

SCIENTIFIC AMERICAN

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

Vol. XXXIII.—No. 25.
[NEW SERIES.]

NEW YORK, DECEMBER 18, 1875.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

A NEW GRAIN ELEVATOR.

A new grain elevator in New York city is now in process of construction by the New York Central and Hudson River Railroad Company, which is designed as the beginning of arrangements for the accommodation of a great grain trade which ultimately will tend to direct a large trade, to New York city in this line.

The magnitude of the future facilities for cheaply handling grain in New York can be inferred both from the requirements of the large traffic of the Central and Hudson River Railroad and from the fact that, with that line, other lines will necessarily be brought into active competition, and so led to provide adequate terminal accommodations for their own benefit. The Pennsylvania road has already recognized this, and, it is reported, contemplates the erection of an elevator as large as that of the New York Central Company, and subsequently of building one of double the size, capable of holding 3,000,000 bushels of grain; while the Erie, we learn, proposes to construct a small transfer elevator of 100,000 bushels capacity, and probably in the future a building of much greater size.

At the present time New York suffers from no lack of storage capacity for grain taken from vessels. There is an abundance of floating elevators, and the stationary edifices will, together, accommodate some 12,000,000 bushels. The absence of railroad elevators has, however, rendered the handling of the enormous quantity of grain arriving by rail both costly and difficult, in a degree which may be estimated from the fact that the same has now to be shoveled by hand from the cars of the New York Central and Hudson River road into canal boats, and by the latter transported to storage houses to the lower part of the city.

The opposition to building elevators on the part of the railroad managers has been based on economical motives. The grain-grading system now existing, through the agreement between the Produce Exchange and the roads, has hitherto not been favored; and as a result, under the old plan (it being necessary to deliver the identical grain received for storage) such grain would have to be stored in a separate bin even if it did not nearly fill the latter, so that it was

practically impossible to utilize even half the capacity of the accommodations provided. The present system obviates this trouble, and admits of the employment of nearly the full capacity, through proper weighing and inspection, by which the exact amount of the same quality, etc., of grain is returned to the storer: though such is not the identical material, as several consignments may be mingled in one or more bins, in order that the latter may be completely filled. Another obstacle has been found in the fact that the buildings must be erected on the Hudson River, and suitable bottom for laying foundations has hitherto not been reached. This difficulty has, by dint of persevering search, been overcome, and now the Central, Erie, and Pennsylvania roads have, on their respective properties, found solid bottom at a depth of some 75 feet.

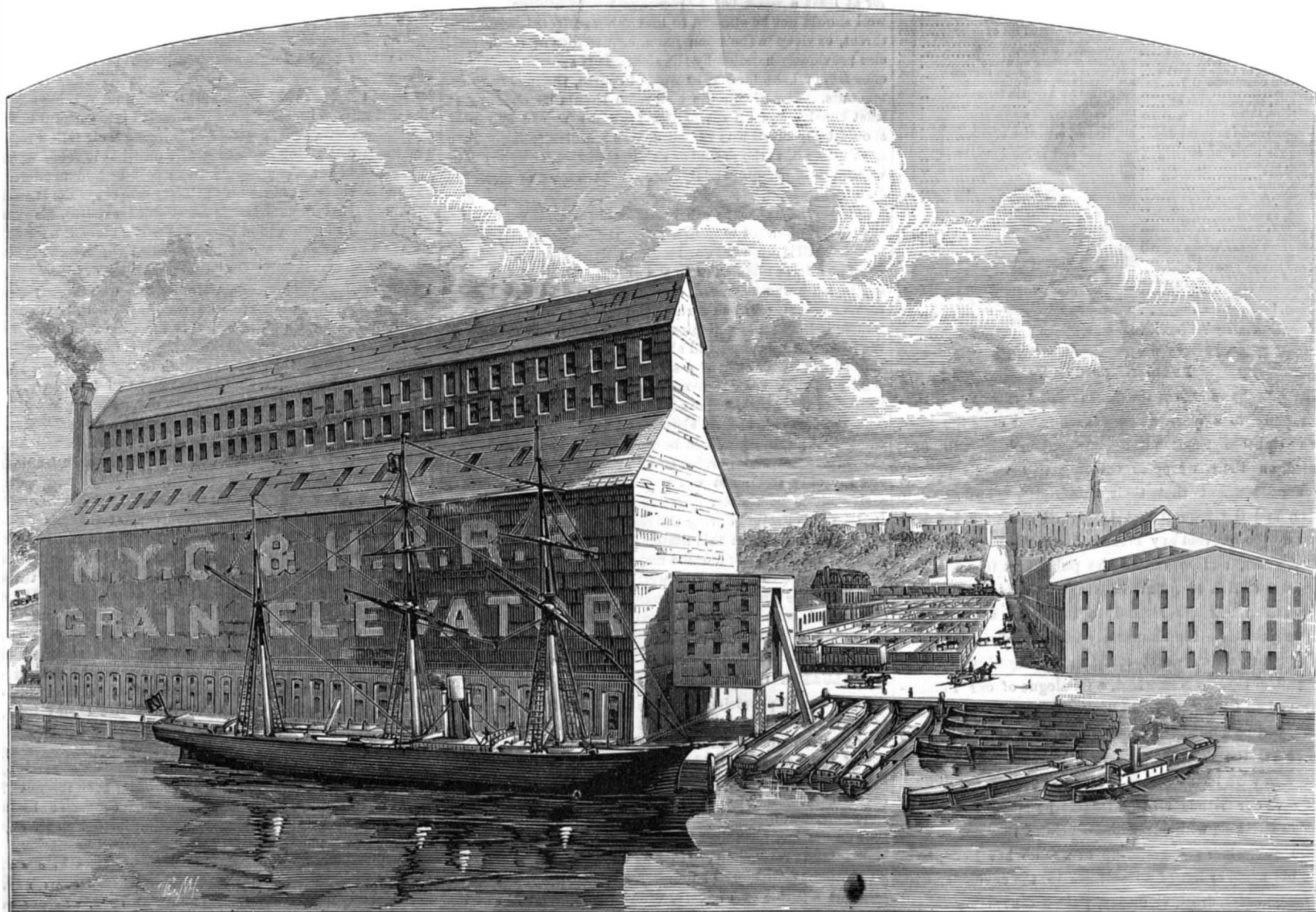
The New York Central and Hudson River Railroad Company's elevator, at the time of writing, exists partially in the shape of foundations and partially on paper, in the form of plans. Mr. Charles Hilton is engineer in charge, and through the courtesy of Mr. C. B. Gerard, the assistant engineer, we have obtained the following facts in regard to the edifice, and from the drawings our artist has prepared the accompanying accurate representation of the structure as it will appear when completed one year hence. The building is located between 60th and 62d streets, and on a line with Twelfth avenue. It is 354 feet in length by 100 feet in width, and 160 feet in height, and contains 264 bins, each 65 feet high, having a capacity of 6,000 bushels each, or an aggregate capacity of over 1,500,000 bushels of grain. The foundation is composed of some seven thousand piles driven into the river bed at intervals of 2 feet 9 inches between centers. These are cut off below low water level, filled in with sand, and transversely capped with heavy timbers. Two diagonal cappings follow above, and a series of granite piers, pyramidal in shape, finally support the ponderous timbers which sustain the bins. The superstructure is of brick outside to the top of the bins, and slate above.

