the of the general circula influence will be alike, as illustrated in the trade winds, which blow westerly and toward the equator in hoth hemispheres. The same conditions that produce the whirling storns are alike both north and south of the
equator. Hence they must rotate in reverse order. 3 Suppose the earth to be of homogeneous material and of its present dimensions and density, where then
would be its densest portion? Would it be on a spherical plane taken at one-fourth its diameter? Its density would be nil at its center; then its densest portion would fall soméwhere between its center and its circum ference. A. The densest part of the earth would be at the center. from the pressure of the surrounding mas under the influence of gravity, but the force of gravity would disappear at the center. 4. Is it not true that
there were mechanical motion enough in the universe gravity would be annihilated? As centrifugal force overcomes gravity, then gravity must be the result of insufficient centrifugal motion. If there were sufficient erce-motion-to atomize and distribute all the matter of the universe equally in space, gravity would be
extinguished, would it not? A. Gravity is a constituent of all matter and cannot be annihilated. It is the
(4023) W. E. S. asks: 1. What is the difference between the electricity used for illuminating collected in a Leyden jar \& A. Static or, moreproperly frictional electricity has a very high E. M. F. with very small amperage. Whereas electricity generated by
dynamos and batteries has E. M. F. varying from a dynamos and batteries has E. M. F. varying from a
few volts to several thousand, but always with more amperage than electricity produced by friction. 2 minals in the State of New York : A. Gal vanic or cur ent electricity
(4024) W. P. B. asks : Can you please give the value in cubic feet and in gallons of the statute
inch of water of Coiorado and of California? Also inch of water of Coiorado and of California? Also
same values for the miner's inch. A. We do not know of a "statute" inch of water. The name indicates
that it is a state law. An inch of water as described in deeds of water privilege and approved under court prac tice in various states is the quantity that will flo plank under a given head, 2 inches and $1 \nless /$ inch bein the usual thickness. The ueual head is 4 feet, but vari ous heads are specified. The miner's inch most used is a 1 inch square hole through a 2 inch plank, with its
center $61 / 2$ inches below the surface, and is equal to a delivery of $1 \cdot 57$ cubic feet per minute, or $11 \div 7$ gallous. The head varies somewhat among different water com inches head, all measired from the center of the open-
(4025) J. C. F. A. asks: If the ordirary steam engine only protuces in power about 30 to
35 per cent of the energy of the coal, how is the loss of 55 to 70 per cent divided between the boiler and engine How much of the theoretical force of steam is lost in converting it into power through the ordinary high per cent of the fuel passes up the chimem 20 to 2 , balance, from 8 to 10 per cent is utilized in ordinary high pressure engines. In condensing and compound
enginas, 11 to $12 x$ of thetotal heat units may be realized.
(4026) F. W. S. asks : What amount of 18 karat gold to 20 karat gold. Please give rule and ex ample. A. Your 100 dwt . of 18 carat gold containe 7 ; dwt. Ane gold and 25 dwt . alloy. To bring this up to portion of one-fifth or five times the alloy, which 125 to 25 , or add 50 pennyweights to your 100 of 18
(4027) G. L. H. asks: 1. How many cells of the Fuller battery will be required to run the simple motor No. 641? A. It will require about 20 cells,
s. This battery however is not very well adapted to the motor referred to,on account of the smallz zinc surface iug? A. Owing to the low resistance of the emargthe battery wonld probably run down in two or thre days. 3. Could I make them in the form of the large plunge battery, using a number of wooden boxes 4. What book will give me the different resistances of wires in copper, German silver, etc.? A. Sloane's "Arithmetio of Electricity", \$1 by mail, contains this
infomation. 5. Where can I find the aritmetic of infomation. 5. Where can I find the arithmetic of
dynamos and motors, that is, the relative resistances of the armature and field, also the winding of machines to conform to circuits of different E. M. F. and amper-"Dynamo-Electric Machinery." $\$ 2.50$ by mail.
