
a Weekly journal of practical information, art, science, mechanics, Chemistry, and manufactures.


THE NEW YORK CABLE RAILWAY.
For several months a cable railway has been running steadily and without interruption of any kind on 10 th Avenue, this city, from 125th Street north for a distance of about 314 miles. The massiveness of the machinery, the admirably planned and handsome building in which it is placed, and the sinoothness with which everything works, justify us in presenting a somewhat detailed description.
This system differs in many essential points from those in use elsewhere, and is so designed, by means of duplicate cables and independent engines and driving gear, as to insure the continuous operation of the road under all probable conditions arising from accidents of rear, is occupied in the portion next to the street with The shaft revolves in ten bearings, and drives at each any nature. In a city like New York, a great many two Wright automatic cut-off engines, which may be section a system of gearing carrying two sets of cable street car lines are operated continuously during the day used either together or independently. Each engine drums. As will be seen from the engravings, particuof twenty-four hours; and as it is impossible to get machinery and wire ropes that will run forever, without stoppage for repairs, it becomes lmost absolutely necessary that some plan of duplication should be adopted. We therefore find that the principal char acteristic of this system is of course the double line of cables that run side by side through the trenches; while one of these cables is working the other is held as an auxiliary, or reserve, only to be called into operation should any-


Fio. 2.-VIEW OF OPERATING MACHINERY.-LOOKING TOWARD THE STREET.
larly the enlar ged view of one of the sections, Fig. 3, the gearing is placed in the center of a rectangular space, upon each long side of which are two drums working together. Thus there are four sets or pairs of drums, each pair with its own cable and either of which can be operat ed independ ently of the others, or all may be worked at the same two cables of the same sec tion constitute the double ropes that pass over the same route and with(Continued on

fig 1.-operating machinery of tenth avenue cable railway, new york city.-Looking toward the rear.

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## the interior department favors a suit agains

 the bell telephone patent.In the matter of the application made to the Department of Justice to have a suit brought to annul the Bell telephone patent, which application was referred to the Interior Department for preliminary inquiry, Mr. Lamar, the Secretary of the Interior, has at last promulgated the result of his deliberations, which he summarizes as follows:
"The grounds of invalidity alleged against the Bell telephone patent may be substantially summarized thus:
'First.-The patent was procured by the fraud of the patentee through the collusion or mistake of the officers of the Patent Office, and in violation of the rights of a caveator named Elisha Gray.
"Second.-The invention patented was not patent able, because already public. Referring to what I have said under the other head of inquiry, it is apparent that these allegations describe the occasions in which the Government, upon my view, ought to actively interfere for the cancellation of a patent.
"It is manifest that a decision upon the merits of the controversy, as to the validity of the patent, is not embraced within the terms of your request. The issue before me lies outside of the ultimate merits of the case as a subject of judicial investigation. As to what the final judgment should be I have not felt called upon to form (and if I had formed, I would not express) an opinion. The question is whether enough has been shown upon the hearing to require the submission of the mat ter to the court at the instance of the Government The proof adduced in support and defense is very voluminous, and very conflicting in many respects. It involves great scientific research and detail, and per haps some intricate legal questions. The allegations and the evidence touching the circumstances attend ing the issue of the patent are of such a nature and have such a support as to render it, in my opinion, im proper to ignore or dismiss them. Such a case is presented as, I think, ought to undergo thorough judicial investigation. It appears that many suits have been pending and many are now pending between the cor poration claiming this patent and others that assail it In none of these cases has there been, or can there be, as I think, such thorough investigation and full ad judication as to the alleged frauds or mistakes occur ring in the Patent-Office, in the issuance of the patent as could be had in a proceeding instituted and carried on by the Governmentritself. In a case involving such questions, it seems to me especially imperative upon the Government, as duty to its own officers to vindicate or condemn, and duty to the people, to set on foot and follow up a complete investigation. In my opinion the proceeding should be in the name and wholly by the Government, not on the relation or for the benefit of all or any of the petitioners, but in the interest of the Government and the people, and wholly at the expense and under the conduct and control of the Government I think it should be instituted at such point and in such court as will best subserve the purposes of pub lic convenience and full inquiry. Such a proceeding so conducted, will, as I think, comport with the dignity of the Government and the gravity of the subject, and will insure a final and just adjudication of the merits of the controversy."
It is to be hoped the Department of Justice will coincide with the above views, and order the suit to be commenced. In no other way, apparently, can the real facts concerning the invention of the telephone be judicially determined.

## SIBLEY COLLEGE LECTURES, CORNELL UNIVERSITY.

We have received from the director of Sibley College Cornell University, and publish in the current issue of the scientific Americian Supplement, a second lecture of the course given by the non-resident lecturers to the associations of students in the courses of engineer ing and architecture. This lecture will be found to be quite different in its character from that delivered by Dr. Raymond, and published as the first of our series. Though less eloquent, it is as full of information as an egg is full of meat, and, in that sense, is as thoroughly satisfying. It is a simple, straightforward talk upon the subject chosen-a subject with which, probably, no member of the profession is more familiar perhaps the best authority known in this country upon the practical application of the scientific principles of combustion, and of transfer and utilization of heat, and has attained an enviable reputation for the exceptional completeness and accuracy of his work in the determination of the economy and efficiency of steam boilers. He has earned the distinction of having been the first to make what is now regarded by engineers as a thoroughly complete and satisfactory investigation of the whole problem of the development and utilization of beat from the combustion of fuel, as illustrated in the operation of the steam boiler, and to give an exact account of its production, distribution, and disposal. The scientific aspect of his work is considered
as satisfactory as the technical. The most striking
feature of his work generally is its precision and the scientific accuracy of its presentation.
Mr. Hoadley is one of the most experienced engineers in the United States, and has been well known for many years as a mechanic. a builder of engines of high grade, and as an expert. He is a prominent member of the Society of Mechanical Engineers, and was one of the committee which prepared the recent important and valuable report to that body upon the standard method of trial of steam boilers.
The editors of this journal have arranged for the publication of the whole series of these remarkably valuable lectures and addresses.

## STEAM HEAT FOR MELTING SNOW IN STREETS.

Referring to our article in last week's issue, it may be as well to add that the disposal of snow by steam heat is already successfully practiced in the business part of the city of London. Pits are provided, with steam coils at the bottom. Into these pits the snow is shov eled, and, being rapidly melted, is run through pipes nto the sewers. Such pits might be available here, and steam for them could be supplied from the steam pipes now employed for conveying steam to a large part of the city from the boilers of the New York Steam Heating Company.
It is stated, with reference to the London system aluded to above, that it has proved to be a large econ omy as compared with the carting of snow from the streets, still used in many parts of London and in other European cities.

## Weight of Hydrogen.

A paper was read before the British Association on "An Approximate Determination of the Absolute Amount of the Weight of Chemical Atoms," by Professor G. Johnstone Stoney, D.Sc., F.R.S., who showed that the mass of a molecule of hydrogen is a quantity of the same order as a decigramme divided by $10^{24}$, i. e., a twenty-fourth decigrammet, which is the same as the twenty-fifth grammet. (The grammets are the decimal subdivisions of the gramme, of which the first is the decigramme, the second the centigramme etc.) The mass of the chemical atom of hydrogen may be taken to be half the twenty-fifth of the grammet This-value is based on the conclusion arrived at by several physicists, that the number of molecules in cubic millimeter of a gas at ordinary temperature and pressure is somewhat about a unit eighteen- $10^{18}$ : from which it can be shown that the number of molecules per liter must be about a unit twenty-four- $10^{24}$ From this, together with a knowledge of the weight of a liter of hydrogen, the above value for the mass of a molecule of hydrogen has been deduced. The mass of a molecule of hydrogen being known, it is possible now to determine approximately the masses of all other simple substances and of compounds also.

## Steering by Electricity

The old war vessel Tallapoosa, which has been undergoing a thorough overhauling at the Brooklyn Navy Yard, has among other improvements been sup plied with an electrical steering apparatus, by which the ship guides her own course automatically. The tiller is operated by compressed air, governed by electricity from the pilot house, and can be turned from its extreme starboard to its extreme port position, or the reverse, in a fraction less than three seconds. The automatic action is obtained by means of an electrical mechanism, which is attached to the compass at the point to which it is desired to secure the vessel's course. This mechanism holds the ship to that point, the electric circuit being opened and shut by the motion of the vessel. The rudder is thus acted upon, and cor rects any deviation from the marked course.
The invontor states that the introduction of electricity into the compass box has no influence upon the needle; but a great many mariners, we fear, will be apt to think that this is playing with fire. The pilot house is further equipped with an independent hand wheel, by which the course of the vessel, by the action of the current upon the compressed air cylinder, may, when desired, be changed from the set direction without disturbing the automatic device. By means of a small electric lever on the bridge, the officer in charge may, however, take instant command of the rudder and change the direction of the vessel at will. This does away with the man at the wheel of our former navigation. At the same time, the control of the ship is much more perfect.

Of the Ericsson new submarine gun, mentioned a fortnight ago in these columns, the Naval and Military Gazette says $\mathrm{i}^{+}$is an object of much interest in English naval circles. But, it adds, the partially bald ones are fast losing their few remaining hairs scratching their heads over the puzzle how the India rubber diaphragm over the muzzle is to be replaced for the second charge, after the first has been fired away nine feet under water. Captain Ericsson will no doubt provide a means for accomplishing that, so the British officers had better spare their scalps till they hear further from the venerable inventor.

## PHOTOGRAPHIC NOTES.

Exhibition of Photographs at Philadelphia.-The recent exhibition held at Philadelphia, Pa., from Jan. 11th to the 16 th, at the Pennsylvania Academy of Fine Arts, under the auspices of the Photographic Society of Philadelphia, was undoubtedly the largest display of amateur work yet seen in this country, comprising, it is estimated, over 1,750 separate pictures. It ing, it is estimated, over 1,00 separate pictures. It
was open to both professional and amateur photowas open to both professional and amateur photo-
graphers from all parts of the world; but very little professional work was noticed, and, such as it was, was of excellent quality.
The western views by Mr. W. H. Jackson, Denver, Col., were remarkable for their large size and clearness, and included work made from paper negatives. Mr. Gutekunst, of Philadelphia, had on exhibition his immense panoramic view of the 1876 Centennial Exhibi-
tion, about eight feet long by two feet wide, printed upon one sheet of paper, from seven negatives; also a
fine panoramic picture of the Capitol at Washington. fine panoramic picture of the Capitol at Washington.
Specimens of his fine photo-engraving work were also to be seen.
Mr. Fred. E. Ives exhibited specimen orthochromatic photographs made by his improved chloro phyl process, which attracted attention for the great amount of detail noticeable in the red and yellow portions of the pictures; there were also examples of the Ives process of photo-engraving.
The large assortment of views, mostly direct prints, but including one or two enlargements made upon the new Eastman gelatino-bromide paper for positive printing, by Mr. Wm. H. Rau, of Philadelphia, were extremely clear and good, and specially interesting from the fact that they were the first general exhibifrom the fact that they were the first general exhibi-
tion of this class of work in this country. When it is tion of this class of work in this country. When it is
considered that most of the prints were made, perhaps, at night by an artificial light, the possibilities and advantages of the paper for obtaining prints from negatives with a printing-press rapidity, independent of sunlight, at once becomes manifest.
There appears to be a large future in store for this paper; its excellent keeping qualities, easy and quick manipulation, make it at once superior in many classes of work to the ordinary albumen paper.
Excellent specimens of platinotypes were shown by Mr. William Willis, of Bromley, England. We also noticed some beautiful examples of instantaneous marine views sent from England, by G. West and
Sons, of yachts flying through the water sped on by Sons, of yachts flying through the water sped on by
a stiff breeze, and yachts in tow, with sails spread.
Both pictures were remarkable for their clearness
Both pictures were remarkable for their clearness
and crispness, being also extremely sharp; every line and crispness, being also extremely sharp; every line
and peculiar curve of the white foam, as well as the hull and rigging and sails of the boats, was wonderfully distinct and natural.
Mr. Pepper exhibited many curious instantaneous photographs of athletes in various positions; one or two of his best pictures illustrated a man in the act of making the high jump, for example, just as he was about to pass over the bar. The peculiar attitudes shown were novel and interesting, illustrating,
as they did, that the negative plate often catches as they did, that the negative plate often catches
movements which are too quick for the eye to perceive.
A frame of photographs hy Dr. Ellerslie Wallace, including many views of English scenery, castles, and old abbeys, was particularly fine. The point of view was well chosen, and the work, technically, all that one could wish for.

A number of views taken in India of the Calcutta Exhibition, by Mr. C. R. Pancoast, were much admired on account of their clearness, good lighting, excellent choice of point of view, and fine technical qualities.
Artistic landscapes were shown by Mr. Robert S. Redfield, the secretary of the society, and deserved the prize awarded him. Both Mr. Frank Bement and J. C. Browne had a number of fine pictures, the latter showing a view of a catalpa tree in full bloom on the Hudson, the detail and lighting being excellent. The negative from which the print was made was by the old wet-plate collodion process.
We also noticed some excellent work sent by Mr. John E. Dumont and Frederick A. Jackson, members of the New York Society of Amateur Phctographers, Mr. Dumont taking a prize for a beautiful Niagara winter scene. Mention should be made of an attract-
ive composition picture ive composition picture entitled "The Village
Smithy," by W. L. Shoemaker, of Philadelphia, in Smithy," by W. L. Shoemaker, of Philadelphia, in
which the arrangement of the figures was extremely natural.

What an artist can do with photography was shown in the twenty pictures exhibited by Mr. George B. Wood; his particular specialty appears to be in the taking of single figures and groups, each of which is so lighted and composed as to tell the story intended. All of his work, in this respect, was excellent, and was rendered more interesting by his happy faculty of giving each picture an appropriate and suggestive title.
Mr. J. P. Gibson, of Hexham, England, had on exhibition five or six pictures which had been awarded eight prizes at different English exhibitions. In them a very high standard of work was noticed.

Several ladies were among the exhibitors, their work being of excellent quality.
In lantern slides made on dry plates in which it was required that both the negative and slide should be made by the same person, the award of a prize was accorded to Mr. James E. Brush, of the New York Amateur Society. On the evening of the 14 th , his slides, including over one hundred others, were thrown upon a large screen in a commodious hall on the ground floor of the main building. The lantern exhibition, which was well conducted, proved to be one of the most interesting and entertaining features of the entire exhibition, and comprised many beautiful pictures. A special double lantern, with a peculiar dissolving valve arranged between the two gas cylinders, instead of being attached to the lantern, the invention of Mr . Frank Bement, was used, and worked quite smoothly. The managers of the exhibition are entitled to considerable praise for their enterprise in collecting and hanging such a formidable array of beautiful pictures. The interest in amateur photography will undoubtedly be extended by the continuance of similar exhibitions, which we hope will become more frequent. The display of fine specimens of any art is invariably instructive, and in no better way can the progress made in an art be made known than by a public exhibition.

## American Society of Civil Engineers.

The American Society of Civil Engineers held its annual meeting on the 20th and 21st, at the Society's house, in New York City.
During the first day, sessions were held morning and afternoon, at which the reports of the Secretary and sented and discussed.
Prof. Eggleston, on behalf of the Committee on Standard Time, reported that the movement toward a continuous notation of the entire twenty-four hours was making gratifying progress. In time it will probably be adopted on all the leading railroads. The Canadian Pacific has already printed its time tables according to this standard.
A committee on rail and wheel sections was appointed. The Norman Medal was awarded to Mr. Eliot C. Clarke, of Boston, for his paper on cement, referring particularly to its use in the Public Works of Boston. The Rowland Prize was presented to Mr. A. M. Wellington, for his paper on the friction of journals. Prof. Eggleston gave the results of microscopical examinations of the stone of the obelisk. He attributes
its decay to a very minute vegetable growth found some distance beneath the surface, but still containing sufficient chlorophyl to show a green color. Dr. Rothwell explained a new system of laying submarine tunnels. The summer convention of the Society was voted to be held at Denver.
In the evening Mr. B. S. Church, Chief Engineer of the Aqueduct Commission, explained the work now in progress on the new aqueduct and the proposed dam at Quaker Bridge. The second day of the meeting was devoted to a visit to the works themselves, Mr. Church acting as host. The sessions terminated with a reception and supper in the evening. The Secretary, Mr. Bogart, announced the Society to be in a very flourish ing condition. The membership is between nine hundred and a thousand, the annual revenue about $\$ 20,000$, and the total assets of the Society, including $\$ 48,000$.