At the north end, four tracks enter, and between the outside pairs twenty-two receiving pits are made, each pit holding one car load of grain, and so located as to come just

abreast the car doors. Steam shovels are to be used to remove the grain from the cars; and the grain is then carried by the elevator leg, which enters each pit, to a receiving hopper above the bins. The power for elevating is furnished by a 500 horse power double engine. As soon as the receiving hopper is filled, an attendant on the ground floor opens a valve and allows its contents to run into a weighing hopper placed beneath. The scale rod is also in the lower story, though connected with the hopper far above by suitable devices, so that the weight is easily read off. The weighing hopper may be rotated on a vertical axis, and is provided with an inclined spout. This spout traverses the interior periphery of a ring, into which opens a series of conduits, leading to twenty-four adjacent bins. By means of a wheel and index hand, the attendant can adjust the hopper spout against any desired bin chute, and it only remains to open a valve to deliver the grain into the bin. Meanwhile the receiving hopper valve has been closed, and the hopper is being refilled, so that the raising of the grain is continuously carried on. At the bottom of each bin is a spout, and under every fourth row of bins there is an endless moving belt. Bags, after being filled at the spouts, are thrown upon the belt, and thus transported to the vehicles at the delivery door.

In order to accommodate shipping, a separate hopper is provided, and a spout therefrom leads outside the building to the hold of the vessel. Arrangements are also provided for removing grain from boats, the elevator leg for this purpose being 60 feet in length and capable of vertical adjustment over a distance of 20 feet, to suit varying conditions of tide, etc.

Our engraving represents the new elevator, and also affords an idea of another edifice, probably the largest of its kind in the world, and of the extensive yards owned by the New York Central and Hudson River Railroad Company and let to the Union Stock and Market Company as a receiving station for the immense droves of live stock received from the West over the Hudson River road. The sheep and hog house, which very recently has been completed, is shown in the distance. It is a brick structure 370 feet long by 200 feet wide, and is



THE NEW YORK CENTRAL RAILWAY'S GRAIN ELEVATOR AND STOCK YARD

divided into one section 100 feet in length and three stories high, for the reception of hogs, and another occupying the remaining space, but four stories in height, for beeves, calves, and sheep.

Scientific American.

MUNN & CO., Editors and Proprietors. PUBLISHED WEEKLY AT NO. 37 PARK ROW, NEW YORK.

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

TERMS.

One copy, one year, postage included. \$3 20 One copy, six months, postage included. 1 60

Club Rates.

Ten copies, one year, each \$2.70, postage included. \$27 00 Over ten copies, same rate each, postage included. 2 70

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order.

VOLUME XXXIII, No. 25. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, DECEMBER 18, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing contents of the magazine, including articles like 'Air, buoyancy of', 'Answers to correspondents', 'Barometer, to make a', etc., with corresponding page numbers.

PUBLISHERS' CARD.

The present volume of the SCIENTIFIC AMERICAN is drawing rapidly to a close. The next number ends the year. Some eighteen thousand of our subscribers will find, printed on their wrappers covering this week's papers, the announcement that their subscriptions are about to expire.

To save our friends all the trouble possible, we also inclose an envelope with our address printed thereon, so that all the subscriber and getter-up, of a club has to do, is to place his name or list of subscribers in the envelope.

The terms of subscription remain as heretofore—\$3.20 per

annum, postage prepaid by us, for single subscribers, with discount for a number. See terms for clubs in special prospectus. All news dealers throughout the country will, as usual, receive subscriptions and have our publications on sale.

DIPHTHERIA.

There has been recently in this city, and throughout the country, quite an alarming spread of diphtheria, amounting almost to an epidemic. The disease is one which fastens on children most readily, although it attacks adults with often fatal effect.

About a year ago, Dr. Stephen Smith, of the New York Health Department, published some useful suggestions relative to diphtheria which are well worth remembering. Under the heading of precautions, in addition to the removing of sources of sewer gas escape as mentioned above, he advises the removal of every kind of filth from around the house.

Diphtheria, like many other serious maladies, is not difficult to check if attended to in time; but it frequently baffles the highest skill if allow to run. Its distinctive feature is the formation of a false membrane in the throat, which shows itself in grayish brown patches.

A VALUABLE GIFT BY CHEMISTRY TO THE WORLD.

A celebrated physician, the late Dr. Valentine Mott, used to say that iodine was the greatest gift which medicine had ever received from chemistry; and it may now be said that one of the most remarkable and important services rendered by chemical investigators to the arts and sciences is the discovery of bromine.

grapher. Another 15 years elapsed; and then physicians commenced to experiment with the new element, and they soon ascertained its great value as a remedial agent, and the salts of bromine now form a series of the most important substances in the materia medica.

Bromine is commonly obtained from the mother liquor or bitter of salt works, which is rich in bromine compounds, the latter being retained in the liquor, as they do not crystallize out as easily as the chlorine compounds, of which common salt is the principal.

According to an improved method, the bromine is obtained directly from the mother lye or bitter, by heating the latter with the sulphuric acid and black oxide of manganese, which decomposes the chlorides and yields chlorine gas; this in its turn sets the bromine free from the bromides.

Bromine is a very disagreeably smelling brown liquid, freezing at -8° Fah., and boiling at 150°, when it changes into a deep red vapor, nearly 6 times heavier than the air.

MAKING EXCUSES.

It has been said that a person who is good at making excuses is good for nothing else. Nature never accepts an excuse, the law seldom does, and yet in ordinary affairs of life excuses play a large and pernicious part.

We do not mean to assert that, frail and imperfect mortals as we are, we should require perfection of our fellows, nor, like Shylock, demand that the letter of the bond be fulfilled. Justice must be tempered with mercy, but sometimes we must be cruel in order to be kind.

The infraction of any and all of Nature's laws brings as certain punishment as does Recorder Hackett's court, nay, more certain, if less speedy. The tight shoe, whether of satin or cowhide, worn voluntarily or involuntarily, by a city belle or a rustic clown, is sure to produce the well known corn.

excitement produce brain diseases as frequently in the pulpit as in Wall street. How often are people engaged in charitable work stricken down by disease incurred in the fulfillment of a holy mission! Most undeserving of such a fate, we are inclined to exclaim; but Nature accepts no excuses. Violate her laws, and ye die!

But what is the great harm in excuses? we think our reader begins to inquire. First, it encourages story telling, untruth, prevarication, and white lies. Second, it makes people careless. Railway trains are our best examples of punctuality; if you reach the *dépôt* but 15 seconds too late, you are left and must wait, perhaps for hours. It is of no avail to tell the doorkeeper that your delay was unavoidable, that the omnibus broke down, or the street was blockaded, or the car ran off the track. People know that the rule is as inflexible as the law of the Medes; they do not flatter themselves, as does the tardy school boy, that their excuse is a good one, and thus loiter along at a convenient gait. One of the blessings of railway travel is that it makes people more prompt and more diligent. The banks are another class of institutions that will not accept excuses; if your note is not paid by three o'clock, it goes to protest. It matters not that the money promised you fails to come to hand in time, the train bringing your draft was delayed by snow drifts, or the telegraphic remittance was stopped by a broken wire, or the messenger on his way to the bank fell into an open coal hole and is maimed for life: the bank asks none of these questions, it listens to none of these excuses; the law is carried out.

The publishers of the SCIENTIFIC AMERICAN discontinue sending it to a subscriber as soon as he stops paying. The forgetful subscriber, who would continue forgetful if his paper kept on coming, arouses from his lethargy, and the next year he does not forget to renew it in time to avoid any loss.