(4028) Inquirer writes : I am interested in Mr. Wightman's method of fixing the paste for the
positive plates of storage batteries. Now wwill he kindy wrte again and explain beet method for the negative
(4029) W. J. A. asks: What is the acAnd is theory increasiug or diminishing? 4 th the ocean conceded that the saltness of the sea was at ifrst partially derived from the combinatiou and precipitation of the vapors of its constituents during the earliest of the geological ages, and that the disintegrated azoic rocks con tinued to farnish the chlorine and sodium in gradually to be scarcely perceptible by analysis.
(4030) M. A. L. says : Would be pleased o have you state the composition of the stronges
nown castings. The tensile strength of same. Also supposing a tubular steel shaft 21/ inches diameter out side by $\frac{1}{4}$ inch thick by 2 feet long, resting in a suitable bearing, and a pulley 4 feet diameter attached to each end, one pulley made fast. What safe working lowd pulley? What load would it take to break the shaft? The same in composttion. The same with a solid shafi $13 /$ inch diameter in steel and composition. A. Nickel steel is claimed to be the strongest metal. Tensile hollow shaft will break with a load on the pulley from 900 to $1,000 \mathrm{lb}$., according to quality of steel. A solid steel shaft $13 / 4 \mathrm{inch}$, about $3,500 \mathrm{lb}$. The composition
shaft, $21 /$ inches, $1 / 4$ inch thick, about 150 lb ., variable cording to composition and hardne
(4031) Reader, Selma, Ala., asks why the drift wood keeps in the center of a rising stream, and
why it gqes to the banks when the stream begins to fall: A. The high and steep banks at Selma retard surface water. As the stream falls, the current becomes slower drift wood begins to spread toward the banks.
(4032) G. L. F. asks: 1. How much pressure per square inch will a boiler stand, of followshell, 18 to $3-16$ inch., 12 to 14 inches; thickness of type fire bos? Boiler well riveted. A. It is a very slim basis upon which to judge of the pressure tha your boiler will carry from the data that you give
The strength of the cylinder may be satisfactory, but the locomotive fire box is an unknown quantity in all its details, and this is the life of the boiler. If the fire box is as strong in proportion as the cylinder and properly stayed, it might be safe for 50 lb . working
pressure. 2. In firing boilers with petroleum, which is pressure. 2. In firing boilers with petroleum, which is
best-a steam or hot air blast? A. You shoald have an air blast to start with; after steam is up, the steam blast is most convenient and proper. 3. Can the hand power to run one 16 cande power electric light, by using powe to run dynamo? If so, what wire should be used on
armature, etc.? A. It will not. Two 6 candle power
(4033) C. E. T. says: Can you tell me the reasoc why the pipe leading to a steam gauge of in it, or is it there for looks, or some ther less import ant reason? A. The coil is essential to preserve the interior of gauge spring from contact with the steam, which injures the gauge. The coil gathers water by
coudensing the steam and makes a seal between the air
(4034) J. McD. says: When the hot ter faucet at sink is opened. a great rattling noise in roduced in boiler, which is of copper, 40 gals., and continues until faucet is shat off azain, then producing
sudden sharp click in boiler; all is quiet until ho water faucet is used again, when the above is repeated; pipes to water back in range are all ruu correctly and are not trapped. Hot and cold water pipes run dows then vertically 40 fcet to other fixtures, remaining separate all the way and not joining at top. remaining suggest a remedy? A. The noise is caused by the sudden vibration of steam in the water back, caused by the reduced bressure in the water when the faucet is opened. The steam rushes into the boiler through the circulating pipe. where it comes in contact with the ing noise. A larger cold water inlet pipe from the ing noise. A larger cold water inlet pipe from the
street, and an air chamber, will be a partial remedy: perhaps the street pipe is partially closed, which is
often the case where galvanized pipe is nsed. This often the case where gal.
will cause the hammering.
(4035) V. L. C. asks: 1. How to make a perfectly smooth dead black varuish for brass, etc.?