## Notes of Decisions Relating to Patents.

In the U. S. Circuit Court, Southern District of New York, before Judge Wallace, the bill of complaint alleges infringement by the defendant of letters patent or a new and useful improvement in electric lights, of which Sawyer and Man were the inventors, bearing
date May 12, 1885, granted to the Electro Dynamic Light Company, its successors and assigns, as assignee of Sawyer and Man. The application for the patent
was filed January, 1880; in January, 1880, they assigned was filed January, 1880; in January, 1880, they assigned their whole interest in the invention to the Electro Dynamic Light Company; in April, 1881, that company assigned the invention to the Eastern Electric Manufacturing Company, and the Eastern Elec-
tric Manufacturing Company, in. September, 1882, assigned the invention to the complainant. All these assignments were duly recorded in the Patent Office more than two years before the patent was granted.
The defendant has demurred to the bill, and the point raised is that the patent is void, because the Electro Dynamic Light Company, the grantee named in the patent, had assigned itsinterest to the complainant before the patent issued, and had no interest of record
in the patent at the time the same was issued. The demurrer admits the validity of the assignments made by the Electro Dynamic Light Company to the Eastern Manufacturing Company and by the latter company to the complainant, and no question is made, or can ant with the title of the Electro Dynamic Light Complainant with the title of the Electro Dynamic Light Com-
pany to the invention. Judge Wallace overruled the pany to the invention. Judge Wallace overruled the
demurrer, and holds that the title thus acquired by the
complainant is as effectual to protect the defendant against any claims of the Electro Dynamic Light Company as if the assignment had been made by that com pany to the complainant after the patent had issued.
If the demurrer is good, the complainant, although the owner of the invention and the sole party entitled to enjoy the monopoly conferred by the patent, will be defeated because of the inadvertence or erroneous action of the Patent Office in issuing the patent to a corporation which cannot challenge the complainant's rights or assert any adverse claim against the defendant. It may well happen occasionally in the pressure of business at the Patent Office that an assignment made during the pendency of an application may be overlooked, although duly recorded, and the patent be issued to the inventor, or to an intermediate assignee whose assignment is on record. If, whenever this happens, the patent is to be deemed void, notwithstanding the title of the grantee named in it is instantly vested in the true owner by operation of law, and notwithstanding no possible injury or inconvenience can be occasioned to third persons or to the public, the result would be one of such unnecessary hardship that it is not reasonable to suppose that it could have been contemplated by Congress while framing the provisions of the patent laws.

In the U. S. Circuit Court, District of Vermont, in the case of the American Diamond Rock Boring Company vs. Sheldon et al. an arrangement of devices was described in an original patent, although it was not called a combination. Judge Wheeler held that a reissue calling it a combination, and containing a statement that the invention consisted also in this combination, does not appear to vary the prior description in effect. If separable claims of the reissue cover the same invention as the original, and no more, such claims would seem to be as valid as the original, and would be infringed by whatever would infringe that.
The enlargement of the scope of a claim six years after the original patent is not valid according to the series of later decisions upon reissued patents.
The act of 1837 and the present statutes carefully limit the right of a party in an action to such material and substantial parts of the thing patented as could be definitely distinguished from the parts claimed without right.
The parts of the claims in this reissue which might cover the infringement are so blended with the other parts that they cannot be distinguished
and the bill must thereupon be dismissed.

## A "House Epidemic" of Pneumonia.

Dr. Fr. Rudberg gives a brief account in the Eira of an epidemic of pneumonia occurring at the end of last year in a workmen's barrack at Sandarne, near Soderhamm, in Sweden, where there are five of these barracks, situated in a row, at a distance of a couple of hundred feet from one another on a piece of sandy soil near a pine wood. The epidemic was confined to one of these barracks, there being only a single case in the remaining four at the same time, and very few in the surrounding districts. This building was constructed of wood, and had sixteen rooms arranged in two stories, there being a common porch to every two rooms. Each room was occupied by a separate family. The total number of inhabitants was seventy-eight, of whom forty-seven were over fifteen years, and thirtyone under that age.
The first case occurred on November 16, in a boy of eight; subsequent cases occurred on November 27 and December 4, 7, 11, 14, 16, 19, and 20. Of these there were four males and five females, one boy and one girl being under ten, but all the rest between twenty and forty. Six cases occurred in the lower story, and three in the upper. The disease appeared to have no tendency to pass from one room to the adjoining one, or even to another room on the same story, and in no case was more than one inmate of a room and in no case was more than one inmate of a room
affected; but one woman living at a distance, who occasionally visited some of those who had the disease, was attacked by it herself on December 14. It should be stated that there was plenty of intercommunication among the families. The writer does not mention any of theclinical characters of the epidemic.

## Prize for Instrument to Relieve Deafness.

From the Boston Medical and Surgical Journal we learn that Baron Leon de Lenval, of Nice, has offered a prize of 3,000 francs for the best readily portable intrument, constructed according to the principle of the microphone, for improvement of hearing in cases of parial deafness. The committee consists of the following persons, to any one of whom instruments of this description, intended for competition, may be sent before December 31, 1887 : Professor Hagenbach-Bischof, Ph. D., M.D., Chairman of the jury (Basle); Benni, M.D. (Warsaw); Professor Burckhardt-Merian, M.D. (Basle); Gelle, M.D. (Paris); Professor Adam Politzer, M.D. Vienna). The prize will be awarded at the Fourth International Congress for Otology, to be held at Brusternational Congress for
sels in September, 1888.

## California Whaling Interests.

San Francisco is now one of the most important "whaling ports" in the United States. There has always been more or less whale fishing carried on at the stations along the coast, the product of which was marketed in this city, and this port has been an outfitting station for some few whaling vessels. But in the past few years the whaling fleet which is outfitted here as grown very materially A number of the vessels are now owned here, among them the steam whalers, the best of the fleet. 'The Arctic Whaling Company have built large tanks for their oil on the bay shore, and the product is all handled here. The whalers that formerly outfitted at the Hawaiian Islands now come to this port. Oakland Creek is now a favorite wintering place for the Arctic whaling fleet. Some of the vessels leave here every fall to go to " the line" fishing, and then work up to the Arctic when the ice breaks up, returning here with their cargoes. The high price of bone of late has made the business very profitable.
The bulk of the oil is reshipped from here to the East, most of it going around Cape Horn in vessels. Of late, however, the railroad company has placed the freight rates at such a point that oil is shipped East by rail. One day recently the first shipment of whale oil for the season was sent from here. There were 17 car loads, or $460,000 \mathrm{lb}$. of oil. The train was a special one, and it was intended to make the unusual time of 12 days to New Bedford, Mass., the destination of the consignment. No transfers were to be made. The whaling business of this port is now very important. There is a great deal of money invested in it. The steam whalers were some of them built here.解 cisco's industrial importance. -San Francisco Ex.

## FEEDING COAL TO FURNACES.

The method of feeding coal to furnaces as herewith illustrated is designed to insure a more thorough combustion of the coal than has heretofore been obtained. A series of crusbers, $b d f$, pulverize and then discharge the coal through branch ducts into the pipes, $a c e$, when the blowers placed at the upper ends of these pipes act upon it. The coal is first put into the crusher, $b$. After being pulverized, it passes through the duct to the pipe, $a$, where the suction current created by the first blower carries the finer particles up into its casing, and then by blast forces it through the forked distributing ducts against fire clay deflectors placed in the center of the fire chambers, just in advance of the bridge, where it is consumed. The large particles of coal, upon which the current has no effect, fall upon a screw in a receptacle at the lower end of the pipe, $a$, which carries them to an elevator which delivers them to the crusher, $d$, set to crush finer than the first one. The course of the coal after leaving this crusher is substantially the same as already described. If all the coal is not drawn up by the blower after leaving the


REHMENKLAU'S APPARATUS FOR FEEDING COAL TO FURNACES.
third crusher, $f$, it is carried back by an elevator for further crushing. The pipes, $a c e$, are connected together as shown, and at the junctions are placed valves; the branch pipes leading to the furnaces, and the main pipes, are also provided with valves. The free end of the rod operating the valve moves in an arc slot (Fig. 3), and can be locked in any position by a winged nut. By means of these valves the supply of pulverized coal can be cut off or admitted to any one of the furnaces. A detail view of one of the air inlet ports of the blower is shown in Fig. 2.
This invention has been patented by Mr. R. W. O. Rehmenklau, of 310 Plymouth Ave., Minneapolis, Rehm

## THE MICRO-AUDIPHONE.

The accompanying engraving represents the microaudiphone, the invention of Dr. F. M. Blodgett, of 207 West 34th Street, this city, which is designed to relieve deafness. The instrument is made of hard zylonite or other suitable material, and is formed to fit the ear, the shape being as clearly shown in the three views herewith presented. In the tube of the instrument is placed a membrane, or diaphragm, of very thin rubber or skin, held by the edges over a small chamber, as shown in the sectional view, Fig. 2. This diaphragim is by preference guarded by a small metal thimble placed in the tube, and formed


## BLODGETT'S MICRO-AUDIPHONE.

with an opening to expose the diaphragm to the action of the sound waves passing through the tube. The action of the waves on the diaphragm causes it to vibrate, so that it has a "sounding board" effect, and augments the waves and renders the sound more audible. The device may be provided with a tubular portion to be held to the ear by the hand, and it may also be formed with an extending flaring section to collect the sound waves, like an ear trumpet, and direct them to the tube, as shown by the dotted lines. As indicated in Fig. 3, the device may be provided with a shell-shaped attachment, held detachably in place by its edges entering dovetailed grooves in the outer part of the main device. The sound waves en ter the opening and strike the inner surface of the shell, by which they are guided directly to the opening of the ear. This attachment serves to collect the sound waves in a manner similar to the hand when held just behind the ear. The above-mentioned article has recent ly been patented in the U. S., Gt. Britain, and Canada.

## APPARATUS FOR MAKING ILLUMINATING GAS

The accompanying illustration represents an apparatus for some time past in operation at the Laclede Gas Works, of St. Louis, Mo., and we are assured that it has been in continuous operation, without one min ute's intermission, since it was first started. A somewhat detailed description of the apparatus will be of interest to all concerned in the making of illuminat ing gas, because of the many valuable features intro duced-all tending to simplify the construction, lessen the cost of the gas, and reduce to a minimum the labor necessary to operate it.
The generator, A, is provided with a door, fuel hop per, and valve, stoke and sight holes, $s$, and take-off pipe, P , leading through suitable valves and pipes to the fixing chambers, $n$. The bench of retorts, $B$, is such as is used in coal-gas works, except that in place of two of the ordinary retorts generally used there is set a series of fixing chambers, $n$, made of iron or fire clay. They are set on the tile on which the retort is usually placed, but, unlike the retorts, they run all through the bench lengthwise, and are connected at both ends with one common mouthpiece in batteries of four (more or less) to each mouthpiece.
Although retorts might be used instead of these narrow fixing chambers, they would not be as good in operation. It is the heated surface or wall of the fixing chamber which acts on the gas; and when a retort is used much of the gas passes through, if used as a fixing chamber, uncombined, for, gas being a poor conductor of heat, only those vapors near the walls are acted upon. For this reason these inverted U-shaped fixing chambers were devised. As will be seen by reference to the engraving, these chambers are set so that a series of them may be united at each end by one common mouthpiece, and that, for instance, as shown, four of these chambers have one common inlet pipe, $n^{\prime}$, and also one common outlet pipe at their opposite extremities, or rear of the bench. The outlet pipes connect with a hydraulic seal, from which the gas is taken by an exhauster.
Gas may be made in the retorts independently of the generator, in the good old-fashioned way from coal, with this difference-that as the gas made would not
go directly from the retort into the usual hydraulic main, but would have to pass first through the fixing chambers, the tar vapors, which condense soon after leaving the retort, would be subjected to additional heat at the time when they are in the best possible state to be acted on, viz., as vapors, thus adding greatly not only to the illuminating power of the gas pro duced, but to the volume as well. It will be seen, then that the bench, as shown, may be used with advantage to make coal, oil, or wood gas, or a combination of all three, and with the best advantage.
The method of making water gas being well understood, it is not necessary to describe the generator here shown, except by the difference in operation from existing ones. Ordinarily, a bed of burning anthracite coal or coke is brought to a high heat by a forced blast; then the air is shut off and steam is admitted, which in passing through this incandescent mass is for the most part decomposed, forming what is generally termed water gas, which, in a subsequent stage, is car bureted to the required degree to form illuminating gas. During this operation the furnace door must be kept closed air tight; it is only opened when clinkering makes it necessary. Of course, the production of gas is intermittent; for while "blowing up," no gas is made for use. With the apparatus here described, all this is unnecessary. By opening the valve between the bench and generator, the same exhauster which takes away the gas from the retorts causes an in-draught of air at the generator door. Superheated steam, admit ted under the grate of the generator, passes upward, and is decomposed the same as in the ordinary watergas generator. The superheated steam, when once the generator is fairly started, seems to add to rather than take from the heat of this part of the apparatus. The fuel used in this case is ordinary Pittsburg gas coal, which, it is claimed, has never been used successfully in any other form of water-gas generator. The tar vapors from the coal add materially to the illuminating power of the gas made, since the gases in the generator as well as those in the retort must pass through the fixing chambers together.
This apparatus was at first designed as a mere auxilary to the well-appointed coal-gas plant of the company in whose worksitis now in operation; but it has proved itself so valuable that it is only a question of time when it will be the principal, and the regular coal-gas process the auxiliary. It is apparent that this apparatus can be easily applied to any style of coal-gas works, and it would be especially valuable to works in which it is found troublesome to supply the great demand made on their resources during the winter months. The bench here shown has produced 100,000 cubic feet of gas in twenty-four hours. It requires 5 gallons of naphtha or other oil, 11 to 14 pounds of bituminous coal, and 20 to 25 pounds of gas coke or other equiva lent fuel to produce 1,000 cubic feet of gas. Ás stated above, the bench can be used either with or without the generator. The following simple enumeration of the operations necessary to run this apparatus clearly shows the small amount of attendance required, and will forcibly illustrate the difference between this and


EGNER'S IMPROVED APPARATUS FOR MAKING ILLU. MINATING GAS.
other systems: Open the valves, start the oil, start the exhauster, feed the generator with gas coal about once an hour, feed the fire in the bench about once every forty-five minutes, and rake the ashes out of the geneator occasionally. The first three are done once for all. This statement. will be particularly appreciated by those familiar with the labor required in attending o other styles of apparatus.
All further particulars can be obtained from the in ventor, Mr. Frederic Egner, Engineer of the Laclede Gaslight Company, of St. Louis, Mo.

According to Prof. Langley, the inherent tempera ure of the moon is below that of melting ice.