The poorest of all excuses is forgetfulness, and the best method of cultivating the memory is to resolve never to accept this excuse from yourself nor make it to others. "I forgot" and "I didn't think" have caused untold misery, and should be stricken from the vocabulary of every ambitious youth. Conductors and switchmen sometimes forget that a certain train is due, and the next morning we read in heavy head lines: "Fearful Railroad Accident! Dreadful Loss of Life." The innocent (?) conductor is acquitted of the murder because he renders an acceptable excuse, and history goes on repeating itself. In some eastern countries, it is said, when a house burns down, the owner, instead of getting paid for it, loses his head. Fires are not of frequent occurrence there.

The old saw, that where there is a will there is a way, is true more frequently than is generally supposed. Let a man know that no excuse will avail for the omission of duty, and nine times out of ten he will contrive to accomplish what he had supposed to be impossible.

WEAK SPARKS.

Poggendorff's *Annalen* for February, 1875, contains an interesting account of many experiments by the celebrated German electrician, Professor Reiss, concerning a new form of electric spark, which he discovered several years ago, and which he denominates "weak sparks." He states that they differ from the ordinary strong electric sparks, not only in form, light, and sound, but in other and very various properties. For example, the length of the conductor makes no difference in the production of the weak sparks; in reference to length, light, and sound, they are independent of the composition of the circuit in which they occur; they produce no marked indication of heating in the circuit, and no magnetization. So far as we have examined the accounts of M. Reiss's results, he appears to have experimented chiefly with the Holtz frictional machine; but doubtless he has tried other apparatus. We however do not observe that he anywhere suggests any form of apparatus for telegraphy or other practical uses of the weak sparks.

It would naturally follow, from what we know of electricity and from the extensive series of experiments and the careful investigations of the nature of the weak sparks by the author, that they might be produced by any of the various known forms of electrical apparatus; and this would appear to be confirmed by certain recent experiments of Mr. T. A. Edison, the well known telegraph engineer and inventor, of Newark, N. J. Mr. Edison has recently ascertained that the weak sparks may be produced by means of an ordinary electro-magnet, and has also put the new sparks into working harness in the form of a telegraph apparatus. As before intimated, we have not carried our examination of Professor Reiss' experiments far enough back to determine whether he describes any method of obtaining them from magnets, and will therefore leave that branch of the subject for further consideration, giving briefly an account of Mr. Edison's new experiments, and what he supposes he has discovered.

The method by which Mr. Edison generates the weak sparks is so simple that any telegrapher or electrician can test it. A bar of metal (cadmium seems to be best) is placed on or over an electro-magnet in an electric circuit: attached to the metal is a wire (of iron or copper, possibly any other metal) which conveys the current of newly discovered force. On breaking the electric circuit with an ordinary telegraphic key, sparks are observed when the free end of the wire is brought in contact with any metallic substance. When the wire from the cadmium is attached to a gas pipe, sparks may be drawn from any part of the entire system of gas pipes simply by touching it with a piece of metal. By this simple means signals have been sent for long distances, as from Mr. Edison's laboratory to his dwelling house, in another part of the city, the only connection being the common system of gas

pipes. Mr. Edison states that signals have also been sent the distance of seventy-five miles on an open circuit, by attaching a conducting wire to the Western Union telegraph line.

For some time Mr. Edison has been industriously studying the weak sparks, and the developments, he thinks, are unceasingly novel and surprising.

Thus far his examination has resulted chiefly in determining the fact that the weak sparks, first supposed to be a phase of inductive electricity, have really no further likeness to electricity than similarity of origin, the power of furnishing sparks, and the ability to transverse electric conductors. On the other hand, the sparks seem to travel over electric non-conductors with equal facility, a glass rod or a strip of hard rubber conveying them as well as a bar of metal. They require no closed circuit. They cannot be grounded, and seem to be incapable of insulation. They are retroactive, sparks appearing when the conducting wire is turned back upon itself, just the same as when the free end of the wire is brought in contact with any other metallic substance. They have no polarity, and apparently no mechanical power. With carbon points and points of several metals, the spark is highly actinic; yet the current seems to have no physiological effect, and does not influence in any way the most sensitive of electroscopes or galvanometers.

Such, in brief, are the leading points of Mr. Edison's observations concerning weak sparks from magnetism, and they closely correspond with the long prior observations of Professor Reiss.

We shall recur to the subject in our next.

WORKING MEN'S READING ROOMS.

We are very much in favor of the plan, which some contemporaries are just now discussing, of free evening reading rooms for workmen; and if such resorts could be started and maintained in every manufacturing village, we believe that an immense amount of good would be done, both in educating the men and checking the spread of intemperance. The average workman gets very little time to read except during the evenings; and if he be single and live in a boarding house, the lack of light, fire, and other necessities for comfort effectually precludes his doing so there. The tavern is, however, open to him, well lighted and well warmed; and there, perforce almost, he spends his evenings in idleness and in the acquisition of habits which are the reverse of beneficial. The trouble with most reading rooms which we have seen in country villages is the fact that they are generally the work of excellent and pious people who unfortunately imagine that a selection of religious literature and a pious cast over the general surroundings of the place are beneficial. However good the motive, this often fails to induce workmen to visit the places. The effect is indeed ordinarily the reverse; for working men are but human beings, and prefer the joviality and lack of restraint at the tavern to the perusal of tracts or the mental digestion of Sunday school books, be the morals and precepts of the last never so good.

The true way of making a reading room both successful and useful is first to render its advantages absolutely free, and secondly to make the room both comfortable and attractive so that every man of average intelligence may avail himself of its privileges. The literary fare may consist at the beginning of periodicals alone, leaving the formation of a library to the future, when a membership becomes established and the members feel like subscribing to enlarge its scope of usefulness by adding a library. Publishers will generally send their journals to such reading rooms at reduced prices; or the charitable in the town or village may often be successfully appealed to for contributions of papers, magazines, and sometimes books which they have read. If there be a local journal, and few towns in this country exist where one is not published, the editor will gladly contribute such of his exchanges as he does not need. In this way, it will be found, plenty of good reading matter can, with a little energy, be collected, and it will prove serviceable in benefiting the community without much expense.

Our plan for a working men's reading room is a plain apartment, as easily accessible to everybody as the tavern. There is no need of costly appointments of any kind: but plenty of good light and a warm fire are indispensable. A table and sufficient chairs, some files for newspapers, and a few shelves for books, include all the furniture absolutely necessary. If the philanthropic projectors can afford a few pictures, a tasteful paper for the walls, or any other ornamentation, so much the better; money thus laid out will not be lost, as such articles lend a home-like air which, to most people, is attractive beyond all else.

A few weekly papers and three or four monthly magazines will be enough for a start; and then, as it becomes apparent that the people of the town are growing more interested in the work, plans can be matured for a wider selection of reading matter; and perhaps, as we before intimated, a subscription among the readers can be taken towards putting the establishment on a broader basis. This is the season of church and similar fairs, for raising money for various benevolent purposes. Perhaps we may venture the suggestion that a small amount may be raised in this way, thus enlisting the coöperation of the young people in the good work. Certainly a free reading room would be a noble Christmas gift from the churches of a village to the working men residing in its limits, or from the proprietors of factories to their employees.

A PIECE of rubber belting fastened around the belt pulley of an engine will keep the belt from slipping.

THAT OBNOXIOUS POSTAL LAW.