A. A good black for brass consists of thin seed lac varnish (made by dissolving seed lac in alcohol) and refined lamp hlack. The varnish must be quite thin to insure a dead black, and it should be strained after th addition of the lamp black, to remove all lumps. 2
How to make s transparent dip varnish or lacquer fo silver plated and gilt work (on metals)? A. Use a thin shellac
alcohol.
(4036) J. B. says : Kindly answer through Soientific American what causes clicking in pipes and remedy. Why would not it be a good idea in orde to increase the speed of our fast boats, to have o forced out at the bow and keel? This would naturally rise and envelop the hull, forming a film of oll for the water. Give a scientiffc explanation of how electricity mimple way of heating water closets in this cold climate A. The noise in the pipes is cansed by water hamme The steam is rapidly condensed in the cold pipe, and is thrown against the pipes, elbows or bends by the velocity of the steam through them. The water also accumulates in small masses, which are dashed agains each other; this in a confined space like a pipe produce pensive Air hae been tried on 4 steamboat in Ne York Bay, but did not meet expectation. A motor riven by maintenance of poles in the armature attracte or repelled by the field magnet poles. We suggest that
you move the water closet into the house, or put up a you move
(4037) W. L. asks : 1. Would a bar magne nds (say one-fifth of the tempered hard only at the ould be if tempered for the full length? A. Yes. What are the ordinary impurities of aluminum? A. often alloyed with copper. 3. Action and reactio clean one, with the samecharge? Also why do som powders produce less noise than others? A. No. Som powders burn progressively with less oise than sudden or water-proofing canvas boats? A. Yes. 5. Is the process of raising bread by means of hydrochloric acid and soda economical or healthful? A. It is not a saf nethod of deodorizing skunk skins? A. It can be don by burying the skins in the earth
(4038) E. D. asks : 1. Will an amperenegative wire : mperes that are delivered on the postive return the negative? A. Yes. 3. What per cent of slip o ynamo belts is good practice? A. No slip.
(4039) E. E. W. asks : Will you please nswer the following question: Is there anything (about
$1-32$ inch thick) I could place between a staple shaped magnet and a flat piece of steel to keep it from drawing? A. No insulator of magnetism has been dis-
covered. Perpetual motionists have been looking for a hing of this sort since magnets wer
(4040) C. H. F. asks : 1. Is light light before it reaches the atmosphere, or is it produced by plays no part in the production of sunlight. 2. Does ound travel equally in all directions, or in a straight line from a common center? A. It depends much on the manner of producing the sound and the condition of the propagating medium. The sound from a bell hung in a clear space and surrounded by a quiescent homogeneous air can be heard equally well in all direc-
tions. 3. Is a pergon in an audience at twice the disions. 3. Is a person in an audience at twice the dis-
ance from a speaker able to hear better than one back of him (the speaker)? A. Yes. 4. Is heat pro auced by the transmission of light through the atmo phere, or does all light possess the quality of heat? The atmosphere is heated when acted on by ethe waves, especially when it contains moisture. 5. Is the orm of vibration of heat-producing light materially different from non-heat-producing light?
are probably the same, but there is no
roof that they are. 6. Is all light convertible int heat on passing through a suitable lens? A. This is an indecided question.
(4041) E. F. L. asks: What is black manganese? For what purpose is it used, and what is en; its formula is $\mathrm{MnO}_{2}$. It is used in batteries to certain extent as a depolarizer, but its principal use io in the manufacture of bleaching powder. Its value depends on its purity and quality. It retails by the barwould bring far less than this,
(4042) A. B. C. asks (1) from what Glauber salt is obtained. A. $a$. By treating salt with sulphuric acid and distilling off the hydrochloric acid. It and magnesinm sulphate at low temperatures. c. By roasting iron or copper sulphide with salt. $d$. By calcining a mixture of sodium nitrate and magnesium sulphate. $e$. It is a by-product of petroleum refining,
but is not always utilized. 2. For what is it princibut is not always atilized. 2. For what is it principaily used? A. Principally in the manufacture of glass, ultramarine, and soda ash. 3. How much is annually
nsed in this country? A. No reliable statistics are procurable, as a great part is made directly by these who tise it. 4. Is it used for dyeing and in print works? A. Sometimes in wool dyeing.