## COMBINED MILLING AND SLOTTING MACHINE

This is a new machine patented by Mr. Dixon, one of the partners in the firm of Kendal \& Gent, Manchester, and it has been designed, says the Engineer, to combine in one machine the operations of roughing out objects with the slotting tool and afterward finishing them complete with the milling cutter, without the loss of time and, what is of still more importance, the risk of inaccuracy, due to the necessity, as hitherto, of changing and resetting work from one machine to another. A further advantage secured by the combination is that in medium sized works, where it is often difficult to find sufficient employment for a large machine adapted for slotting only, the addition of the milling motion gives so much more scope for the constant running of the machine; and, in fact, in any engineering works a combined tool of this class is more than doubly serviceable, as either operation can be made use of according to the nature of the work, many objects even requiring both. Our illustration is taken from a photograph of the first machine of this type that Messrs. Kendal \& Gent have constructed, and which we had an opportunity of seeing at work before its dispatch to the Antwerp International Exhibition, where it has figured very prominently, and was, in fact, the largest and most powerful machine tool exhibited. The machine is capable of admitting an object 6 feet 2 inches in diameter and 27 inches deep, and it is adapted for taking a cut of 15 inches deep with either slotting or milling tool. The main frame is exceptionally strong, giving great rigidity to the whole, and carries a long counterbalanced ram, working in rectangular slides, and provided with improved quick return motion by means of elliptic wheels, the disk plate being well supported and arranged for taking up all wear. The ram carries a strong steel spindle for milling, driven by gearing and side shaft at the top, the whole being so arranged as not to impede in the slightest degree the slotting motion when this is required to be put in operation. The ram can be raised and lowered or clamped in any position by screw, so that when milling it forms a rigid support for the cutter quite up to the face of the work. The driving is by a large cone pulley and strong gearing, and is arranged transversely to the machine, so that it serves both milling and slotting motions, an arrangement being provided for instantly changing from one operation to the other. The machine can be changed from slotting to milling, or vice versa, in less than onetenth of the time usually required to reset an object on another tool. The tables are made very strong, and are well supported quite up to the edge. The handles for working the various motions are placed together at the side of the machine, and are well under control. For keeping up a constant supply of lubrication when either milling or slotting, the machine is fitted with a small centrifugal pump. The total weight of the machine is about 11 tons.

## The Panama Canal.

Dr. Arthur Gore returned recently from a trip through the United States of Colombia. Referring to the Panama Canal, he says that since the failure of the company to receive a new loan a spirit of demoralization seems to have settled down upon the whole enterprise. Nothing of any consequence is being accomplished at present.
Workmen are being discharged right and left, and auction sales of mules, carts, and other property are of frequent occurrence. It is said the sub-director-general intends to remove his headquarters to Colon, and that the Grand Hotel, built by the Grand Hotel, built by
the canal company, is to be the canal company, is to be
sold. Nearly all the mersold. Nearly all the mer-
chants of Panama hold "canal paper," as it is called, and the large owners are feeling very blue over the prospect in store for the enterprise. Dr. Gore is satis fied that the whole proceeding has been worked by egregious frauds from the beginning, and for the $\$ 120,000,000$ already expended there is nothing to show in the way of a canal but a superficial scratch in the hard mass of volcanic rock through which it was proposed to cut a passage. Large sums of money have been spent in the construction of residences for officers, houses for workmen, hospitals, shops, tool houses, etc., nearly all of which were built by contractors who have bled the country most unmercifully. Some very handsome buildings and grounds now mark the line of the canal at the various points where it was thought best to begin operations. Gazing on these palpable evidences of extravagance, the French residents remark, "C'est magnifique, mais ce n'est pas
le canal" [it is magnificent, but it is not the canal] The surveyors' stakes were supplied under contract for $\$ 25$ apiece, and all the other preliminary arrangements have been made on a scale and at a cost that would bankrupt a company with anything less than the "wealth of Ormus and of Ind" at its back. $-N$. Y. Sun.

## Manufacturers and Machinery.

Men who conduct great business enterprises, says the Manufacturers' Gazette, are naturally conserva tive and averse to innovations and experiments. And yet it is through experimental knowledge, acquired by reducing theory to practice, that all progress in the useful arts is made. But it is not the business of the purely practical man to theorize; he is concerned only with actual results, and is satisfied to leave "well enough alone."

"knows a good thing when he sees it," and who believes that "the best is the cheapest" in the long run.
It is undoubtedly true that the continual improvements in machinery involve frequent changes, which are sometimes expensive and burdensome to manufac turers.
Of course, we do not recommend the practical manufacturer to grab at every new patented machine which comes along, regardless of merit. While open to conviction and ready to investigate, he also needs to be cautious, deliberate, and discriminating in his action, in order that he may be sure to get the best, and not throw away his money on mere pretentious and catchpenny devices. There is no danger of his being deceived or imposed upon if his investigation is properly conducted. He is not called upon to take the word of any man, however well known or expert in machinery, as to the merits or capabilities of any new specialty. A mere guarantee of certain results should hardly satisfy him. It is not unreasonable for him to require the proof, the practical ocular demonstration; and the owner of any really meritorious patent will never shrink from the real test, however rigorously applied. But after the demonstration is complete and its utility is established beyond doubt or question, there should be no holding back, if terms a rereasonable, on the part of the buyer. A new and good thing in the machinery line, which is really wanted and needed by manufacturers, will not long go a-begging for customers.

Fireproof Construction.
A superficial inspection of the ruins left by the recent great conflagration in Clerkenwell, London, afforded much instruction as to the behavior of different kinds of building materials in resisting the action of a fierce fire. The buildings destroyed upon this occasion were mostly filled with wares of a highly inflammable char-acter-such as toys, furs, clothing, paper, etc. In some places where the fire raged fiercest, and whence it extended in all directions, as from a center, everything had disappeared from the site except a heap of crumbling bricks-not even the mortar remained. Some brick walls continued standingnear these places; but they were split and shaken from top to bottom. Further off were brick party walls, standing firmly enough themselves, but inclosing areas open from basement to sky, and destitute of front and back walls. Beyond these came the shells of houses, from which all the interior had been burnt out. It appeared from this scene that there is in conflagrations a point of intensity at which the best brickwork fails, al though this is a point far be yond the durability of stone concrete, or ironwork struc tures. Fireproof construction is, in fact, a term which can only be used in a comparative sense. At the same time, there are degrees in the capacity of materials to resist fire which do not always appear from a cursory appreciation of the nature of the material. Thus, among the ruins at Clerkenwell, there were many specimens of timber brest summers which had failed and fallen rather from the
There are hundreds of fossilized mill owners who dread the appearance of the inventor with his new machine as the sick man dreads the potion of physic or the surgeon's knife which is to cure his infirmities and give him a new lease of life. He would rather be let alone and plod along in the same old beaten track which leads to no progress, provided his contemporaries in the same line of business are content to do the same. Even if it can be demonstrated that the new invention is one in the interest of true economy, and will pay for itself ten times over in the course of a few months, he is reluctant to investigate its merits, and don't care to experiment with it. He can only be interested on compulsion. Especially if its adoption would involve any considerable immediate outlay, he can't see any good in it, and won't touch it until compelled to do so by the action
of some more enterprising and progressive rival, who
yielding of their supports than from their own ignition. Provided that it is in sufficiently solid pieces, and shielded from air currents, timber is, for all structural purposes, more reliable in a fire than either stone or iron. Wrought iron girders fail at a comparatively early stage; and it is a question whether, for the support of shop and warehouse fronts, etc., solid timber posts, properly shielded, would not be preferable to ron or stone.-Journal of Gas Lighting.

In a case of alleged epithelioma involving the facial bones, with extensive infiltration of the tissues, where an operation was not deemed desirable, Dr. Antonio, of Mazzara del Vallo Maggio, applied an ointment consisting of 15 parts of resorcine to 20 parts of vaseline twice a day, with the result, it is said, of completely curing the disease; nothing remaining but a white sca a centimeter in diameter.-British Medical Journal.

## Honors to Professor Hughes.-An Interesting Speech by Him.

The anniversary meeting of the Royal Society was held at their rooms, Burlington House, on the 30th of November. Students of electricity will welcome the announcement that a royal medal was awarded to Professor D. E. Hughes, F.R.S. At the anniversary dinner, the president, Professur Stokes, mentioned the presentation of the royal medal to Professor Hughes, and proposed a toast to the recipient, to which Professor Hughes replied as follows: Mr. President, my Lords, and Gentlemen: I cannot hope to find suitable words to express my thanks for the kind manner in which you have responded to the toast proposed by our president, Professor Stokes, nor sufficiently thank him for the flattering terms in which he has mentioned my researches. The numerous experiments which led me to the invention of the microphone are based upon the discovery I made of the remarkable property of loose electrical contacts. If we make a bad joint or loose contact in an electric conductor, we find that not only do these dis. jointed conductors vibrate in unison with the atmosphere, but in vibrating they produce an enormous variation in the strength of the electrical current. And if we join a telephone in circuit, we find that every word spoken to the loose contact is repeated with absolute perfection. An equally remarkable fact is the reversibility of the effect, so that a loose electric contact will repeat in sound any variation of current passing through it; consequently, we may speak to one loose contact and listen to a second, when every word spoken to the first will be clearly heard. The greatest power of sound, however, is obtained when used with a telephone, and the augmentation of sound is greatest when the original sound is most feeble. In order to study the effects of feeble sounds, I at first listened to the ticking of a watch; and after making the microphone more sensitive, I was desirous of listening to sounds below the power of the human ear, such as those produced by the walking of a fly. This succeeded perfectly, but, unfortunately, flies were scarce at the time I was experimenting. I then studied sounds still more feeble, such as the sounds produced in a copper wire at each passage of an electric current -sounds which no human ear has heard direct, but which, by the aid of the microphone, are heard as a clear, ringing sound, due, I believe, to molecular motion in the wire itself. The microphone not only augments feeble sounds, but it will transmit the most complicated sounds of speech and music with absolute perfection. It has also been employed in physlute perfection. It has also been employed in physit has been of service to humanity in listening through the rocks to the sounds made by entombed miners, and by its indications encouraged the aid which finally saved them. The molecular sounds which the microphone revealed led me to invent an instrument which should penetrate inside of a metallic body, and reveal any change in its structure. This I accomplished in my induction balance. In this instrument induced currents from two separate coils are opposed and balanced with each other; but this balance of current is so sensitive that the slightest disturbance or reaction produced by the introduction of a piece of metal in one of the coils destroys the equilibrium. The amount of disturbance can be measured and the balance restored by the introduction into the second coil of a similar piece of metal or by an equal reaction. If we could find two equal pieces of metal, such as coins, they would balance each other; but in practice the instrument is so sensitive that it points out differences in two similar coins fresh from the mint, or in two pieces of equal weight cut off the same bar, due either to a slight chemical or molecular difference in the structure of the metal. Any physical or mechanical change, such as that produced by heat, magnetism, or strains, is at once declared; and it is particularly sensitive to such changes in iron or steel. A curious example of its sensitiveness to iron occurred at the Paris Electrical Exhibition. Elisha Gray, the inventor of the harmonic telegraph, told me that fifteen years ago a small iron filing had penetrated his finger, giving at first some pain, but the filing and pain soon disappeared. He was anxious to know if the filing was still in his finger. I told him to place each finger successively in the induction balance, which he did, and all fingers gave perfect silence except one. This finger, however, immediately acted on the balance. producing loud sounds, and this finger proved to be the one which had been injured by the filing. So there could be no doubt that the filing still remained after a period of fifteen years. If we place an iron bar or rod in the coils of the balance, we find that no two portions of the bar are exactly the same, and the slightest flaw, strain, or crystallization of the iron is at once detected. Now, it we could apply this method to locomotive axles, we should be able to detect, in advance, any detect, and thus prevent the numerous accidents which occur on our ralways from this cause. At present we cannot do this without first detaching the axle from the locomotive, out first detaching the axle from the locomotive,
but l hope some day of finding a modification of the
balance which will overcome this difficulty. The electric sonometer aids the induction balance by comparing sounds from an absolute zero to any desirable extent, and it has been found most useful for measuring the power of hearing in those partially deaf. To cite a single example: Dr. Richardson, F.R.S., lately published an account of a youth who had been very deaf for many years. On being observed by the aid of the sonometer, the sonometer indicated that the cause of deafness was that of a solid obstruction, and upon operation a stone or pebble, was found in the ear, which had been there unsuspected since childhood. On the removal of the pebble, the hearing was immediately and permanently restored. I will not detain you by speaking of my researches in electricity and magnetism, nor of the many remarkable effects of the microphone and induction balance, but I am proud to say that all these instruments and researches were first presented to the world through the Proceedings of the Royal Society. I am deeply grateful to Dr. De la Rue for having on many oc-
casions assisted me with his valuable advice, and allowing me to make use of his magnificent laboratory whenever the nature of my experiments needed such aid. Allow me to express my sincere thanks for the great honor conferred on me this day, and for the kind manner with which you have listened to my remarks.

How to Construct a Microphone will be found fully illustrated and described in Scientific American Supplement, No. 163. How to Make the Induction Balance, in Supplement, No. 196.]

## Conditions of Success in Life.

In a recent address before the Georgia State Medical Association, Dr. Searcy stated that the physiologica conditions of success in life depend mainly upon a vig orous, healthy action of the brain and nervous system. It follows, therefore, that the structural integrity and functional capacity of the brain are matters of the deepest importance, and their preservation and im provement are of vital moment. The author believes that much would be accomplished, could we discove the ways in which the brain capacity is increased and lowered. The problem is a most delicate one, for up to a certain point the receptivity of the brain is directly proportional to the strain already brought to bear upon its capacities. An even balance between the brain functions is an essential element. The superior nan must have the ability, not only to comprehend, but, in an equal degree, to discriminate; he must be able to select for a purpose. Besides the ability to learn, a man, to be successful, needs the power to ver-
ify his learning, to deduce his own conclusions, and to ify his learning, to deduce his own conclusions, and to execute his purposes with persistence.
A simply erudite man is not necessarily successful. On the contrary, he is of ten the reverse, a perfect failure, for lack of the saving virtue of common sense. The capacity to receive is of small value unless it be coupled with an ability to adjust, arrange, and impart. It frequently happens that a man who is simply a scholar and nothing else is at an absolute disadvantage in the inherent of unlettered man who is blessed with an inents excellence of capacity in the three depart possess thrain action. One need not be educated to possess this trait, though it is the addition of education
to such natural gifts that brings distinction. It is not an exaggeration to say that many a man of eminence has had occasion to envy his humbler associates the possession of those so-called commoner merits which ability. Nature his own attainments a greater avail of the concrete to maintain a mental equipoise. The man who can learn, reason, and execute with equal facility possesses the elements of success, even though his qualities be of but an inferior order; while one who has any of these faculties abnormally developed at the expense of the others will always be crippled by the absence of the essential features of a successful life.