Postmaster General Jewell, in recommending in his recent report the repeal of the Act of Congress passed last January which doubled the postage on transient newspapers, books, and similar third class mail matter, raising the same from one cent for every two ounces or fraction to one cent for every ounce or fraction, simply reflects public sentiment relative to that illconsidered and obnoxious law. It was a stupid blunder, on the part of those who framed the bill, that, contrary to their intent, by their own admission, language open to construction as affecting anything but the miscellaneous merchandise which the mails are allowed to carry should ever have entered into it; and the passage of the act shows even more reprehensible negligence on the part of those members who voted for it, in not subjecting the measure to proper examination. Except in the opinion of the express companies, who have been greatly benefited, and by whose influence the act was adopted, there was no necessity for increasing rates even on the miscellaneous matter, as the cheap postage on similar parcels, like seeds, bulbs, samples of merchandise, etc., was a great convenience to the public, and especially such to people living in out-of-the-way localities.

The Postmaster General excepts this mixed material from his recommendation to return to the old rate on printed matter, but fails to show a good reason therefore, based on a possible benefit to the Department. In fact in this respect the report logically contradicts itself flatly, for it may be justly inferred that: if, as the writer paradoxically asserts, "the sending of public documents through the mails has not delayed the delivery of ordinary mails or perceptibly increased their cost," some 200 to 300 tons being the estimated amount sent: the sending of small parcels, not exceeding, if altogether aggregating, in weight the hundreds of tons of documents which the members of Congress heretofore sent free through the mails, would, if the matter were paid for at any price, result in positive gain. It may be remarked in passing, that the sentence above quoted is unfortunate from another point of view, as it apparently offers an argument to those who are seeking the return of the franking privilege; for it is easy to predicate the assumption thereon that, if several scores of tons of matter is imperceptible in point of cost or trouble, then as many hundred tons would be practically inconsiderable.

There are rumors that Congress will act upon this subject early in the session. We trust that the same are well founded, and that our representatives will use no delay in restoring the old and popular rates, including all articles coming under what is "third class matter."

SIX GOOD REASONS WHY EVERY MANUFACTURER, MECHANIC, INVENTOR, AND ARTISAN SHOULD BECOME A PATRON OF THE SCIENTIFIC AMERICAN.

I. It is a publication devoted especially to their several interests. Every number contains sixteen pages of useful matter pertaining to mechanism, new discoveries and inventions, and themes interesting and useful to all persons engaged or interested in mechanical or manufacturing pursuits of whatever kind.

II. It is a cheap publication—furnished so low, in fact, that no mechanic, manufacturer, or inventor can plead inability to spare from his earnings or business the small sum charged for a year's subscription.

III. It is printed on a good quality of paper, in a form for binding, every number being embellished with original engravings of new machinery, new scientific and chemical discoveries, and all the important inventions.

IV. No other paper published in this country, or any other in fact, furnishes so much useful information for the manufacturer, mechanic, inventor, or man of Science, as the SCIENTIFIC AMERICAN. This is a fact admitted by all our contemporaries, both in this country and in Europe; and the wonder to all is, how a paper containing so many expensive engravings and so much new and useful matter can be furnished weekly at so small a cost to the subscriber.

V. In subscribing to the SCIENTIFIC AMERICAN, the reader receives the latest foreign as well as home intelligence on all subjects pertaining to the industrial pursuits of the world. All the best scientific and mechanical periodicals published in England, France, and Germany are received at this office, affording us facilities for presenting to our readers the very latest news relating to science or mechanics in the old world.

VI. Subscribers who preserve their numbers have, at the end of the year, two handsome volumes of 416 pages each, containing several hundred engravings, worth, as a work of reference, many times the price of subscription.

A Gas Shadow.

A striking and curious experiment, showing the superior weight of carbonic acid gas over air, may be made by projecting the shadow of the gas, as it is poured from its containing vessel, upon a screen. The latter should be of white paper and bright sunlight should fall on the stream of gas, which should be poured from the spout of a pitcher held within 10 inches of the screen. The curious result, of a shadow produced by apparently nothing, will be seen, the former resembling descending smoke, quite black at the spout of the vessel, but brightly illuminated whenever the sunlight is concentrated by passing through the gas.

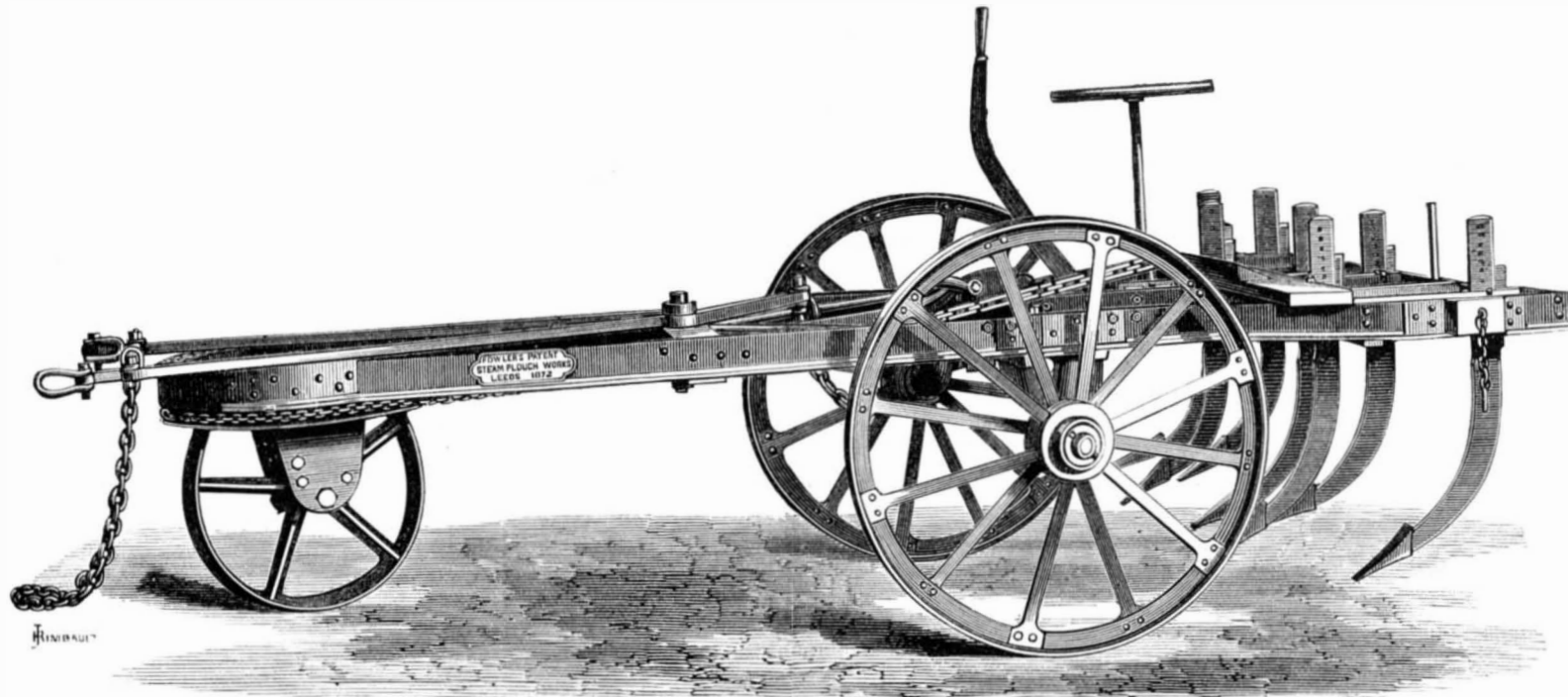
To prepare tin for tinning brass, copper, and iron. Melt the metal in a crucible which has previously been slightly warmed; and at the moment the metal begins to set, and when it is very brittle, pound it up rapidly, and sift when cold to remove any large particles.