(4043) F. T. K. writes: 1. I made a batcery of the Chaperon-Lalande type inch flageing a piece other, through which I put the zinc (a $3 / 6$ inch $x 6$ inch rod) insurtated from the pipe. Not being able to procure the oxide of copper, I made some by precipitating a so lution of sulphate of copper with caustic soda. placed the oxide of copper in the tube to the depth 0 about an inch. The hattery would ring a small bell fo
wrong ? A. Your trouble is due to the use of cuprit
hydrate instead of oxide. Make the oxide by heating hin copper plates to red heat in the air, and after coo beat off the oxide and reheat until it is all oxidized. gas plant of the Pintsch system for lighting the pas pressed to about 14 atmospheres, and during compres ion there is a liquid condensed from it which the ma in attendance calls hydrocarbon, which has won quit reputation as a cure for rheumatism. What is thi quid and what do you think of it as a cure for rheu nue or parsfine or erapeutic value.
(4044) T. H. B. H. says: We have a 20
 We have put in instead " "direct steam press," 30 inc cylinder. In pressing the bale, we make four charge e., put into the priss a certain amount of cotton, run up the press," and "dogs" for the purpose hold p the cotton thus pressed until more cotton is put in, nd another charge or run-up is made. When makin the last or fourth charge, often the water is drawn on fhe boiler from two gauges to less than one. What ent a man here to adjust the press, and he condemn the dome system. Ours 1824 inches by 24 inches. His plan is to have a pipe $11 / 4 \mathrm{inch}$ in diameter and four o ive feet long inside of boiler, perforated with a num ber of $1 / 4$ inch holes, and to take steam from boiler by aid pipe instead of by dome, arguing that the sma roles in the pipe would not permit the water to escape fice, now in boiler for the dome, does. A. There hothing wrong in the dome. The 11 inch pipe is to mall, and would be nearer the water than the dome You probably open the steam valve tho wide and lift he water in the boiler. This is had, and dangerous practice. Go a little slower in opening the valve, and 114 inch pipe from the top of the cylinder slowly. The 14 ith a 11 inch valve, would be preferable to are steam pipe and valve--anything to throttle the sudden outrush of steam which causes the lifting of the
(4045) E. E. B. asks: If a man with a fle and one with a cannon are placed any distance apart within range, and both fire at the same time
oward each other, the cannon ball to travel twice as fast as the riffe ball, the rifle ball penetrating the cannon ball all the time untilit is brought back to the place tarted from, does herile ball at any time come to dead stop? Second, if a man is on a moving train, can it be said that he is going in two dircections at once hird, if anything is started in any direction, is it pos sible for it to return to the starting point on the same line, withont stopping first? Fourth, does the pendum of a clock stop in swinging back and forth? The man moves only in one direction. All reversing dead stop. The same with the pendu-
(4046) H. M. asks : 1. What pressure r square inch is exerted by illuminating gas comressed to one-tenth its original bulk? A. Gas comWhat is give about 135 pounds gauge pressure no limit above the point of liquefaction. 3. Would ne-sixteenth inch steel plate be strong enough to stand the pressure referred to in question one? A. Yes, if not
ver 1 inch diameter. 4. What is the difference in trength and also in weight between steel and aluminum? A. Aluminum has about one-third the tensile strength
of steel, depending upon their quality. 5. As one horse power steam engine equals 33,000 foot pounds per minute, would this be the same as 550 pounds per 1 cubic foot high? A. Yes. The best results are abot he weight of a 100 horse power gas engine (Otto fo A. Address the Otto Gas Engine Co., Philadelphia, Pa
(4047) V. M. asks : 1. Are engineers ennsed as to grade?-for instance, a man might be ca pable of tending boiler and the common slide valve en gires, but not the high grade of Corliss. Could he pro cure license? A. There are no provisions for the gran-
ing of valid license to engineers, except under municipal regulations in cities. 2. What is a blister on bliser sheet? How calsed and where found? A surface of the plate. This prevents the heat pussing into the boiler at that point. The surface become overheated and expands the film of iron over the de-
fective place, and in a short timpe raises a blister. fective place, and in a short tinfe raises a blister. It
usuanly occurs on the fire sheet. 3. How is a pop afety valve adjusted? A. A pop valve is regulated by tery cell for medical purposes? A. Any ordinary cell an he used for producing the current of a medical battery. 5. How are the flues arranged in vertical boilers? A. See "steam Boilers and their Construc
(104) B. . W.