## Telephoning from Lightships.

An experiment of the greatest importance to the commercial world is now being made on the east coast of England by the Telegraph Construction and Maintenance Company. For the last eight months the company has had several of its best operatives located in the neighborhood of the Naze, off which the most dangerous sands round England are to be found. These
gentlemen are hourly in communication by telephone with a lightship which is anchored ten miles out, in the vicinity of the Swin passage. An ordinary telegraph cable has been laid from Walton-on-the-Naze to the Sunk Lightship, and telephone and telegraphic appaIt was considered im to both ends
It was considered improbable that the human voice would be conducted ten miles, especially in rough weather; but this has been now proved to be thoroughly practicable. A conversation was carried on with Mr. Stevenson, one of the Telegraph Maintenance Company's officials (who was on board the Sunk Lightship), by telephone, for a considerable time. Mr. Stevenson
all kinds of weather, during which time he had kept Mr. Lewis and Mr. Pinkerton, his colleagues on shore, fully informed of the state of the weather, roughness of the sea, and passing craft, adding frequently forecasts of weather, which usually turned out to be correct.
A month upon the lightship is a trying ordeal; but Mr. Stevenson was so satisfied with the success that attended the experiment, and knowing, if the advantage of telephonic communication with lightships was understood and generally adopted, what a splendid boon it would be to mariners and merchants, that he spent his time busily in collecting information, and watching the working of his electrical machines. In a back room of the Walton post office are machines for utilizing
magnetic currents of all descriptions. A button is magnetic currents of all descriptions. A button is
touched which rings a bell in Mr. Stevenson's cabin upon the Sunk Lightship, ten miles away; then a voice, that of Mr. Stevenson, is heard inquiring what is that of Mr. Stevenson, is heard inquiring what is
wanted. "How is the wind ?" "How is the tide?" "Have you seen such and such a ship pass?" "How much water is there in the Swin passage?" These questions can be answered at once. Or the following is transmitted: "Signal such and such a ship that she is to put in at Harwich."
Every ship passing is duly signaled, and her name and description telephoned to the Walton post office. On an average, ninety ships pass in the day, and if it was known that messages could be sent ashore, no doubt the majority of these would a vail themselves of the benefit. A considerable number of the ships passing have come great distances without passing one of Lloyd's signaling stations. The signaling of these passing the Sunk Lightship would be of great commercial value, as their time of arrival at any port they were bound for could be timed by the owners in London accurately, and everything could be made ready for the landing and the sale of the cargo.
Of much more importance is the use the telephone could be put to in a storm, or in the case of a ship getting on the sands. One night last year, in a rough sea, a ship did get on a sand bank, and instantly her exact position was telephoned to Walton from the lightship. The gentlemen at Walton awoke the lifeboat crew and telegraphed to Ramsgate and Harwich, where the lifeboats were got ready for launching. Just as all three lifeboats were about to start, a telephone message came from the lightship that the ship in distress had got safely off the sand bank, and that there was no need for the lifeboats to start. The boats were stopped, and if it had not been for the telephone they would have been out on the rough sea all night searching for the ship that sent up distress signals. If all the lightships around the coasts of Europe had this means of communication to point out the exact position of a ship in distress, a great number of lives would be saved, as the position of many ships foundering cannot be indicated with any certainty by the ordinary rocket signals. Besides the above uses of the telephone with lightships, all passing ships in quest of a pilot to navigate them through dangerous channels could without difficulty telephone their desires to shore.
The Sunk Lightship is only 150 tons, and yet only once in the stormiest sea, when she had been tossed about in a gale of wind, has the telegraph wire been broken. The two ends at the break were picked up and rejoined within twenty-four hours. She is moored in ten fathoms of water, and is manned by a captain and six to eight men, all of whom express their most earnest approval of the intercommunication with the shore, whereby they can make known, at once, their own and the wants of others. During the night, communication is as open as in the day. The Trinity Board is showing considerable interest in the experiment, and it is hoped that it will see the great importance of at once putting, by this means, the chief lightships in communication with the shore. It is stated by the gentlemen engaged at Walton that the telephone will act over twice ten miles; and there is no reason why some day it should not act over much greater distances.-London Times.

## Manufacture of Writing Materials.

At a meeting of the Academie des Sciences, M.De Boutarel read an essay upon" Paper and the Industries connected with it," in the course of which he quoted some statistics as to the rapid increase in the quantity of pens, paper, pencils, etc., which are manufactured in Europe and the United States alone. M. De Boutarel says that the manufacture of paper, which at the beginning of the century was practically nil in the United States, now amounts to 500,000 tons per annum, and that it is just double this figure in Europe; the value of the straw, rags, and other materials used in the manufacture of the paper being $£ 20,000,000$. M. De Boutarel estimates the value of these $1,500,000$ tons of paper, when manufactured, at $£ 40,000,000$; the note paper being calculated at 120,000 tons, worth $£ 6,400,000$. M. De Boutarel estimates the value of the steel pens manufactured annually at $£ 800,000$; while the nu mber of heliotype plates may be safely estimated at $3,000,000$ of heliotype plates may be safely estimated at 3,00
-thirty Paris houses alone turning out 900,000 .

## © Grrespondence.

## Fire from Steam Pipes.

To the Editor of the Scientific American:
On page 17 of the Scientific American, dated January 9 th, 1886, is an article on the subject of fires caused by steam pipes. Will you please explain, through the medium of your valued paper, what it is that prevents the wooden lagging of locomotive boilers from firing? If the article is correct, a very boilers from firing? If the article is correct, a very
few hours' exposure to the heat, due to the high steam few hours' exposure to the heat, due to the high steam
pressure usually carried on these boilers (120 to 140 pounds per square inch), should cause it to char and ignite; while the fact remains that the wood stands for years, and, under normal conditions, never chars nor ignites. In fact, there are only two causes which can make it igne: First, the sheet iron jacket sometimes gets loosened, and allows sparks from the smoke stack to get under and set fire to it. Second, if the water in the boiler gets low and the crown sheet becomes exposed, thus superheating the steam, the wood may char or possibly ignite. I have known sawdust and shavings to lie on top of a boiler for years, and never knew them to char or burn-the boiler meantime working at from 60 to 100 pounds pressure. In fact, you will find it impossible to set wood on fire with steam pipes working at any reasonable pressure, unless you use superheated steam.
E. P. Clark.

Owego, Tioga County, N. Y., January 12, 1886.

To the Editor of the Scientific American:
In the Scientific American recently a good deal has been said about spontaneous combustion, and wood being first charred and then ignited by close contact with steam pipes. Permit me to state what occurred in my presence, some twenty years ago.
I was running a stationary engine of 25 horse power, steam being supplied from two cylinder boilers 28 feet long, through a copper pipe about 9 feet long. The engine was one of the old type, without piston springs; the rings being kept out by,hemp packing being driven tight in between the piston head or spider and the packing rings. This packing required to be renewed frequently, perhaps once a month.
One day in the forenoon, the engine was working badly, the packing having got too loose. I told the fireman to let the steam go down at dinner hour, and while the hands were eating, I would pack the piston. When the whistle blew, I at once took off the cylinder head. I then unscrewed the bolts in the piston head (this was pretty hot work, as I hadn't given the piston time to cool, and there was a little damp steam leaking through the valves into the cylinder). As soon as I got the screws out,'I pulled off the piston head. Immediately the air struck the old packing, it commenced burning, and in a minute or so it was all a mass of red fire.
The highest pressure of steam at any time on the boilers was 60 pounds, but the usual working pressure was 5 pounds to the inch.
When a fiber of hemp exposed to a pressure of only 50 pounds, for not over four weeks, of wet steam ignites as suddenly as this did, on getting access to the atmosphere, I think it can be safely concluded that many of our fires unacicounted for had their origin from close contiguity of $d r y$ steam pipes and wood.
If there is anything of value in this fact, you are at liberty to use it as you deem best for public safety.
Lynchburg, Va., Jan. 16, 1886.
J. R. Mabers.

## The Natural Dissemination of Gold.

## by patterson du bors.

It is now nearly a quarter of a century since the people of Philadelphia were startled by the report that the bricks of their houses, as well as the clay beneath their streets, contained an appreciable proportion of gold. The revelation emanated from the Assay Office of the Mint; and the same authority that announced to every landowner his proprietorship in the treasure trove denied to him the means of extracting the wealth which denied to him the means of extracting the wealth which
nature, with such even-handed justice, had distributed through her wide domain.
In June, 1861, the then assistant assayer, Mr. William E. Du Bois, read before the American Philosophical Society a paper " On the Natural Dissemination of Gold," briefly setting forth the results of a series of investigations conducted by Mr. Jacob R. Eckfeldt, the assayer of the mint. These formed the basis of some curious propositions and calculations, which the author so interestingly presented as to lead to the republication of the pamphlet in England, as well as to countless abstracts by the daily press of our own country. Since then, there have been tidal waves of inquiry, and piecemeal expositions of the subject, the newspapers far and wide catching it up, copying and recopying from one another, diminishing truth and multiplying error, until it would seem that the time has now arrived
for a fresh start in an authorized republication. While
not strictly apropos of numismatics, there are reasons why this account of a treasure trove may not be altogether out of place, and certainly not void of interest to the readers of the American Journal of Numismatics. I therefore reprint the main portion of the original report, as follows:
"To assert that gold is at once a very rare and a very abundant metal would seem to be an abuse of language; and yet, in a certain sense, it would be true in both branches of the proposition. Iron, in its many mineralized forms, has been profusely scatterêd by the Cre ative Hand all over the world; and gold is found in so many natural situations and alliances where it would not be looked for, as to hold out the expectation that a diligent search would find it almost as widely, though by no means so plentifully, diffused. Such is not the fact in regard to many other metals, but it is remarkably true of the two whichstand in the market at the head and foot of the list.
"These remarks are preliminary to the detail of seve ral interesting examinations lately made by Mr. Eckfeldt, the principal assayer of the mint, from time to time, as opportunities of leisure would allow.
"The first experiments were made upon galena, or native sulphide of lead. It was well known that this was occasionally found to contain gold in larger or smaller proportions, according to the various localities But inasmuch as there is reason to believe that every variety of galena is argentiferous, it seemed an inter esting inquiry whether gold, as well as silver, is sure to be found in the same association. Our examinations
have gone far enough to warrant the belief that such is the case.
"We find in the galena of Ulster County, New York (Ellenville locality), gold to the amount of $171 / 2$ grains, or 75 cents, to the ton.
"The most curious result was obtained from the ga lena of New Britain, in Bucks County, Pennsylvania, where gold was found in the proportion of $21 / 4$ grains, not quite ten cents, to the ton. This represents one part in $6,220,000$, and may serve as a remarkable exam ple of refinement in the art of assaying. The operation was performed on five ounces of the ore. The speck of gold which resulted is visible to a good eye, and is exhibited in the cabinet of the mint.
'Turning next to the examination of lead in its metallic and commercial shape, 'we find the Spanish bar lead, which is sufficiently free from precious metals to be used as an agent in our mint assays, contains 12 grains of gold to the ton, or one part in about 1,170,000.
' The next inquiry was, whether other metals, especially those which are commonly considered to be naturally unaccompanied with gold, were absolutely so.
'Copper was tried in various forms. A cent of 1822, the material for which was imported from England, showed gold equal to one part in 14,500, which is one cent's worth in twenty cents. An English halfpenny showed a like trace of gold. A cent of 1843, of American material, was found to contain one cent's worth of gold in fourteen cents. The result brings to mind the old story of the golden cent of 1814 . In that year, as was idly reported, the melters at the mint carelessly emptied some gold into a pot of copper from which the cents were coined. It gave some trouble at the counter of the mint for many years afterward, in consequence of numerous inquiries and offers to sell. It turns out to be pretty certain that every ce
"Lake Superior cond, effectually locked in.
"Lake Superior copper is perhaps as free from gold as any, yet is not absolutely so. A trial of 30 grammes showed a quantity not sufficient to affect sensibly a delicate assay balance.
"Adverting to other metals, it is well known that silver is never found in nature quite free from gold.
"A specimen of metallic antimony was found to contain gold, one part in 440,000. In bismuth the gold amounted to one part in 400,000 . A specimen of zinc proved to be absolutely free from gold, a result which may relieve some minds of the suspicion that the very atmosphere of the mint imparts gold to everything within its walls, or that there was a want of the utmost tions.
"Perhaps the most curious result of all is that which remains to be stated.
'Underneath the paved city of Philadelphia there lies a deposit of clay, whose area, by a probable estimate, would measure over three miles square, enabling miles.* The a than fifteen feet. The inquiry was started whether gold was diffused in this earthy bed. From a central locality, which might afford a fair assay for the whole, the cellar of the new market house in Market Street, near Eleventh Street, we dug out some of the clay, at a depth of fourteen feet, where it could not have been
an artificial deposit. The weight of 130 grammes was dried and duly treated, and yielded one-eighth of a

* It must be borne in mind that these figures apply to the Philadelphia of twenty-five years ago. It is hardly necessary to remind the reader that
they would be much amplified now.-P. Du B.
milligramme of gold, a very decided quantity on a fine assay balance.
"It was afterward ascertained that the clay in its natural moisture loses about fifteen per cent by drying. So that, as it lies in the ground, the clay contains one part gold in $1,224,000$.

This experiment was repeated upon clay taken from a brickyard in the suburbs of the city, with nearly the same result.

In order to calculate with some accuracy the value of this body of wealth, we cut out blocks of the clay, and found that on an average a cubic foot, as it lies in the ground, weighs 120 pounds, as near as may be, making the specific gravity $1 \cdot 92$. The assay gives seven tenths of a grain, say three cents' worth of gold to the cubic foot. Assuming the data already given, we get 4,180 millions of cubic feet of clay under our streetsand houses, in which securely lies 126 millions of dollars. And if, as is pretty certain, the corporate limits of the city would afford eight times this bulk of clay, we have more gold than has yet been brought, according to the statistics, from California and Australia.
"It is also apparent that every time a cart load of clay is hauled out of a cellar enough gold goes with it to pay for the carting. And if the bricks which front our houses could have brought to their surface in the form of gold leaf the amount of gold which they contain, we should have the glittering show of two square inches on every brick.
' We have inquired but little into the researches of other experimenters in this line. Some years ago it was stated that Mr. Lennig's workmen had washed out gold from the sands of the River Delaware, and a French writer affirms that there is a trace of gold in the sands of the Rhine.
'When we consider the uses to which this noble metal is providentially adapted and wisely applied, we cannot but wonder at the apparent waste or misplacement by which so much is irrecoverably lost, and to all appearance had as well not been made. Perhaps such inscrutable mysteries in the realm of nature may help us to submit to other difficulties in other parts of the divine order and government. Of this we may be con-fident-that the atoms of gold are homogeneously and equally disposed through the clay or other matrix; but by whatnatural process, and for what final cause, these fine particles should be thus diffused, seems quite beyond the reach of human philosophy.
"The paper thus offered, however deficient and practically unimportant, may afford a diversion of mind, for the moment, from the one idea of the times upon which we have fallen."
In one sense the facts and figures may be regarded, t least by the unscientific, as "practically unimportant." But after all, there is another practicality, of the moral sort, suggested by the author's concluding reflections. If these "inscrutable mysteries in the realm of nature" do help us to "submit to other difficulties, ${ }^{\prime}$ their end is quite practical; and the marvelous attenuation that deprives the gold of all its value to the political economist accords it a new and higher value in the better economy of the moral and spiritual ife of man.
It remains only to add, that all the subsequent experience of these two assayers, as well as of those who upon the natural dissemination of gold.