STEAM CULTIVATION.

The Fowler system of steam plowing has been frequently mentioned in these columns as being the most successful of many attempts to solve a problem of some difficulty and of great importance to the future of agriculture. We illustrate herewith a cultivator, intended by the makers for use where the double machine would be unnecessarily large and expensive; it is constructed so as to be readily turned and operated in the reverse direction after one set of furrows has been cut. Messrs. Fowler have made some improvements in this apparatus, one of which deserves special comment. This consists merely in making the lever, to which

the screw working in the water of replacement was to take away some of the pressure which drives the ship. But with reference to the advantage of housing in a tunnel if the screw were driven at excessive speed, he thought it not unlikely that the housing would produce a beneficial effect by preventing the scattering of the water, and whatever reaction the water supplied would be more effectively directed into the line of motion; nevertheless he considered it would involve the drawback of adding largely to the surface friction of the vessel, and he expected that nearly the same advantage, but less encumbered by surface friction, would be obtained with any kind of shrouding given to the tips of

water, which, being sucked in by the action of the screw, frequently break some, if not all, of its blades. Mr. Griffiths also considers that the effects of racing will be much decreased, on account of the water being taken in from below, and therefore he thinks that the whole of the after part of the vessel will have to be lifted out of the water before any racing will take place. There can be no doubt, however, that for ships of war it is a matter of no small importance that the screw should be protected from shot and shell, and, if possible, completely cased with armor plates. It is well known that at present the helm has to be put over to port or starboard, according as the screw is left or right handed, and



FOWLER'S STEAM CULTIVATOR.

the ropes are attached, of a forked shape, as shown. In use that arm of the fork to which the hauling rope happens to be attached is of course brought into a direct line with the strain; while the other arm is thereby caused to project laterally, thus bringing the tail rope clear of the wheels, and causing it to be in a favorable position for turning the implement when the headland is reached. The tail of the draft lever is coupled to a short chain; and when, on arriving at a headland, the strain is transferred to what was previously the tail rope, and the draft is thus brought at right angles to the implement, this chain is tightened and, by acting on a segment, turns the main axle, which is cranked, and this, by depressing the supporting wheels, lifts up the main frame, and raises the tines clear of the ground. The tines being maintained in this position by a lever and catch, the turn is readily made; and on its being accomplished, the steersman allows the frame and tines to fall again, and the implement starts on a fresh journey. The action of this turning arrangement is admirable. The turns are made with great promptitude, and within a very limited space, while the implement is altogether thoroughly manageable, and there is nothing about it liable to get out of order.

RECENT IMPROVEMENTS IN THE SCREW PROPELLER.

It would be by no means an easy task to enumerate the many inventions which have been made, since the introduction of steam navigation, to improve the form of the screw. The modification of the screw propeller devised by Mr. Griffiths has been generally admitted to be one of the best. Mr. Griffiths, however, has since arrived at the opinion that we have hitherto been neglecting the true principles in screw propulsion; and after a series of experiments he concludes that the difference, between the amount of power exerted to propel a ship by a screw and that required to tow her, which in one case Mr. Froude found to amount to a loss of 58 per cent of the power supplied, is due to the screw not being sufficiently supplied with water. With a full-sterned ship this is greater than in one having a fine run, as the water runs into the space left by the stern, and deprives the screw of its full supply.

To remedy this, Mr. Griffiths' plan is to put the screw into a casing of 50 to 75 per cent larger area than that of the screw's disk, and provided with an opening underneath, so that the screw is not supplied with the water which would otherwise flow into the space left by the ship, nor does the ship rob it of any of the water which it requires to force back in order to give the thrust to the screw shaft for propelling the ship. This view of the case was not, however, assented to by Mr. Froude, who thought that the effect of

the screw blades. Since then Mr. Griffiths has had H.M.S. Bruiser placed at his disposal to experiment with, and the results certainly appear to bear out the experiments with models previously made by that gentleman. The Bruiser was first tried, on February 26, with her propeller fitted in the ordinary way, her course being over the measured distance within the breakwater at Plymouth. The force of the wind was 2 to 3, and its direction E.S.E., and the sea smooth. The draft of the ship was 8 feet, both fore and aft, and she was fully equipped and ready for sea. The screw fitted was one of Griffiths', with two blades, having a diameter of 6 feet and 8 feet pitch, with 60 nominal horse power, and a mean pressure in the cylinders of 35.79 lbs. her mean number of revolutions, after six runs, was 881 per mile, and her true mean speed 8.016 knots. Having been docked, and the casing fitted to her, as shown in the accompanying illustration, she was again tried on July 2, under almost similar circumstances to those of the first trial. The force of the wind and the state of the sea were the same, though the direction of the former was S.W. instead of E.S.E. She carried one more ton of coals, and her trim was a little different, being 7 feet 10 inches forward, and 8 feet 1 inch aft. With the same nominal horse power, and only 0.4 more horse power indicated, the mean number of revolutions was only 836, whereas the speed gained was 8.274 knots, or rather more than a quarter of a knot beyond what was realized without

that some loss of speed is thereby occasioned; but with the screw in a casing this is not necessary, and perhaps a good deal of the quarter to half knot increased speed obtained with the Bruiser may be due to this cause. Mr. Griffiths' system, however, is not all included in placing the screw in a casing, for he also proposes to divide his power into two parts, by using two small screws instead of one large one, and putting one at the bow and the other at the stern of a ship. The engines and shafts, also, would be placed lower down in the ship, and therefore, in men-of-war, be more protected against shot. But perhaps the most important improvement claimed for this system consists in having two separate sets of engines, boilers, and propellers, so that if one were placed *hors de combat* the other would still be available to keep the ship off a lee shore, or from getting into the trough of the sea. The experiments with the casing round the screw having proved so far successful, the British Government have now placed a small screw launch at Mr. Griffiths' disposal with which to try still further experiments.

Three Curious Discoveries.

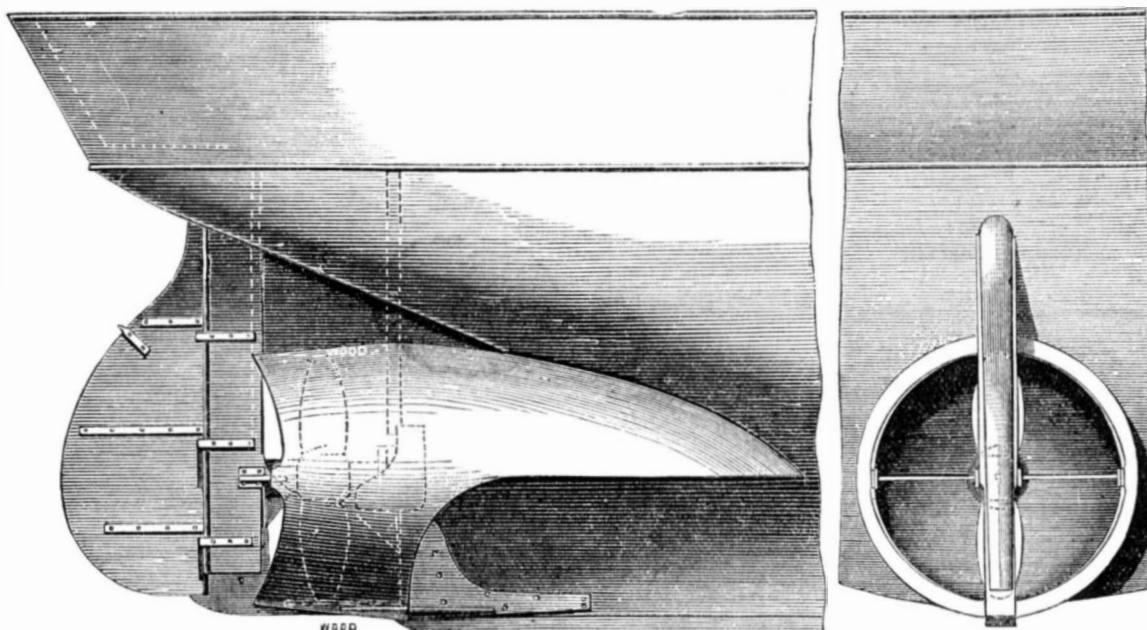
A recent examination of the bottom of an old Roman well, located near the hot springs of Bourbonne les Bains, in France, has resulted in three remarkable discoveries, two of an archaeological nature, and one of some importance from a geological point of view.