(4048) B. R. W. asks the construction izer. Is it a good closed circuit battery the depolsited for open circuit? What is the voltage and am perage? A. It is the ordinary Grove combination. A porous cup is used for the sodium nitrate solution
which is best acidified with sulphuric acid; in this cup is placed the negative plate. The positive plate of zinc amalgamated, is in the outer vessel, which contains diInte sulphuric acid. There is nothing new in the combination. It gives 177 to 19 volts, and is an excellent
(4049) L. S. G. says: Would like to know ir you could let me know of some way to give small he size of a 40 drill and $11 / 3$ inches lons. If yo have a number of spripgs to temper, place them in a smail sheet iron box with a little palverized charcoal
on the bottom and over the springs. Heat to a cherry
red and tip the springs into the water. Dry and spread
them on a wire sieve and dip in boiling linseed oil for or 3 seconds and again cool in water. Another way is o elightly polish the springs after hardening and las and then quickly cool in water.
A. Y. O. asks how to fine wine--L. B. K. asks how
to color brass a fine blue.-S. L. A. asks for a hair tonic hair invigorator.-J. W. wants an iron paint.-Old Sub. asks : Will you oblige by giving the receipt for making the beautiful gloss that is found on collars und
cuffs?-A D. J. E. asks for receipts for making variou cuffs ?-A D. J. E. asks for receipts for making various
kinds of matches.-H. D. H. says: How can I make a hektograph?-F. C. H. wants to know how to mak fuid for brass and steel. (2) A collodion for covering corns.-F. H. W. asks how to make a good glue
mountant suitable for mounting photographs.-F. J. S. asks how to cure corns and bunions.-J. E. W. asks 1) for a good cement to splice belts with, (2) for a rust preventive.-B. V. H. wants to know a remedy for chapped hands-M. D. asks for a lasting perfume, also
for bloude hair dye.-R. H. W. wants to know how to make a depilatory for removing superfluous hair.-J. E . asks (1) for ink to use on typewriter ribbons, (2) caron paper.-C. R. A. asks for a receipt for a hair in is dyed or stained in various colors?-H. M. A. asks the ature of the preparation used to clean wall paper.-G A. M. says : Will you please give me (1) a formula for ombined toning and fixing solation, (2) for a hydro A. P. asks: Can yon inform me through the quer columns of your valuable paper how to make a paste o lue for nse in book binding, or how to nse commonglu o thatit will not crack, as I have found it to do?-H. . asks: Will you kindly inform me in what number an find a receipt for the ordinary writing fluids used the present time, or send me a formula ?-C. D. ask Wonld you have the kindness to advise me what pubo prepare solntions to do bronze, nickel, and silw plating with an electric dynamo?-H. R. S. asks: Please give me a recipe for a waterproot glue to be used in putting the patch on a shipping tag. 2. Also a recipe or taking rust off fine steel tools.-C. N. F. says Will you tell your subscriber how to make Roman can-
dles ?-J. J. eays: Conld you give me a sure cure receipt for perspiration of the feet. Sometimes in my daily walks hey annoy me very much and the odor is very offensive would benefit me as well as others that may be afficted with it.-L. B. says : Please be so kind as to give one of your steady readers a recipe to make glue so that water will not act upon it after it has been applied on wood or any other articles.-M. M. asks: What preparations an I write to ask if you can suggest anything which, ap Aners 10 , $f$ Answers to all of the above queries will be found in
the "Scientific Americau Cyclopedia of Receipts, Notes and Queries" to which our corresuondents are referred The advertisement of this book is printed in another column. A new circular is now ready

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