## The Waring Anti-induction Cable.

The Waring anti-induction cables are manufactured in many forms to suit a variety of uses, and may contain any required number of conductors; but whatever the form, the general principle of construction is substantially the same in all. The conductor is first enveloped in a wrapping of fibrous or textile material, which is then saturated and coated with an insulating compound, to which the name "ozite" has been given, and the whole is afterward inclosed in a continuous sheathing of lead, which is pressed closely around the insulated conductors, each conductor being separately surrounded by the metal on all sides. This metallic sheath serves to perfectly screen each conductor from all induced currents from adjacent parallel conductors, making it the only absolutely anti-induction cable, and the only cable in which telegraph, telephone, and electric light circuits may be worked side by side without interfering the one with the other. The disastrous ef fect of induction on telephone circuits is so well known that no elaboration is needed. In the Waring anti-induction cable the inductive action from wire to wire is, of course, effectually cut off by the intervening shield of metal, a feature which renders the cable peculiarly well adapted for the telephone service. But not only does the construction of this cable prevent interference from induction in the cable conductors themselves, but also where air linies are connected to even a short length of the cable the latter is found to eliminate induction.
No underground cable that does not embody this anti-induction feature is adapted for a general underground system, in which telegraph, telephone, and other electric circuits may be worked in the same other

THE NEW YORK CABLE RAILWAY. (Continued from first page.)
in a few inches of each other. One of these sections now operates the line along 10th Avenue, and the other will in the near future operate cables passing through 125th Street, from river to river. On the main shaft are four loosely mounted pinions, two at each section. Each pinion drives a train of gearing carrying a pair of drums, and as they are precisely alike in construction, a description of one will answer for all. Meshing with the pinion is a gear on a shaft, a gear on a shaft, so mounted that it carries one of the driving drums upon its outer end. The second driving drum is carried by a shaft having a large having a large ear wheel, simi ar to the one on the first shaft Between and meshing with these gears is a smaller one. Around each pair f drums a cable is wound.
An important variation from the onstruction usu ally found in ma chinery of this kind is here introduced. Generally the bearings of the drum shaft are placed one at each side of the drum. The ad
vantage of placing both bearings at the same side engravings has been devised, says the Engineer, by Mr. of the drum, as in this case, is apparent. When the Lional Pearse, of Coalbournbrook, nearStourbridge, for tension car, owing to the stretching of the rope, has the production in an open boat, or in any boat at sea, reached the upper or farther end of the pit, the sur- of small quantities of fresh water from sea water with plus length of rope can be easily taken upby wind- out any heat supply except that of muscular energy ing it once more around the driving drums, there- The still and the small machine for illustrating the by saving the time trouble and ng. The the time, trouble, and expense of splic . The outer ends of each pair of drum shafts are onnected by a strut, adjustable in length by a key, and which serves to take the strain created by the cable passing around the drums, and relieves the bearings.
Each pinion on the line shaft is provided with a friction clutch operated by a handle lever, the bearing points of which are so arranged that there is no strain brought upon the shaft, to throw it either way in the direction of its axis, when the clutch is closed. The cluteh consists of two sets of steel plates, one set secured to the pinion and the other to a sleeve sliding longitudinally upon, but revolving with, the shaft. The plates of one set alternate between those of the other, so that when pressed together by the lever, operating through a compound toggle, the friction between them is sufficient to revolve the pinion with the shaft. The incoming portion of the cable passes around the drums, then around a sheave on a car running on tracks laid on the edges of the pit, shown in Fig. 1 , and then to a sheave located so as to guide the rope into the trench along the middle of the street, as shown in Fig. 2. The slack in the cable is taken up by weights on a differential lever at the upper or rear end of the tension pit. The two cables operated by the same section run through the trench upon independent pulleys at a distance of about 3 inches apart. The grip is formed with clutching jaws at each side of the lower end, so that either cable may be grasped to propel the car. By means of the double grip, the cable in use is bound to drop into the rooves of its own pulleys as the car passes on. A cross section of the trench is shown in Fig. 2.
The care of the ropes in the cable system is a very important item, and experience has proved that they should be examined at least once in twenty-four hours, to discover, if possible, any breaks which might otherwise cause the rope to "strand:" For this purpose the pair of small vertical engines shown in the center of each section are provided to move the idle rope slowly. It is also very convenient often in repairing a rope to move it a very little, without starting the main engines. Steam is supplied by four return tubular boilers of 150 horse power each, located in the rear of the engine room. The operating machinery was built by Messrs. Poole \& Hunt, of Baltimore, Md. Its smooth and almost noiseless working shows the accuracy and


Fig. 3.-NEW york city cable railway.-Enlarged view of one section.

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skill displayed in executing the designs, while the great through the seat, fixes the part above the seat to that size of many of the parts shows the facilities at their below. The metal supporting the boiler must be uncommand, and conveys some idea of the extent of derstood to be part of this fixed frame, though the their works. The duplicate system for cable railways is the invention of Mr. D. J. Miller. of this city.

MARING STEAM BY FRICTION.
The friction still illustrated by the accompanying section does not clearly show it. The movable frame,
$\mathbf{M}$, is capable of a sliding motion in three bearings, one above the pressure screw, S , and another to each side of friction wheel, W. It is single where shown in section, and branches off to each side of the whel to form bearings for the spindle, $P$. This frame brings the friction wheel, W, in contact with the boiler, B, at $B^{1}$ with any desired pressure, regulated by the prassure screw, S.
Theinequalities which may occur in the periphery of the friction wheel are compensated for in the elasticity of the packing at E . Either side of the spindle may be fitted with a han dle, and the same still can be work ed effectively within the range of power from that of a lad of fourteen years of age to 4 man pow er. The boiler, B is held in a hard wood block to prevent heat being readily conducted to the metal frame support ing it. The upper part of the ma chine is hinged at , and may be thrown open, leaving boiler and fric tion wheel exposed; the inner domes, $\mathrm{D}^{1} \mathrm{D}^{11}$, also hinge open or take out for any attention that may be re quired.
The overflow tank, T, is pivoted so as to be easily released from the boiler. The manner in which it is fed and the action are as follows: It will be seen that the upper tank, A, is full of sea water; from this tank the water is made to pass at intervals in the direc tions indicated by the arrows. It then passes down small pipes shown in the center, and feeds or saturates the flannel with which the two domes are covered. The arrows still indicate the course of the sea water after it has left the coverings, and it will be seen that that from the inner dome, $\mathrm{D}^{11}$, as it is collected by its trough, runs through a pipe in to the overflow tank, T which tank is openly connected with boiler, B, keep ing that fed with sea water to the height allowed by overflow tank; the overflow from the middle dome, $\mathrm{D}^{1}$, is allowed so run away as cooling water, because that from the inner dome is sufficient feed for the boiler, and, being hotter than that from $\mathrm{D}^{1}$, is preferred. The water enters the boiler at the bottom, as shown by the arrow. The heat result of the friction of the wooden wheel, W , against the steel on the boiler at $\mathrm{B}^{1}$ causes the sea water to boil in about half a minute. The steam then rising is wrapped in the dome, $\mathrm{D}^{11}$, and, condensing upon its inner surface, drains away into its trough, then from that to outlet pipe, P. The condensed steam or distilled water may be traced throughout the engraving indicated as drops.
The heat given up by the steam condensed upon the inner surface of dome, $\mathrm{D}^{11}$, will be imparted to the sea water held in the saturated flannel covering the dome, $\mathrm{D}^{11}$; this water is freely vaporized at a lower tempera ture than that required for the boiler, its vapor being condensed upon the inner surface of dome, $\mathrm{D}^{1}$, inclosing it. ' The action of vaporizing and condensing goes on in the next compartment; as just described, but at a lower temperature; the product from the three con densing surfaces can be traced as drops all flowing into and out of outlet pipe, P. The feed water, W, in the tank, A, will, when the machine is in full work, reach a temperature that a delicate hand cannot bear by heat imparted to it from the vapor which condenses upon the domed bottom of the tank.
If the machine is worked by the power of a boy of fourteen years, the product from the two flannel-covered domes will be nearly double that of the boiler; if worked by a man, the product from the boiler will be equal that of the two domes, making the profit through the domes upon the man's work much less in proportion to that of the boy's work. Cov-
ered domes may be used with profit to any convenient number, but, on account of size, the inventor prefers to put only three in the friction still. In its present form the still is capable of producing thirty pints of distilled water in twenty-four hours, sufficient, he thinks, for any small boat's crew. Salt will not, we are informed, appear deposited if the machine is used properly, or unless all in the boiler or in the domes is vaporized to dryness.
Should this occur-and it must occur many times before sufficient salt is incrusted to causeany serious loss of heatit can be got at by throwing the top open and releasing the overflow tank. The domes are cleansed by allowing a quantity of water to flow over them when not at work. The inventor explains the non appearance of salt in the boiler and on the flannels by saying that, in the case of the flannels, all the water fed to them is not vaporized; thus the salt is kept in solution, and is carried off in the water as it runs to waste or to the overflow tank. The boiler does not show any because of the overflow tank, which is al ways wasting water, and its water being nearly as heavily charged with salt as that of the boiler, because a certain amount of circulation goes on between them; so the salt is kept at an equilibrium, regulated by the salt carried away in the overflow. The hard salt that does appear is only found on the outside of the overflow tank, TT. So long as the evaporation in the boiler is not allowed to empty it, no salt appears there.
Fig. 1 of our engravings shows another arrangement by the same inventor for utilizing friction as a mode of heat. As this is not like the still-a thing treating of life and death-he has thought fit to make it rather fantastic, and his design carries us back many ages. A single casting, taking a snake-like configuration and the necessary course, forms the whole of the frame; a sliding box carries the wood in which the boiler is mounted; the spindle of friction wheel has one bearing in the mouth of the creature and another in the frame at the opposite side of the friction wheel; the radiating flame piece or wheel boss is in one piece with the spindle or is fixed thereto, the purpose of it being to fix the wooden wheel; an ordinary handle and bolts complete the machine, the boilers for which may have various sizes or shapes, according to purpose.
The inventor devised it as specially suitable for lectures on physics, for use in magazines where fire is not allowed, or for heating shaving water, where half a minute's vigorous work every morning serves the purpose of providing a little hot water for this purpose, waking the shaver up, and providing him with exercise which is better now than in July.


BOARD AND PAMPHLETS PERFORATED BY THE TERMES fLAVIPES.


## FEATHERED BUTCHERS.

## the termes flavipes.

We received some time ago, from Mr. Joseph Eich baum, of Pittsburg, a pamphlet which had been curiously eaten away by a small boring insect. The pile containing the pamphlet stood on a half inch board, and was about three feet high. Both board and pamphlets had been completely penetrated as represented in our engraving. Mr. Eichbaum found a small white worm, to which he was inclined to attribute the injury. After examining the result of its work, however, Professor C. V. Riley, the Government Entomologist, decided that it was due to the activity of that mischievous pest of the libraries, the white ant. He describes it as follows:
'The pamphlet perforated with numerous round, or oval, or oblong holes, or even with long branching slits, admirably illustrates the work of one of the most dangerous insect enemies to libraries and stored paper. This is the notorious white ant (Termes flavipes), which has received its popular name from its external resemblance to our commoner ants, as well as from its somewhat similar mode of life, i.e., congregating in large, well organized colonies. Otherwise, the white ants have no relation to the true ants, the former belonging to the order Neuroptera, the latter to the Hymenoptera. The colonies of Termes flavipes, the only species of white ant occurring in North America east of the Rocky Mountains, are to be found in the ground under large stones, or within old stumps or roots, but never exposed to the light. As the food of these insects consists of dry vegetable fiber, their work in the field proves beneficial by hastening the decay and crumbling of old logs, etc.; but, unfortunately, these insects also destroy fence posts and fence boards, enter our houses, and stealthily weaken the beams and rafters. But, above all, they prefer to attack rows of old leather bound books or piled up paper, working through covers and pages in the manner illustrated by the pamphlet sent by Mr. Eichbaum. As the white ants never come to the surface, but always work in the interior of woodwork or within books, the mischief done by them is usually not observed until the destruction is complete, and herein lies the great danger from these insects. Thus quite a number of instances are on record where in public or private libraries large rows of valuable books or documents were found to be utterly destroyed by the white ants before their presence was suspected.
"In the Southern States, and especially in tropical countries, the white ants are much more numerous and their inroads into houses more frequent than in the North, so that in some places it is only possible by
incessant watchfulness to preserve and protect the
public records. Books kept in rather damp and dark places are more exposed to this danger, but perfect safety can only be secured in buildings constructed entirely of stone and iron.
"If we examine the individuals of a colony of white ants, we find among them the same wonderful variety of forms as exhibited in honey bees or true ants. By far the most numerous class are the workers, which are asexual, wingless, yellowish white, the head being small, rounded, and the jaws very minute; then come the soldiers, with immense head and jaws, and then the large females."

## FEATHERED BUTCHERS.

The name butcher bird, that is often given to the family Laniada, or shrikes, is not misapplied, as they are quite equal to the hawks and other predatory birds in their courage and the cruelty in which they seem to delight. They have a wide geographical distribution. In southern California they are particularly common, and at the time of writing, Dec. 17, in Los Angeles County, they are to be seen uponalmost any tree, where they sit motionless, awaiting the approach of their prey, which is of a most varied character.
The shrikes are powerful birds, of attractive mien, presenting an appearance indicative of courage. In many the upper mandible is arched and hooked, forming a powerful weapon with which to tear and lacerate their prey. The adults attain nearly the size of a robin.
It is, however, the habits of the bird that are the most interesting, and the term butcher is applied perhaps from the fact of their impaling their victims. In California they catch a large variety of lizards, including the horned toad, mice, and kangaroo rats, and one has been seen flying laboriously, carrying a blue jay quite as large, if not larger, than itself. As a rule, game thus captured is taken to some favorite spot and impaled or hung up, and then torn apart, so that in a locality frequented by these birds quite a museum is often found, composed of the dried reroains of various animals, the dismembered parts, bits of bone, and other material. In southern California the orange tree offers every inducement to these butchers, the thorns with which the branches are armed being used for this singular purpose of laceration. Sitting perfectly immovable on a twig, the bird suddenly espies a horned toad or lizard, and darting down, before the frightened animal can bury itself or seek shelter, it is seized in the powerful beak and borne struggling to the place of execution. At first the victim is often held down with one claw, after the manner practiced by hawks, and so torn and lacerated; but generally a sharp thorn or a pointed twig is selected, and the body forced against it until it is firmly impaled. This having been accomplished successfully, the body is sometimes left, as often the capture is seemingly made in wanton pleasure, for the mere sake of killing; the victim left disemboweled-a grim warning to others.
When the butcher is disposed to devour its game, the thorn is used to help tear it apart, the flesh being