After the excavation had been thoroughly drained, and a thick layer of refuse penetrated, the first discovery was made in the bringing to light of thousands of small metallic objects of art. These included ornaments, statuettes, and coins, the last of silver, gold, and copper, dating back to the times of Nero and Hadrian.

Beneath the layer of ornaments, etc., a second layer was found, composed entirely of fragments of sandstone, which, together with the metallic objects, were completely covered and held in masses by metallic crystals, evidently deposited by the water above. These crystals were subjected to careful investigation; and as a result they have been pronounced to be of such a nature that geologists would unhesitatingly describe their formation to natural causes, working

through ages. That such is not the case is plainly evidenced by the known eras of the coins above which they have formed. It will be seen that the circumstance, which constitutes the second discovery, may throw serious doubt over a large quantity of important geological deductions as to lapses of time, when the same, as is the fact in many instances, are wholly based on supposed slowness of formation of similar deposits.

The third discovery relates to the fragments of sandstone



THE GRIFFITHS SCREW PROPELLER.

the casing. It being thus evident that Mr. Griffiths was correct in his conclusions, that greater speed would be obtained with a screw in a casing than with one fitted in the ordinary manner, it may be as well to inquire into the other advantages which he claims for his system. No small value is attached by him to the fact that a complete protection will be afforded to the propeller by the casing, as a safeguard against the dangers a screw usually is liable to from pieces of wreck, ice, etc., floating on or near the surface of the

By comparing these with other pieces, already found in similar localities, the investigators have concluded that such fragments were thrown into the wells as votive offerings to local divinities by the ancient inhabitants of the country, and that the same custom, continued through centuries, accounts for the presence of the much more recent Roman money. A chain of proof, mainly circumstantial, has been elaborated, which refers the stone fragments to the neolithic epoch, in prehistoric ages, and further shows that the pieces probably represent the earliest money used by man.

Self-Acting Car Couplings.

At a recent meeting of the Master Car Builders' Association, the subject for discussion was "Freight Car Couplings, Draw Bars, and Buffers," upon which Mr. Partridge made an address.

Mr. Adams was called upon for information on what is required by railroad companies, and said that he had no specific facts to present in relation to the repair of drawbars throughout the country. It was very difficult to get very specific data. The habits and customs of our car men have not been of the character to present these data accurately. The committee appointed on this subject, in looking over the matter, had made up their minds as to some important points to arrive at in the way of improvements. "We have been shown by Mr. Partridge some of the defects in the present arrangement, which had been considered by the committee. But there were some other things that presented themselves to their minds, and one of the most startling of the whole of them was the expense of links and pins. Upon some roads this expense was enormous, amounting to anywhere from \$10,000 to \$60,000 or \$70,000 a year, according to the size of the road. The ordinary roads perhaps would average \$30,000 to \$40,000 a year. We need something to couple our freight trains which will enable us to dispense entirely with pins and links. This was one of the points to be striven for. Another point in which we thought there was an absolute necessity for improvement was a greater power of resistance in our buffer springs, and a greater range of motion. Our resistance is altogether below the line of connection. If the springs were made stronger, given more motion, and placed in the direct line of resistance, the difficulty would be materially obviated. Various devices have been presented to us during the past year; a good many models have been brought out, and some of them have approximated somewhat to the accomplishment of the idea, but we have not seen any yet that meet our wants, in the opinion of the committee. The thing, after all, is progressing, but yet there is room for improvement. We have got to have a device that will couple freight cars without a link and pin, and, in addition to that, a separate buffer placed directly in the line of the frame or bottom of the car, and we have got at the same time to use our present stock; that device must be made to connect itself with our manner of coupling. We have got to use our present stock until it is worn out. But the committee is not as yet prepared to recommend anything. They have not found anything that will entirely accomplish the purpose. A buffer must be so built that it won't couple when you don't want it to. Many inventors seem to think that you must get something that will couple every time it strikes. There have been but few models that seemed to embody the idea to dispense with links and pins, but I think we shall have to make it in two parts, a separate buffer and separate hook, because we want our connections to be in the floor of the car. Mr. Stone in his model has accomplished considerably towards it, and I have no doubt he may be able to bring it perhaps to something near what we want."

Mr. L. Garey said that it was easy to find fault, and difficult to apply the remedy. "The necessity for improvement in the attachment by which cars are coupled together has been felt for a great number of years, and it was still evident that the improvement had not been got. The necessity of these improvements was shown by the immense number of patents granted year after year. The real necessity is an automatic coupler with buffing attachments, either connected or with another device placed on the line of resistance. The buffing requires from one half to double the resistance of the drawing to make it substantially strong. Now if some of our inventors will dispense with the use of the links and pins entirely, provide us with a coupling, automatic or not, which can be uncoupled from cars from the top or side, and give us a buffing attachment which is sufficient for the work, that ought to make a dozen fortunes for him and secure him the blessings of all the people, not only those that travel, but especially of the men employed on railroads. He thought that the railroads would say that, out of the cars which were side-tracked for repairs, eight tenths were owing to some defect in the drawing or attachment. If this could be reduced to three tenths, it would be a great deal. There was more difficulty from the failures of the attachments than in the drawbars themselves."

Don't Leave a Legitimate Business for Financiering.

It is an evil of the intense competition in great mercantile communities that it drives many from the walks of legitimate business into schemes of speculation with reference to sudden and extravagant gains. The history of frauds teaches that they originate chiefly in the attempt to grow rich rapidly by financiering rather than by diligence in business. Financiering has its place in legitimate business. Some men have a talent for this, which is as true a mark of genius as is poetry or art. But it is not a talent that every man can acquire, and it is fortunate that this is so; for if all the world should turn financiers, the earth itself would soon go

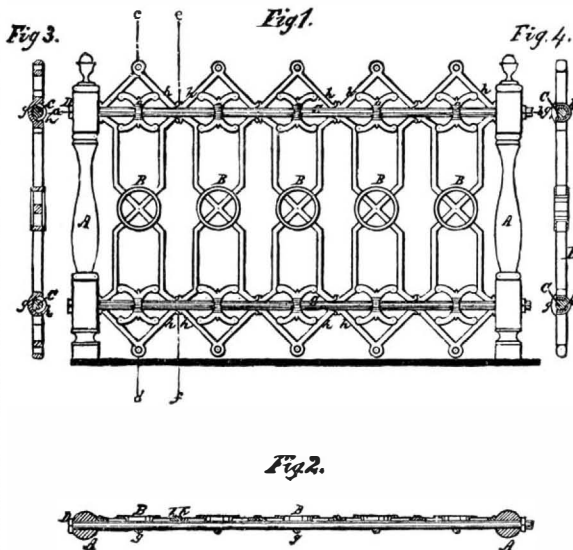
into bankruptcy. Now, the calamity of a great city is that every one who gains a little money takes to financiering as a readier mode of increasing it than regular business. Wall street, the focus of financiering, gives a tone to the whole business community.

But financiering is a deep game; and he who leaves an honest toil in a business that he does understand, for calculations of chance in matters where he has no skill, is very apt to become the loser, and, as in all lotteries, to grow desperate in the attempt to make up his losses. We do not speak of investments in stock as property, but of the spirit of speculation; and we have no doubt that a just verdict upon many cases of fraud would be: "This man lost his capital and his character by speculation in stocks." Keep, therefore, to honest toil in a legitimate business, and do not aspire to become a financier. "Be content with such things as ye have."

ROBERTSON'S IRON FENCE.

The use of ornamental iron fences is no longer confined to expensive city residences, but is gradually extending to the more humble suburban or village houses; and they would be used much more but for their great cost; to lessen this is the object of an invention lately patented by Mr. T. J. W. Robertson, which is illustrated in the accompanying engraving, Fig. 1 representing an elevation, and Figs. 2, 3, and 4 showing sections through the lines, *a b, c d,* and *e f,* respectively.

This fence is made up of castings having the metal so disposed as to allow rods to be passed through the ornamental openings in the sections or pickets, whereby the latter are so effectually secured to the former that they cannot be removed when the panel is in place between the posts by which it is supported; and this is done without fitting, riveting, or other fastening, except that necessary to secure the rods in the posts. To accomplish this, the sections or pickets are made with three vertical bars, *h g h,* where the tie rods are to be connected to them; and these bars are so formed as to admit the tie rods between them, in the same manner as the weft thread passes through the warp in weaving cloth. That the tie rods may readily pass through the sections, the two side bars, *h h,* have recesses on one side, and the central one, *g,* on the other, so that an edge view of the castings would show holes through it about the size of the rods, *C C,* through which the latter are passed.



With sections thus cast, all that is required to make a panel of fence is to pass rods or gas pipes through a sufficient number of sections and the posts, and then bind the whole together by screwing nuts on the ends of the tie rods, when the panel is ready to be erected. Where large hollow posts are used the nuts may be concealed in their interiors.

From this it will be seen that the cost of a fence of this character may be reduced to that of the castings, rods, etc., as no time is spent in fitting, boring, riveting, etc.; and although thus cheaply built, it is one of the strongest fences made, as the whole strength of the materials employed is utilized in fastening the parts together.

For further particulars, or the purchase of State or county rights, application should be made to the patentee at 818 O street (N.W.), Washington, D. C.

A NON-RETREATING BUNSEN BURNER.

BY PRESIDENT HENRY MORTON, PH. D., STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

In consequence of the low pressure of gas during the day time, in this place, we have long experienced trouble from the retreating of Bunsen burners of the usual construction. This having repeatedly proved a source of annoyance and loss, I was led to a series of experiments with the view of removing the difficulty, if possible, by some modification in the form of the burner. After various trials with burners, in which the relation of height to diameter in the main tube and the size of the gas jet were varied, I was led to the following consideration of the subject:

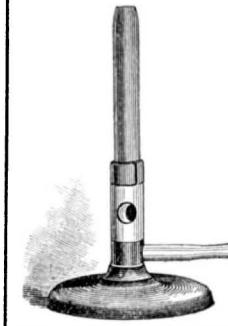
The retreat of a burner will evidently occur whenever any part of the ascending column of mixed gas and air is moving at the orifice with a velocity less than that at which the same will burn. Now, in an ordinary burner, with its main tube of regular cylindrical bore, it is evident that the friction of the surface of the ascending column of mixed gases will cause that portion to move at a less velocity than the central part, and that even currents of the nature of eddies will be developed. It will thus happen that, while the central portion of the ascending column of gaseous mixture issues at a velocity much greater than that at which the ma-

terial can burn downwards, and thus is quite free from any danger of retreating, the marginal portions of the column or jet of gas will be escaping at a rate so much less that the velocity of their combustion downwards will exceed that of their upward motion, and retreat of the flame will ensue.

It is well known that, to secure a jet of water or of any other fluid whose particles shall move with equal velocities in all parts, and thus avoid currents and eddies, it is only necessary to make the orifice of efflux an aperture in a thin wall. In following out this idea, I made a burner of a bore rather large compared with its height, and then drew in its upper edge into the form of an open-ended thimble, so contracting the orifice of escape to about two thirds of the area of the tube, and rendering this orifice practically an opening in a thin horizontal wall or plate. The results of this modification far surpassed my anticipations.

A burner thus constructed, as shown in the engraving, gives a perfectly non-luminous flame with gas pressures varying between $1\frac{1}{2}$ inches and $\frac{1}{10}$ of an inch of water, and with the lowest of these pressures cannot be made to retreat by the most violent handling in the way of sudden movement or waving about in the air, even when this violence is carried to the extent of extinguishing the flame altogether. Under like conditions of pressure, a burner of the ordinary construction is made to retreat by a slight draft of air or a very moderate amount of motion.

These burners are being manufactured, for our own use and for other colleges, by George Wale & Co.



Correspondence.

The Purification of Water.

To the Editor of the Scientific American:

In 1869 I took occasion through the columns of your valuable journal to call attention to the beneficial action of air for purifying water which had become foul with decomposing organic matter, and to offer my patent air treatment for the purpose, for domestic uses, free of charge. At that time the subject was new to the public; and few perhaps attached to it the importance which more recent developments have shown it to possess, especially for dwellers in cities. Recent articles by various writers on the subject tend not only to fully support my statements, but to show that bad water invariably suffers for want of oxygen, the degree of foulness indicating the diminished proportion or the absence of free oxygen.

The putrid water of a river can be reclaimed by absorption of oxygen, and it will arrive at sweetness and wholesomeness as soon as it possesses $\frac{1}{2}$ of 1 per cent of free oxygen; this amount is necessary for fishes to thrive in water. But such water would not necessarily be suitable as a beverage for man.

Great apprehensions are now entertained that the horridly putrid condition of the ponds in Central Park will spread disease over the neighborhood, and these fears will be too fully justified if the present state of things continues. But there is no necessity for pond water to be putrid, or to become unwholesome, at any time. By the moderate annual expenditure incurred in running an air force pump or pressure blower, requiring about 20 horse power, in a place conveniently central, conveying the air by light but durable mains of about 12 inches bore to pipes of smaller bore near the bottom of the ponds, with perforated branch pipes through which the air issues, all apprehension of the re-occurrence of foulness in ponds can be entirely removed. Sufficient oxygen can be supplied by thoroughly agitating the water for about one hour daily, by pumping in air, to keep the ponds sweet. To purify them in their present state, the most rigorous air treatment for several days is needed; it may take a week to do it. The Croton water has suffered with this malady for years, and if it be not speedily provided against, it will fill our cemeteries at a still higher rate than 27 in 1,000 per annum, a death rate only exceeded by Bombay with 29.

R. D'HEUREUSE.

New York city.

The Treatment of Diphtheria.