$a$, larva; $b$, winged male; $c$, worker; $a$, soldier; $e$, large female; $f$, pupa. (After Riley.)
torn in both directions. So strong is this habit that in confinement the bird still takes advantage of any sharp object. Thus a pointed stick, sharpened for the purpose, being given a caged butcher bird, all its food, consisting of faw meat, was immediately placed upon it, and either left or devoured.
A neighbor of mine arranged a series of spikes in a star form, for the benefit of the birds that carried on their depredations in the vicinity, and found that hey eagerly took advantage of the artificial thorns, Not only were living being arranged upon the spikes. Not only were living creatures impaled, but various
gaudy objects that might attract attention. My informant watched one bird for a long time, at work, attempting to disengage a piece of red flannel from a bush where it was entangled. It was eventually successful, and immediately the gay cloth was hung among the victims, a ghastly piece of humor, the red pennant waving in the breeze, seemingly intensifying the horrors of the butchery.
This bird, which was of extreme size, was seen attempting to carry off a young pouched gopher; but it was only able to bear it to the ground under the impaling machine, where, by discordant shrieks, it showed its rage and displeasure.
The butcher bird appears to entertain a particular hatred to caged birds, darting toward them with the greatest fury, and, if unable to reach them, flying about the cage, in some instances causing the death of delicate canaries from mere fright. In a case that came under my notice a butcher bird noticed a canary hanging inside a window, and darted at it with such force that the pane was shattered. The butcher must have been severely shaken up at least, but it kept fluttering left when driven away by the interpsition of some the family.
This occurred in Connecticut, but the birds here in their winter home exhibit the same hatred. In our neighborhood a pair of birds were hung out under a live oak, and on going to take them in, the owner found both birds lying on the bottom of the cage headless, these important members having been ruthlessly torn off, and one ornamenting the thorn of a neighboring orange tree. As the cage was neither broken nor bent, it was somewhat of a puzzle how the outrage was perpetrated, but later the same bird was seen darting at another caged canary that hung in a window. The butcher rushed at it, seizing the wire with one claw, and by beating the cage with its wings it completely demoralized the inmate, who finally, in its struggles, flew near the bold intruder, who quickly threw out one of its powerful claws and grasped viciously at its victim. Undoubtedly it would have torn the canary's tim. Undoubtedly it would have torn the c
head off in this way had it not been disturbed.
The butcher birds are not at all particular as to their food, it varying from blue jays and gophers to grasshoppers, even worms, scorpions, and centipedes being found impaled on the same or neighboring trees.
Although these birds are cruel and vindictive, they are bold and courageous in any contingency, attacking the largest hawk or eagle in the defense of their young. The peculiar bravery of the little king bird, a member of this family, is well known. I have often seen them combine against a hawk and utterly rout him. Crows seem to be especially disagreeable to them, and one king bird is quite sufficient to dispossess an ordinary crow. Wilson says, in referring to the American butcher bird: "The character of the butcher bird is entitled to no common degree of respect. His activity is visible in all his motions, his courage and intrepidity beyond every other bird of his size (one of his own tribe only excepted, L. tyrannus, or king bird), and in his affection for his young he is surpassed by no other. He associates with them in the latter part of summer,
the whole family hunting in company. He attacks the whole family hunting in company. He attacks the largest hawk or eagle in their defense with a reso-
lution truly astonishing; so that all of them respect him, and on every occasion decline the contest. As the snows of winter approach, he descends from the mountainous forests and from the regions of the north to the more cultivated parts of the country, hovering about our hedgerows, orchards, and meadows, and disappears again early in April."
The common American form is the Lanius borealis, while the familiar English species are the great gray shrike (L. excubitor) and the red-backed shrike (L. collurio). The former is about the size of a thrush, with a powerful black beak, protected at its base by bristles. The upper portions of the plumage are pale blue ash, with white underneath. The wings and tail are black, also a band that crosses the eye, some white
being on the scapulars and tail. Referring to this bird, being on the scapulars and tail. Referring to this bird, an English writer says:
"It is common all the year in France, and is known in this country chiefly as a somewhat rare winter visitant. It is one of our late birds of passage, but its arrival is soon made known to us by its croaking, unmusical voice, from the summit of some tree. Its nest is large and ill concealed; and during the season of incubation the male bird is particularly vigilant, and uneasy at any approach toward his sitting mate, though often by his clamorous anxiety he betrays it. The female, when the eggs are hatched, unites her vociferations with those of the male, and facilitates the detection of the brood. Both birds are very assiduous in their attentions to their offspring, feeding them long after they have left the nest, for the young appear to be heavy, inactive birds, and little able to capture the winged insects that constitute their principal food. I could never discover that this bird destroyed others smaller than itself, or even fed upon flesh. I have hung up dead young birds, and even parts of them, near their nests, but never found that they were
touched by the shrike. Yet it appears that it must be
a butcher too, and that the name Lanius, bestowed on it by Gesner two hundred and fifty years ago, was not lightly given. My neighbor's gamekeeper kills it as a bird of prey, and tells me that he has known it to draw the weak young pheasants through the bars of the breeding coops; and others have assured me that they have killed them when banqueting on the carcass of some little bird they had captured. All small birds have an antipathy to the shrike, betray anger and have an antipathy to the shrike, betray anger and
utter the moan of danger when it approaches their nests. I have often heard this signal of distress, and, cautiously approaching to learn the cause, have frequently found that this butcher bird occasioned it. They will mob, attack, and drive it away, as they do the owl, as if fuily acquainted with its plundering propensities."
The red-back shrike derives its name from the fact that the back, scapulars, and wing coverts are a rusty red hue. It arrives in England in May, breeds in the southern counties, and departs in September for France and the countries bordering the Mediter-

The butcher bird in southern California greatly resembles the English great gray shrike, and presents an attractive appearance when on the wing, the black, gray, and white markings affording a striking contrast They are quite valuable from the fact that they destroy so many noxious insects.

## How the Ocean Bottom is Lighted

One of the most striking things noticeable in dredging is the great variety and brilliancy of colors in the deep sea animals. There are bright red sea anemones, deep purple sea pens, delicate pink corals, pure white sea cucumbers, and dulb black fishes, all mixed up in
a mass of bluish gray mud. A few of the animals are a mass of bluish gray mud. A few of the animals are
blind, but most of them have very well developed eyes. In depths of over 1,000 fathoms it is physically impossible for the faintest gleam of sunlight to penetrate. It must be darker on the ocean bottom in 2,000 fathoms than the darkest starless night, that is, if nothing but sunlight were to be depended upon. If it was as dark as that, neither eyes nor colors would be of any use. Nature does not support useless
organs, and when an organ is no longer needed, it is dropped. The fish of Mammoth Cave, no longer need ing eyes, have become blind. Such would be the case in the deep sea. Another proof that there is light on the ocean bottom is the fact that many unprotected animals assume the colors of larger ani mals on which they habitually live. There is a brit tle star that is always found in the branches of a bright orange-bush coral, and unless looking at it
very closely, one can hardly distinguish it. There is an object in this-the starfish wishes to conceal itself; but if the ocean bottom was totally dark, there would be no need of such an arrangement, for the darkness alone would be sufficient.
One evening the dredge came up at eleven o'clock and the electric light suddenly went out while we were examining its contents. Just before it became dark, I had thrust my hand in the mud to draw out a rare shell; and when I withdrew my hand it glowed with phosphorescence, the mud was covered with a phosphorescent light, and many of the animals when touched gave out a brilliant glow. This was the secret of the deep sea eyes and colors. With such a light, both sight and color would be as useful at the bottom of the sea as on the surface.
I believe, if we could suddenly find ourselves on the ocean bottom, in 2,000 fathoms, we should see brilliant white lights, casting intense shadows, illuminating the ocean bottom in an effectual manner. There would be vast tracts of darkness almost absolute, and here the blind forms would habitually live, having no use for colors or light. Groves of coral would shine with this intense light, shrimp and fish would
dart about, specter like, over an illuminated pathway, each carrying his own lamp, and the whole ground would be one glow of phosphorescent light.
On the surface many animals are phosphorescent; the large schools of mackerel and menhaden can be seen for miles emitting a bright light. In the evening, on the seashore, the surface is often aglow with
silvery light. On such nights the sailors say, "A silvery light. On such nights the sailors say, "A
storm is coming." The billions of embryos and microscopic animals that fill the surface waters each emits a little firefly spark, and all vie with each other to see which canexcel in brightness. The result is a sheet of pure white light. The boat leaves a train of bright light and silvery drops fall from the oar back into the water, sending a little spray of light into the air, and spreading out little ripples of phosphorescence. Why these tiny animals emit their little sparks is not known, though it is generally said that it is the result of nerv-
ous excitement or irritation. When sailing in the ous excitement or irritation. When sailing in the
Gulf Stream, I have passed through schools of jelly fish, when the prow of the vessel turned up brilliant waves of living light, and the whole surface for miles around was aglow with phosphorescence. In this case the light is for protection. Animals that might be dangerous enemies to the softlbodied jelly fish
deadly stinging powers, and they instinctively avoid it. But young and inexperienced fish have not yet learned the lesson; and so, attracted by curiosity, they approach the light and receive the deadly shock, and furnish food to the well protected jelly fish. If one escapes, it never tries the experiment again, for just as certain as it comes near the jelly fish it receives a shock that, if not fatal, is strong enough to inspire it with terror that will never be forgotten. An inoffensive animal has learned the terror that the jelly fish inspires its enemies with, and has assumed the same protective light. This is Pyrosoma, the sea lamp, a cluster of ascidians that have no stinging power whatever, but which defraud fish that might be dangerous enemies into the belief that they are jelly fishes. There was a time when the ocean bottom was much nearer the surface than at present, and when sunlight pervaded the entire water. Phosphorescence was then in use by a few animals just as it is to-day, for protective powers. Gradually the ocean bed sank and became darker, until the sunlight was no longer of use to the denizens of the deep. The few phosphorescent animals found another use for their light than protection. It became serviceable as a lamp to illuminate their dark home. Other animals saw the use of the light, and, just as in the case of Pyrosoma, began to adapt themselves to their surroundings by becoming phosphorescent. There is some strange law of evolution that allows this to be done. Animals and plants alike in their struggle for existence can assume colors and forms best adapted for survival. This is illustrated on every hand in the sea and on the land. What the power is that allows them to do this is unknown. Be it Providence, instinct, or unconscious change, the result is the same; it is done and is being done every day, nearly always to the advantage of the species.

Ralph S. Tarr.

How an Astronomer Captured a Comet.
In the Scientific American of January 16 we gave a notice of the recent discovery of a new comet by Mr. W. R. Brooks, of Red House Observatory, Phelps, N. Y. The following extract from a private letter by Mr. Brooks to a friend, which we are permitted to make, gives an interesting account of some of the circumtances attending the discovery:
Mr. Brooks says: "When I discovered the new comet in the early evening of December 26, 1885, it was in the constellation Aquila, and already low down in the western heavens. It was fast settling down into the tops of the trees of my orchard, and for some time the limbs of the trees were visible in the field of the telescope along with the comet, greatly to my embarrassment. I had secured the approximate position of the comet, but had not obtained its direction of motion, which I was very anxious to do in order to telegraph the discovery that evening. But the comet soon disappeared behind the trees, and furtherobservations were impossible that night from the observatory. So I removed the telescope from it spermanent stand, carried the instrument across the garden and around the house to the front yard, which faces the west. It was a heavy lift and a big armful, for the telescope tube is of iron, and a foot in diameter. I called to my wife and father to bring out a table, laid the upper end of the telescope upon the front fence, and with boxes, door mats, books, and papers placed upon the table raised the other end of the telescope to the proper angle. While I stood out in the road, gazing into the telescope my wife stood in the yard holding and moving the instrument at my direction to follow the fast setting comet, while father placed books and papers under neath to keep the plescope in position.
"In this way my last observations were made. I followed the comet until it almost touched the distant horizon, and was enabled to telegraph the discovery the same evening by 8 o'clock, with three-quarters of a mile to go to reach the telegraph office. It was promptly cabled to Europe, and in a few hours the discovery was published throughout the civilized world."

## Ruined by the Patent Register.

Moseby, who has been a way from town for some time, eturned the other day. Shortly afterward a friend met him, and noticing his seedy and low spirited appearance, asked:
"Moseby, what's the matter, old fellow?"
"Ruined."
"A financial wreck."
"How did it occur?"
Well, you see I had charge of a bridge not far from here. 'The owners are very particular about receiving every cent that is due them, so they put in one of those registers. It is a sort of fool arrangement sunk in the foot passageway of the bridge, and makes a mark with a clicking punch every time anybody stepson it. Well, everything was all right until the ather day. A big Newtioundland dog got on the blamed thing and began to scratch himself, and, sir, before I noticed him he had charged me up $\$ 275$. Yes, I am a ruined man."-Arkan saw Traveler.

## Photo Printing by Machinery

Regarding the new method of printing by machinery, invented by Mr. John Urie, of Glasgow, having seen the machine at work, we are in a position to give such an account of it as will enable our readers to understand its action.
Externally the machine consists of a long box of about the dimensions of a foot and a half square, and of three times that length. In a recess in the center is fixed a pad, over which a long band of Alpha paper passes, as it is being unwound from a spool at one side upon a drum at the other. Surmounting this pad is a heavy metal frame containing the negative, this being hinged at one side so as to admit of its being raised when it is necessary to move the paper underneath; and above this in turn are two gas burners. Certain clockwork in the interior is actuated by two weights as the motive power
The time of exposure is regulated by the adjusting of a barrel or drum containing spikes inserted in its periphery, and by which the duration may either be five seconds, three minutes, or anything between. To prevent the heating of the negative by the gas flames that are so near, a glass bottomed trough of water is interposed.
When we saw it in action, the following movements took place: The clockwork, when started, turned down the gas to a very low point, raised the weighty frame, in which the negative was fixed, to a height sufficient to enable the sensitive paper on the spool to be pulled forward a distance equaling the width of the negative, which was no sooner effected than the negative was immediately lowered again upon the paper, with which it remained in that olose contact insured by the weight of its frame. Simultaneous with this movement the gas flames were turned up to their full power, and remained so during the period previously determined
 upon as that necessary for impressing the image on the paper, the whirr of the machinery being heard all the time. At the expiry of this predetermined period down went the gas, the negative being then raised dhe paper drawn forward the requisite distance, when the negative resumed its place on the paper, the lights being turned up, and the whole process of exposure re-enacted.
As the machine registers the numbers that are printed, the attendant may lock up the room and go away, ascertaining on his return the precise number that has been printed during his absence.
To develop, the exposed paper is cut into suitable lengths, each containing thirteen prints, and is placed in a bath of ferrous oxalate, by which the latent image becomes visible, at first very faintly, although it soon acquires great vigor. The band of prints having been washed is then transferred to a bath containing alum solution, in which it remains ten minutes. It is then placed in a gold toning bath, where it acquires any color desired. This tone may be determined with accuracy, as the prints undergo scarcely any change at all when, subsequently, they are fixed hy hyposulphite of soda. It will be understood that one print is identical with another in vigor and tone, and that these qualities are quite under the control of the operator. As many as two hundred cartes or cabinetsmay easily be printed in an hour by one machine.
As regards quality of print, it is all that need be desired.-Photo. Times.

## Best Plant for Holding Banks.

The best plant at present known for consolidat ing, by the interlacing of its roots, the loose soil of a newly made embankment is, according to M. Cambier (of the French Railway Service), the dou ble poppy. While the usual grasses and clovers need several months for the development of their comparatively feeble roots, the double poppy germinates in a few days, and in two weeks grows enough to give some protection to the slope, while at the end of three or four months the roots, which are ten or twelve inches long, are found to have interlaced so as to retain the earth far more firmly than those of any grass or grain.

Though the plant is an annual, it sows itself af ter the first year, and with a little care the bank is always in good condition.

## WHITTLED FANS.

If you had been passing a certain bustling and smoke begrimed railroad depot, in a city not far from our
(6).
great metropolis, during the pleasant summer days, you would havenoticed an industrious blind man whittling away at a piece of wood which, when he had laid his knife aside, he dexterously twisted into a fan, much to the delight of the numerous small boys and other passers-by who were attracted by his peculiar occupation.
Thinking that what interested the boys who had gathered around in a group watching this blind worker would interest the boy readers of this paper, the writer stopped and watched him make several, so as to be able to describe to the boys (who possess a jack-knifef how this ingenious fan is made, in order that they may be able to make them for their own use or to present to their friends.
First, obtain a piece of soft white pine, free from knots, 12 inches long, 2 inches wide, and seven-eighths of an inch thick. Make an incision on each side of the wood $5 \frac{1}{2}$ inches from one
 end to the center of the incisions, and leave the wood a quarter of an inch thick between them (Fig. 1). Now split the shorter end of the wood downward (see knife in Fig. 1), as far as the two incisions, into sections one-sixteenth of an inch thick Twenty-four parts or blades are needed to make a well proportioned fan. Cut off the surplus ones, half from ach side, before making the handle.
The longer part of the wood is thinned down into a handle, any shape the maker desires (see Fig. 2). Now make three more incisions on the same flat sides as the first were made, beginning three-quarters of an inch above the handle. These incisions should be about a quarter of an inch deep, three-eighths wide, with a quarter of an inch of the flat surface left between each incision (Fig. 2).
Before bending the blades into shape the wood must be thoroughly soaked in water, or they will snap off while being bent.
When the wood is well saturated, begin to bend the blades on one side (as shown in Fig. 3) until the center is reached. Overlap the shoulder (made by the top in cision) on the left side of each blade with the right of each succeeding blade. When one-half of the blades are in position, turn the fan to the other side and bend them in the same way. This will complete the fan (as shown in Fig. 4).
V. S.

Navigating the Suez Canal by the Electric Light.
In presence of the continued increase in the traffic through the Suez Canal, even during the present commercial crisis, and to provide for the still greater increase that is anticipated in consequence of the aboli-


Fig. 4.
by which merchandise now reaching Europe from the East and from Australia by the route round the Cape will be able to be sent through the Canal, the company has for the last two years been making experiments with electric lights, with a view to enable vessels to continue their passage through the canal during the night. These experiments (says the Paris corre spondent of the London standard) have at length proved so successful that it has been resolved to permit from the 1st of January next all vessels of war and postal steamers provided with the requisite electric lights to navigate by night that portion of the canal comprised between Port Said and kilometer fifty-four. Therefore, in almost half that portion of the canal where ships have to put into sidings to allow other vessels too pass them-in the Bitter Lakes vessels pass each other without stopping-vessels of war and mail boats, that together represent 22 per cent of the total traffic, will be able to continue their passage at all times of the day and night. This will constitute a great saving of time, and M. De Lessep in his circular expresses the confident hope that the trial will be so successful as to enable him to authorize within a short time night navigation for all descriptions of vessels through the whole length of the canal.

## Torpedo Experiments.

The London Times gives particulars of some important experiments carried out recently on the torpedo ground outside Portsmouth Harbor, in the Solent. Within the area of the torpedo field situated opposite the sea fronts of Forts Monckton and Gilkicker, near Portsmouth, an important experiment in submarine mining was carried out recently by Captain Markham and Commander Robinson, of the Vernon, on the part of the Royal Navy, and by Major Bucknill and Captain Wrottesley, on the part of the Royal Engineers. At each corner of a quadrilateral was sunk a heavy mine, consisting of 500 pounds of gun-cotton, inclosed in wrought iron cylinders, all four being in separate elec rical connection with a battery on shore. The distances of the mines apart were the same as is usually observed in the navy as being within effective destructive range.
At various known distances rom the charged mines were submerged a great number of cases of various construction loaded down with dummy guncotton as target mines, and the object of the experiment was to ascertain the effect upon the different structures of exploding heavily charged submarine mines in their neighborhood. Twelve of the targets consisted of simple Royal Engineer mines, ined with plaster of Paris and
 cement, also of electro-contact mines. The targets also included naval countermines, fixed mines, and electro-contact mines, service and experimental. Among others weresamples of the ingenious mechanical fixed torpedo invented by Lieutenant Ottley, late of the Vernon, which sinks to a predetermined depth on being thrown overboard, and a soli tary example of the mines which were manufactured in England for the use of the Chinese Government on he commencement of hostilities with France. This differs from the service pattern in form and mate rial, being constructed of cast iron instead of wrought iron, and semicircular or umbrella shaped in section, instead of cylindrical or spherical.
The various mines were all fixed buoyantly, and were destitute of blowing-up charges, as the purpose in view was not to discover whether the explosion of the heavy mines would detonate those in their midst, but to learn the comparative effects of the concussion on the containing vessels and gear, the force of the explosive at different ranges being measured by crusher gauges. Such heavy charges of gun-cotton, amounting in the ag gregate to 2,000 pounds, and having an energy equal to about 8,000 pounds of gunpowder, had not previously been simultaneously discharged at Portsmouth. The charges were simultaneously exploded at a quarter past 12 on a half-ebb tide. As a spectacle the effect was somewhat disappointing. The spouts of water were almost connected, and were extremely jagged in outline, but they did not rise to the height expected, the stream of mud which overflowed the interior lining of the jets showing that the mines were scarcely buoyant at the time of the explosion. The detonation was not unpleas ant on shore, but the radial extension of the dis turbance must have been effective, as fish were stunned at considerable distances out to sea. The results of the experiment cannot yet be known, but it is believed that the Chinese mine is brok en up. \&

## ENGINEERING INVENTIONS

 An oscillating engine has been patented by Mr. Douia C. Putnam, of Wayne Center, N. Y. Thesteam inlet and exhaust ports in the cylinder and the steam inlet and exhaust ports in the cylinder and the
exhaust ports in the valve may be lengthened to any desired extent to permit quicker work in engines designed for any special duty, but the travel of the valve is in any case comparatively short,
ing movement of the cylinder.
A traction engine has been patented by Mr. Benjamin S. Benson, of Baltimore, Md. It has two obliquely arranged eylindrical boilers, with their higher ends in the midade 'and next to each other, the epace
beneath the cylinders forming the firebox, with hollow beneath the cylinders forming [the firebox, with hollow
legg, which communicate with the water and steam space of the boilers, and the apparatus having an endspace of the boilers, and the apparatus having an end
less track chain with feet passing beneath, around, and over the boiler, with guide and truck wheels for the
chain, to support the body of the engine and the track upon which it runs, with various novel features for re ducing friction and facilitating the guiding of the engine

## agricultural inventions.

A grain separator has been patented by Messers. Francis Waddsworth and Henrry N. Prentice, of Venice, $\mathbf{O}$. It is intended to separate the straw and
chaff from the grain at the same time, and then remove chaf from the grain at the esame ime, and then remove
the unthrashed and partly thrashed heads and heavy impurities that may have passed through the thrashe
A seed planter has
A seed planter has been patented by Mr. Louis S. Flatau, of Pittsburg, Texas. Its construc
tion is such that as the planter is drawn forward the tion is such that as the planter is drawn forward the
hopper and a stirrer wheel are revolved, the latter forchopper and a tirrer wheec arg revovived, the atter forcwhich and the tubular plow they fall into the bottom of the furrow opened by the plow, where soil is throw upon it by covering plows.

## miscellaneous inventions.

A lemon squeezer has been patented by Mr. Sheridan S. Badger, of Chicago, III. It has a fixed or stationary jaw, a hinged swinging jaw, and a handle or lever, so combined that the power from the com until the operation is completed.
A fire escape has been patented by Annie M. Jeffers, of Chicago, Ill. It is a spiral struc-
ture ranged along the windows of a buildings, and conure ranged along the windows of a buildings, and con-
aining a ladder, being stretched or opened opposite the windows, and having safety chains at such openings wind also an alarm bell.
A pipe tongs has been patented by Mr. James J. Palmer, of Fall Brook, Pa. The invention consists essentially of tongs in which the binding
contact surface is composed of a number of sections, and by removing or adding links or sections the tong may be adjusted to fit almost any sized pipe
A nail plate furnace has been patent ed by Mr. Simeon Bunn, of Belleville, Ill. It has double bottoms or decks, with openings, and outer walls with openings, so arranged that the products of com-
bustion will be carried by a long, indirect passage, and the heat will be utilized to the greatest possible extent
A reflector has been patented by Mr. James E. McLaughlin, of Portland, Oregon. It is for gas, lamp, or other artificial lights, and is so made that of metal and polished, can be conveniently kept in the desired position behind a burner.
A tag making machine has been patented by Mr. Harmer Denney, of Brooklyn, N. Y. This machine takes the paper from a roll, and by a series of automatic operations the tags are printed, cut, eye-
leted, cut off, and their corners beveled, the machine leted, cut off, and their corners beveled, the machine
being readily adjusted to make tags of different widths. A motor has been patented by Mr. Jackson B. Miles, of Lincolnton, Ga. It is a spring motor intended for use in connection with churns to
operate the dasher staff, and when wound up the mech operate the dasher staff, and when wound up the mech-
anism works from fifteen to forty-five minutes, according to the speed at which it is allowed to run.
A tongue support has been patented by Mr. Milo M. Russeil, of Hayward, Wis. The running gear of a wagon and its tongue is combined with a gear of a wagon and its tongue spring of pections for holding the tongue, whereby pro-
abision is made for adjusting the tension of the spring, vision is made for adjusting the
and the whole heft is equalized.
$\Lambda$ necktie fastener has been patented by Mr . Daniel T. Freese, of North Amherst, $\mathbf{O}$. It consists of a plate slotted twice to receive the tie, and with a forked arm bent over parallel with the slotted por-
tion to receive the collar button, the arms of the tion to receive the collar button, the arms of the
fork being at right angles with the slots of the body of fork being
A two wheeled vehicle has been patent ed by Messrs. William E. Davies and William C. Gayey, of Deringer, Pa. This invention consists in mak ng the thills in two parts hinged together, with a spring and relieve the horse to some extent of the weight upon his back
A belt punch has been patented by Messrs. Henry Bouchy and J. Henry Bamberger, of
Newark, N. J. It has pivoted lever jaws, with a sliding tool in each handle end, and a revolving head carrying cutting devices on one of the jaws, with a rotary disk provided with p
convenient tool,
A metallic bayonet scabbard has been patented by Mr. James McKenney, of New York city It is made with an outwardly projecting flange upon
the angular side of its upper end to overlap the edge of the angular side of its upper end to overlap the edge of the scabbards and the throgs will be firmer and more secure than with the ordinary construction.
A bellows has been patented by $\mathbf{M r}$. more F . Weititzel, of Cincinnati, $\mathbf{Q}$ It is intended
ar bee smoking, and comprises main plates of sheet metal bent at their edges, forming
rooves or pockets, while the bag or fiexible portion has
its edges inserted and held in these pockets, with various other novel features.
A broom holder has been patented by Mr. James F. Barringer, of Bennettsville, S. C. A Uhaped plate and rod are so combined with cross pieces
nd arms as to make a holder in which broom straw or rattan can be clamped, as well as bagging, cotton waste, rope, to form a mop,
A safety device for elevators has been atented by Mr. Peter Moran, of New Orleans, La. The object of this invention is to prevent the water in the nks of hydraulic elevators from being worked so low to empty the pipes and allow the car or cab to fall, parts is provided.
A nutmeg grater has been patented by Mr. Albert L. Platt, of Bowling Green, Mo. It consists In a revolving barrel made of a spiral coil of steel wire having notched outer edges, combined with a block
having a hole through it and a counter bole or hole at right angles, to form a case in which the spiral cylinder

A land channeling roller has been patnted by Mr. Robert H. Banks, of Fort Lewis, Col. It is so made that as the machine is drawn forwara plows
open furrows in the ground and ribs pack or roll the pen furrow in these furs, while onother roller olls the surface, so as to form channels for irrigation purposes in rolled land.
A sawing machine has been patented by Mr. Daniel W. Smith, of Long Lake, Mich. The achine is attached to the log to be sawed, and then by imparted to the saw through a shaft and pitman, the motion of the saw being directed by a guide, while the

## NEW BOOKS AND PUBLICATIONS.

## YNAMO-Electric MaChinery. B

 Silvanus P. Thompson. Newand London: E. \& F. N. Spon.
This is a second and much enlarged edition of a olume published by the same author in 1884, which
was itself based on the Cantor lectures of Professor was itself based on the Cantor lectures of Professor
Thompson before the Society of Arts, in 1882. The Thompson before the Society of Arts, in 1882. The
rapid multiplication of forms and perfecting of details in dynamo-electric machinery which has taken place in in dynamo-electric machinery which has taken place in of the facts given in the lectures of 1882 with the accumulated material that is presented in the present
volume of 500 pages. Almost every kind of dynamo hich has attracted any considerable attention is here described with sufficiently full explanations of deails to render an understanding of its construction and operation perfectly easy, even if one has never before made a special study of the subject. A good
deal of attention is given to special forms of motors and their government, and to the testing of dynamos and motors. In the appendix is a short but very interesting chapter, covering statistics and comparisons of some recent dynamos, in which the author states that "the old pattern Brush machine gave only about 59 watts per pound of copper on the armature, while
the new pattern Brush armature with the same field magnets gives about 90 ," and suggests that "if the field magnets were remodeled, and their cores made of soft wrought iron, the number of watts per pound
of copper in the armature might be raised to 200 or more, and the old 40 -light machine which, as now improved, supplies 60 arc lights, might then yield current for over 100 lights." The author also notes improvements in the Gramme machine from 87 watts per pound of copper in an old machine up to 306 watts in a late pattern, and asks correspondents for further statistical information of this character, "in view of the possibility of further'
The Determination of Rock-Form
ing Minerals. By Eugene Hussak New York: John Wiley \& Sons.
The authorized translation of this German work has
been made by Dr. Erastus G. Smith. of Beloit College, been made by Dr. Erastus G. Smith. of Beloit College, Wis., for use more especially by the students of colleges nd universities. Part I. treats of the methods of vestigation, including the preparation of microscop ical sections and proper polarizing apparatus, giving
optical and mechanical methods, and describing the mechanical separation of rock-forming minerals, while Part II. gives an elaborate series of tables for deter-
mining minerals, accompanied by a great number of mining m
figures.
Methods of Research in Microscop 1CAL ANATOMY AND EMBR YOLOGY.
By Charles O. Whitman. Boston: S. E. Cassino \& Co.

This volume is intended for everyday use in the zoological laboratory, to secure uniformity in practice proper selection of the objects of study and obtaining he most complete information in regard to them. It cives'preservative and macerating fiuids, dyes, fixatives, scriptions of the different instruments used and com parisons of their respective advantages.

## Received.

Science of Mind Appled to Teachiva (Accord-
ing to Phrenological Methods. By U. S. Hoftman.
New York: Fowler \& Wells Company. Finical Vocabulary, English and Gebman. By
A. Brockhovonen and A. Van Kaven. Leipzig: F.
ge Panama Canal: Its History, Political As
pects, and Financial Difficultes. By J. C.
Rodrigues. New York: Charles Scribner's Sons.
 Third Annual Reportral Eof the Boreriment of CTatantion:
1884. Albany, N. Y.: Weed, Parsons \& Co. for state Board of Heatury: Third Bienial Re-
port, for fiscal period ending June 30, 1885. Des
Moines: George E. Roberts. spiracy. A Cuban Romance. By Adam Badeau.
New York: R. Worthington. Farmer's View or A Protective Taripf. By
Isaace W. Griscom. Published by the author, Wood-
bury, N. J.

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## A Lady's Serret.

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give date of paper and page or number of question. References to former articles or answers should
Inque date of paper and paye or number of question.
be repeaten not answered in reasonanable time should
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or in this department, each must take his turn.
Special Writen Information on matters of
personal rather than general interest cannot be expected without remuneration.
Scientific A merican Supplements referred
to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly
(1) P. H. desires a stain to imitate cherry. A. Rain water 3 quarts, annatto 4 ounces;
boil in a copper kettle till the annatto is dissolved, theil in a copper kettle till the annatto is dissolved,
the a piece of potash the size of a walnut; seep it on the fire about half an hour longer, and it
(2) W. C. writes: In making a red or ellow stain with dragon's blood or turmeric, I want tone these colors with a black, soluble in alcohol.
You can probably purchase an aniline black that is
(3) F. F. K.-Old zinc battery plates an be melted in an iron pot and cast into plates in melts just below a red heat. If the zincs have been amalgamated, you should avoid inhaling the fumes rising from the heated metal.
(4) J. W. B. desires a recipe for some -extinguishing liquid. A. One of the best solutions or the extinction of incipient fires consists of crude
alcium chloride 20 parts, salt 5 parts, dissolved in water 75 parts. Keep at hand, and apply with a hand
(5) E. E. G. asks how to make a leaf bluing. A. Use unsized paper and any of the following solutions: 1. Dissolve indigo sulphate in water and
filter. 2. Dissolve good cotton blue in cold water. 3. Dissolve Prussian blue with one-eighth part of oxalic acid in water. 4. Dissolve Tieman's soluble blue in
(6) A Subscriber asks how to make sirit varnish suitable for varnishing carved wood. A. Take 1 ounce copal and $1 / 2$ ounce shellac; powder them
well, and put them into a bottle or jar containing 1 uart alcohol. Place the mixture in a warm place and dissolved; and when strained the varnish will be ready for use.
(7) C. J. C. asks : ©What is cut glass, such as is sold by dealers? A dealer here has two
berry dishes that look alike, prices $\$ 1.00$ and $\$ 20.00$. erry dishes that look alike, prices $\$ 1.00$ and $\$ 2.00$.
One he calls cut glass and the other an imitation, with ough surface. A. Any glassware that has been ground facets and repolished is cut glass. The kind that (8) W. A. E. asks how India ink (liquid), such as is sold in the art supply stores, is made. A.
Dissolve shellac in a hot aqueous solution of borax and rub up in this solution a fine quality of Indiaink. Or rub down genuine India ink with good black ink until it will fiow easily from the pen. See ink erasers, in article on inks, in ScIENTIFIC American SUPPLEMENT,
No. 157.
(9) F. C. E. asks how to make a mould from which he can get one or two dozen castings in
tin or its soft alloys. A. You may make a mould of in or its soft alloys. A. You may make a mould of
ron or brass for casting tin or soft alloys. Plaster of iron or brass for casting tin or sof alloys. Plaster of
Paris mould will allow of a few castings, but are
brittle and not reliable. If the mould can be cut easily, Paris moulas will allow of
brittle and not reliable. If th
(10) W. V. L. asks: Is it true that $\cdot$ gold s one of the constituent parts of silver? A. Both gold and silver are elements, and theoretically are free from
all admixture. In commerce they are generally alloyed with some harder elements. In mining, gold ore often yields a good proportion of silver.
(11) J. M. L. G. asks: 1. What is about the cost of the least complicated and plainest (and therefore the cheapest) lathes in the market? Also
planer of the same description. Both to be durable planer of the same description. Both to be durable
and strong, for working iron. A. The price of lathes and strong, for working iron. A. The price of lathes
and planers varies so widely that it is impossible to and planers varies so widely that it is impossible to
name a price without knowing the size. A new or name a price without knowing
second hand lathe for iron work may be anywhere rom $\$ 50$ to $\$ 00$. heir lists of new and second hand machinery, stating about the size you want. 2. Is it injurious to slightly cil or grease boilers at night when quitting work? A. Thare is no harm in oiling the outside of your boiler.
3. Do the safety plugs (in the crown sheet) ever melt 3. Do the safety plugs (in the crown sheet) ever melt
out when properly filled with metal, when well covered out when properly filled with metal, when well covered with water? A. Safety plugs have been know
(12) A: E. L.- Oberlin College, Ohio, Cornell University, Ithaca, N. Y., are institutions where part of the dues are taken in labor. We do not know
of any institutions that provide for students wholly earning both board and tuition, but with the $\$ 300$ you have saved, some knowledge of the machinist's trade nd plenty of pluck, we do not doubt you can ge
(13) M. I.-Lignite may be readily pressuid pitch or burning, bue aildoes not dry readily and pitch or asphalt. Crude oil does not dry readily
and be found practicable. Presses for this work are made in Pennsylvania.
(14) G. E. B. asks: Of what value would any one at the present time? A. Such a process would any one at the present time? A. Such a process would
be very valuable if it can be done after the copper has been worked to shape or combined with other metals,
as the linings of pump cylinders, hydranlic rams, and as the linings of pump cylinders, hydraulic rams, and
pistons, and for a thousand uses in running machinery. pistons, and for a thousand uses in running
The hard alloys of copper are well known.
(15) F. W. asks the simplest way to tell how much a block and fall will safely carry.
Also, how many men it would take to lift a certain weight with a 2 and 3 sheave block, and the difference with 3 and 4 sheaves and blocks; also, if ropes are measured round or through, and if there is a book on
ropes and knots. A. With a pair of blocks of 2 and ropes and knots. A. With a pair of blocks of 2 and , less the friction. With a pair of blocks of 3 and the friction. New ropes will bear from 1,500 to 2,000 pounds as a safe load per square inch of section. rope of 1 inch diameter will have $3 / 4$ of an inch section,
and may be used for from 1,200 to 1,500 pounds load. and may be used for from 1,200 to 1,500 pounds load.
Ropes are sold by their size in circumference. Thus a Ropes are sold by their size in circumference. Thus a
3 inch rope is 0.95 inch diameter. A $21 / 2$ inch rope will e a little over $3 / 4$ inch diameter, Act Sen Nific
(16) T. H. G. writes: I have a mahogan table which has been varnished and has ink spots on
it. 1. By what means can I get the varnish and ink off. in order to rub on an oil finish? A. The ink spots can be washed off with water and the varnish with
alcohol. 2. What is best to polish carved brass ? Polish with rotten stone and oil, alcohol, or spirits of turpentine. 3. What will remove water stains from polished marble? A. Mix quicklime with strong lye, so as toform a mixture having the consistency of cream, and apply it immediately with a brush. If this composition be allowed to remain for a day or two, and
be then washed off with soap and water, the marble be then washed off with soap and
(17) F. A. C. desires a receipt for a harness cleaner and oiler. A. Take 2 ounces mutton suet,
6 ounces beeswax, 6 ounces powdered sugar candy, 2 ounces soft soap, and 1 ounce indigo or lampblack. ther ingredients, melt and mix together add a giil of turpentine, lay it on harness with a sponge and polish off with a brush.
(18) C. H. B.-The coarse emeries are sifted. You may buy sieves of brass for grades down
to No. 80 or 90 . After that, wash by placing the to No. 80 or 90 . After that, wash by placing the
emery in a basin, pail, or tub, according to the quantity you wish to wash, with a small pipe attached io a hose from a water supply, and a faucet to regulate the flow; stir the emery at the bottom of the pail
with the hose nozzle allowing the water and fine with the hose nozzle, allowing the water and fine verflow into two or three pans. The different the will catch different grades of emery. Your own
judgment and a little tact must be used in regulating judgenent and a liow of water.
(19) L. S. P.-Height of Washington monument, 555 feet. The depth that a body sinks in
sea water depends upon its density. Sea water weighs 64312 pounds to a cubic foot, while fresh wate weighs $621 / 2$ pounds to a cubic foot. From this comparison of the floating capacities may be estimated. once, even to the greatest depths. The greatest depth yet reached is about 23,000 feet. See Scientific American SUPPLement, No. 398, for illustration of deep sea sounding apparatus. 6,000 to 10,000 pounds have heard of being used; 4,000 to 6,000 pounds per (20) C. B. writes:
wash sink with a common trap and $3 / 4$ inch waste pipe
leading to a cesspool in yard. When water is thrown in two or three minutes, but, by lifting up the trap (strainer), the water bubbles up two or three times and then runs down all right. What is the trouble? A. The sink
pipe is air bound, and the bubbling is caused by air escaping. The pipe should be ventilated between the trap and sink; vent should be outdoors. 2. What is
sweet oil made of? A. Sweet oil is the sweet oil made of ? A. Sweet oil is the oil of the
olive, which grows in Spain, Italy, etc. 3. What is celluloid? A. The manufacture of celluloid, parkesine, and zylonite are described in ScIENTIFIC AmERICAN on needle labels stand for the maker's name? A. Red ditch is a trade mark. You may obtain prices
through the jobbing trade in your city.-The sample through the jobbing trade in your city.-The sample
you ask about is called pebble cloth, made by passing ou ask about is called pebble cloth, made by passing
it through embossed calenders. Mastic varnish is proer for it
(21) W. B. H. writes: Have you a remuslin semi-transparent and waterproof? A. Dissolve together white resin pulverized 8 ounces, bleached linseed oil 6 ounces, white beeswax $11 / 2$ ounces; add the while it is stretched tight 2 How are the yellow oil proof coats made? A. The yellow jackets referred to are made by treating the cloth with a solution made by dissolving 1 ounce beeswax in 1 pint best lin-
seed oil over the fire, applying it, when cold, with a piece of rag, rubbing it well in and then drying.
(22) S. G. W. writes: Sam Jones, the noted revivalist, is trying to make people believe that 13 worlds have been lost sight of by the astronomers,
and it is a sure sign that one world or planet will soon be destroyed. Give your opinion. A. We do not think it follows that the stars referred to have been destroyed because they have been lost sight of. Astron
omy cites many instances of stars appearing in the heavens attaining a high magnitude and then sudden have been observed to be periodic. We do not see that the destruction of the earth follows by analogy.
(23) J. J. W. asks: 1. The ingredients for a good water stain to imitate walnut? A. Burnt
umber 2 parts, rose pink 1 part, glue 1 part, water suffiumber 2 parts, rose pink 1 part, , glue 1 part, water suat-
cient; heat all together and dissolve completely; apply to the work first with a sponge, then go over it with a brush, and varnish over with shellac. 2. A good
jet black water stain. A. Pour 2 quarts boiling water jet black water stain. A. Pour 2 quarts boiling water
over 1 ounce of powdered extract of logwood, and over 1 ounce of powdered extract of logwood, and
when the solution is effected 1 drachm of yellow chromate of potash is added and the whole well stirred When rubbed on wood, it produces a pure black. A good size for gilding with gold leaf, one to be
ready for gilding in an hour. A. Good drying oil 1 reay for gilding in an hour. A. Good drying oil 1
pound, pure gum anime powdered 4 ounces. Bring the oil almost to the boiling point in a covered metal pot, add your gum gradually and cautiously to the
oil, stirring all the time to dissolve completely. Boil to a tar:y consistency and strain, while warm, throug silk, into a warm bottle with a wide mouth. Keep it well corked; use as required, thinning with turpentine.
4. The compositition of the so-called oil finish? A. Boiled linseed oil 1 pint, yellow wax 4 ounces; melt and color
(24) H. N. S. asks:"Which is the fastertoboggan or a sled (steel shod); assuming that the tal weight is the same in each case, the incline of the Also, the reasons governing your reply. A. We should
and say the steel shod sled. Although the frictional resistance is independent of the area of contact (so much larger in the toboggan than in a sled) or the velocit of rubbing. and the intensity of pressure is the same yet the rubbing surfaces of the toboggan presen more asperities to interlock with those of the ice or
snow than do the steel runners of a sled. Bodies hav ing rough surfaces, those made of compressible material, and those of irregular surface and form ex (25) N. N.-Art work is so various in its specialties that we cannot venture on specific name your taste leans to in art study. When a young man yorrives at the age suggesting a feeling of responsi bility, he should at once consult with his friends or clivities, as to the probability of his success in an trade or art that presents itself to his grasp. We
believe that you have an excellent library in your believe that you have an excellent library in your
town in which are to be found books on the trades town in which are to be fo
and arts. Join it and read.
(26) C. R. asks whether successive coat glue, applied hot to wood or articles of a wood nature, would permeate the material, giving it tough mere coating, not permeating? If the glue would no materially permeate, what woula you suggest as the same time, have a preserving quality? It is de the same time, have a preserving quality? It is de-
sired that the article should be very cheap and the process very simple. A. Glue will not penetrate wood
sufficiently to affect its stiffness or rigidity. Boilin the articles in thin glue for a few minutes will allo the glue to penetrate slightly further than the mere brushing of the hot glue upon the surface. Whatevel
can be forced through the grain endwise, that would dry easily and of a glutinous nature, would stiffen th
(27) J. M. D. asks: Is there any virtue mining the locality of hidden streams of water? A mining the locality of hidden streams of water? A
None whatever. The bobbing of the. stick is due to muscular pressure by the holder
(28) T. E. writes: I have a marine boiler in use on a steamboat that gives plenty of steam,
but the motion of the engine (12 inches in diameter feet stroke) raises the water in said boiler at least inches. There is a steam drum on top of boiler about 18 inches diam. and 24 inches high. Would an additional steam drum connected horizontally to top of
drum now on boiler, with a three inch pipe, prevent drum now on boiler, with a three inch pipe, preven
the raising of water when the engine is in motion?
so, how large a drum would be necessary? Would
his additional drum save fuel? My steam pipe is 3 inches. A. The additional steam drum will not help
you. It will only add to the work of the boiler by you. It will only add to the work of the boiler by
condensing the steam. If your steam pipe and drum is naked, it should be felted. The raising of the water is, no doubt, a surging of the surface into waves by
the action of the engine, which shows in the wate gauge. This may be partially prevented or broken u by making another connection near the end of th
boiler, between the boiler and the steam pipe with 2 inch or $21 / 2$ inch pipe. This will partially relieve th water under the dome from the reciprocating action of the engine. Felting the exposed parts of the boiler (2)
(29) L. H. R. writes: In a hydraulic rooves running vertically with the ram is caten with the water to leak so badly, I had a new ram cast. now notice small grooves beginning in the same man ner, which, in less than a year's time, will compel me o get another new ram, unless the evil is remedied What is the cause? What is the remedy or prevent
ive? The water used is from the Kansas River, and ive? The water used is from the Kansas River, an
is not filtered; but if the cause was from sand or an gritty substance, it surely would ruin the leather packings before it would eat away the ram. A. The ram pistons in the lead pipe presses in New York and vi cinity have a life of only about one year, wearing in grooves as you describe. The present practice is to
cover the pistons with copper, which wears two to cover the pistons with copper, which wears two t three years. Old pistons are also covered and recov
ered. If you have the old piston, you can have it covered. Gritty substances, as fine sand, iron rust, he hardig of the leather with the the assigned can together with
(30) C. R. desires a simple size for mak g decalcomanie or transfer paper. A. Use gelatin size printing could be a rawn glightly, like a blacking bo lid? A. If the picture is coated with a trang oren japan varnish, it can be baked same as any other var nish. If the japan is quite thin, the metal may be
(31) H. L. writes: 1. I wish to melt a old coin in a sand crucible, and want instructions how to proceed. A. Break into small pieces, mix with
borax, and expose it in the crucible. 2. Is ther danger of heating too hot? A. No. 3. Can I remedy its tendency to crack? A. Only by proper annealing . I have seen gold coin as yellow as brass and some difference as red as copper. What is the cause of so much a:fference in color? A. The red color is due to it being alloyed with copper. The natural color is yellow but it becomes red by the addition of copper. Se
"The Practical Gold Worker," by George Gee, which

$$
\text { d for } \$ 1.75
$$

(32) J. G. H.-We could not recommend a steam pump to be used once a fortnight. It would
never be in order for running. A small low pres never be in order for running. A small low pres-
sure steam pump in the market will cost about $\$ 125$. We consider gasoline a dangerous element in its liquid tate, in the vicinity of fire. Its vapor, mixed with air, as used for lighting purposes, where the vaporiza tion is carried on outside of the premises, will be safe
(33) J. C.-A first class ice boat, sailing first class ice, will sail from three to four time faster than the wind that drives the boat. For exam ple, a wind having a velocity of fifteen miles an hour will drive the b
miles an hour.
(34) W. H. O. desires a formula for naking white miners' oil, for burning in lamps. A ail and from 40 to 50 per cent of or some other 300 il and from 40 to 50 per cent of pure lard oil. A
or rape seed oil.
(35) E. W. asks: What is a good, cheap substitute for beeswax to cout wooden patterns for nse but a few times, something that can be applied with
a brush, without heat? A. Shellac varnish. 2. What is a good flux for welding iron in a blacksmith's fire, and the desirable qualities of coal for same? A. Clear white sand or borax. Use best Cumberland coal, free from
(36) J. C. writes: I am burning in my boiler slabs that are saturated with salt water, and find hat the tubes of the boiler have to be cleaned ou heavily upon them. Is there any danger of the salt eating into them or doing any injury? A. The burning of salt fuel under boilers may use but may make coating or form a coat upon the surface of the tube the condensation of the evaporated salt that will be
roublesome to clean off. When the boiler is not in ase, the salt crust will absorb water and rust the tubes A close examination of the rear end of the boiler and crust whil show whether the tubes are accumulating a better abandon the use of salt fuel. The dry salt does ot affect the iron. The salt absorbs water when the (ar) cold, when rust takes place
(37) J. S.-Cast or tool steel cannot be welded together with any certainty. Low grade steel hat will harden, such as shear and double shear, can or werax alone, which are also good for welding steel
to iron. Use about one-tenth sal ammoniac, pulverized to iron. Use about one-tenth sal ammoniac, pulverized
with the borax and heated to evaporate the water, then pulverize again and weld with the powder.
(38) E. M. asks (1) what to add to hair oil that will give the hair a yellow color. Thave very git hair, and would like to color it a darker shade. American Supplement, No. 356, which is not considred injurious at all to the head. 2. Give me a remedy to purify the blood. A. We would refer you to a hysician for a remedy of this character. 3. A good
oilet soap. A. See "The Manufacture of Toilet Soaps," contained in Scientific American Supple-
ment, Nos. 518 and 519 .
(39) P. M. A. asks: Would you please ive some remedy whereby tattoo marks may be comhey can be completely removed. Pricking in milk, in some cases, rather fades them.

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