To the Editor of the Scientific American:

I wish to make known to the public a method of treatment for diphtheria, which has been uniformly successful, in the practice of the writer, during a number of years, which included two epidemics; and in a large number of cases, not a case has been lost since this treatment was adopted. I feel confident that, by its general use, the mortality may be reduced to one per cent, or even less. I have heretofore delayed publishing the results in order to make sure that the treatment was really what it promised to be, and I now wish to use the columns of your journal, in order that the public generally may have the knowledge in their own possession.

An attack of diphtheria is usually ushered in with a high fever and headache, and, in children, with nausea and vomiting. There is great prostration. Upon the tonsils and surrounding parts are seen white, snow-flaky patches. In malignant cases, the patches are often yellow or brownish, and a terrible odor is perceived.

The remedy found successful by the writer is permanganate of potash, in conjunction (not combination) with the tincture of belladonna. The method of administration is as

follows: From 2 to 3 grains (not more) of the permanganate are dissolved in from 2 to 4 ozs. of water in a goblet. Five drops of the official tincture of belladonna, or, better, from 10 to 20 drops of the 1st decimal homœopathic tincture of the same drug, are put into another goblet with an equal quantity (2 to 4 ozs.) of water. A teaspoonful is to be taken from each goblet alternately at intervals of a half or one hour. It is, perhaps, needless to say that separate spoons should be used, and the goblets kept covered.

In twenty-four hours, frequently, a favorable change will be seen, but quite as often the disease seems to go on unchecked, save that the fever may seem a little more moderate; but I can assure my readers that, during the second day of the treatment, a most marked change will take place. The fever will entirely subside, the mind will brighten, the tongue will begin to grow clean, and the deposits upon the fauces will peel off at their edges or gradually break away. The patient will be upon the highway to recovery, and a day or two more of the treatment will bring back the normal hue of health, and an appetite to correspond. In rare cases, however, when the constitution is bad (cachectic), a longer time, five, six, seven days, may be required; but even here the treatment has not failed.

I think that, under this treatment, diphtheria is not a disease to be dreaded by the profession. The belladonna may, in special cases, find a substitute, but not the permanganate of potash. The only case in which the above treatment will promise unsatisfactory results is when the disease rapidly invades the larynx and bronchial air passages (diphtheritic croup), when suffocation threatens to supervene before the remedy can act, or when the mere presence of large detached deposits in the air tubes imperils the success of the case. Such an instance recently occurred, which was successfully treated with inhalation of the vapor (not the spray) of a dilute aqueous solution of bromine.

I know that the permanganate has been used as a disinfectant, locally applied, in putrid diphtheria heretofore, in dilute form (as a gargle), and upon general principles as an antiseptic; but I am not aware that the persistent use throughout the disease has heretofore been made known to the public or profession. That it does not act as an antiseptic is shown by the fact that the other antiseptics have no analogous effect; that it does not act locally may be inferred, because its marked curative effects appear in the system before they are seen in the fauces. The theory of the writer is that diphtheria finds its nutriment in partly devitalized organic matter in the blood, which the permanganate, rapidly absorbed, attacks and destroys by oxidation (being the most powerful non-poisonous oxidizer we have): thus cutting away the pabulum of the disease, when the deposits die a natural death and disappear. The process certainly sometimes appears magical in its action. I trust that, if others employ this treatment, they will not attempt to modify it till they have first given it a fair trial in the manner above proposed.

I have also found the permanganate of potash very successful in the treatment of certain slow forms of putrid and typhoid fevers, with loaded tongue, foul breath, etc., and in recurring boils. This lends additional force to the theory of its action above indicated. I am sure that this drug, so rich in oxygen the life-giver, so harmless in its action upon the human system, will well repay study by the profession generally, which it has heretofore only received, and that in a very inadequate degree, from the homœopathic branch.

Philadelphia, Pa.

I. W. HEYSINGER.

What Flies Do.

To the Editor of the Scientific American:

An article on this subject, in a recent issue of your paper, by Mr. Emerson, an English chemist, has induced me to send you the result of some careful observations made upon the parasites that infest flies. It is not my purpose to dispute the theory, advanced by Mr. Emerson, that flies are scavengers of the atmosphere, and that, while flying through foul places, they collect on their bodies various organisms, which they feed upon at leisure. My desire is only to draw attention to the fact that the common house fly (*Musca domestica*) is at certain seasons possessed of parasites. In examinations made during the summer months, I have failed to detect the parasites; but in the autumn, as a rule, they can be discovered in large numbers around the *coxa* (the joint of the leg that is attached to the thorax); and when disturbed, they become very active, running up and down the spines or hairs of the fly. They somewhat resemble in form the *acarina tellarius*, the little red mites of our hot-houses. They differ from them in having but six legs; and in fact, they possess every quality, excepting wings, necessary to constitute perfect insects. They are half a line long, and, by the unaided eye, can be seen as mere specks, and therefore do not belong to the animalcules which represent the smallest and imperfect forms of life. By placing a fly possessed of these parasites upon a piece of clean glass, and then killing the fly, the parasites will immediately leave the dead body and wander away upon the glass. By holding the glass up to the light, the parasites can be seen as atoms, moving. Under frequent careful microscopic examinations, I have never observed that these parasites were eaten by the fly. On the other hand, I am very much of the opinion that the fly is consumed by the parasite. In every case of my observation, the fly possessed of these parasites was in a sickly condition.

F. C.

By a recent fire in the arsenal at Rendsburg, Holstein, forty thousand new Mauser rifles, an equal number of rifles of older construction, and much other war material were destroyed.

Prizes for Designs for a Concrete Villa.

In pursuance of past promises, and in compliance with numerous requests, we invite competition designs for a class of structure which commends itself to notice. Of the various kinds of building open to selection, not one seemed to us more suitable, in calling into exercise the skill and ingenuity of architects and the younger members of the profession, than the one we have chosen. We have thought of dwellings for the poor and middle classes, hospitals and asylums, churches and schools, all deserving subjects, but they have been more or less used up, and there appeared to us little in them to provoke inventiveness or to afford so ready a response as a villa designed in a material comparatively new, and affording ample scope for an independent architectural solution.

CONDITIONS OF COMPETITION.

1. The design to be adapted for a villa of the ordinary suburban class, suitable for a corner site.

2. The accommodation provided is to comprise a porch, hall, morning room, library, dining room, kitchen, and necessary domestic offices on the ground floor; two principal bedrooms, dressing room, bath room, and three other bedrooms on the first and second floors. Coal, wine, and beer cellars to be arranged in the basement. A servants' staircase to be provided. The sizes of the rooms are left to the discretion of the designer.

3. The cost of the villa not to exceed \$9,000, calculated at 14 cents per foot cube of the whole building, the contents being measured from the foundation level to half way up the roof. Preference will be given to a design that exhibits economy of plan combined with a suitable architectural treatment of concrete.

4. The general drawings to be to a scale of one sixth of an inch to a foot, and to comprise the following: Cellar plan showing drainage, ground plan, first floor plan, three elevations, one section taken through principal staircase. A sheet of details, illustrating any important part of the construction or decoration, drawn to an inch scale, on a sheet of paper 22 by 14 inches, may accompany the drawings. The whole of the general drawing to be arranged on a sheet of double elephant paper (hotpressed), 37½ inches by 27½ inches, and to be sent in unmounted. The designer to be at liberty to send in a perspective view with the general drawings, in lieu of one elevation, but no account will be taken of this in selecting the design.

5. All the drawings to be drawn in black (Indian ink) lines, and to be suitable for photo-lithography. No wash of any kind to be used. The shadows, if any, should be hatched in line.

6. The drawings to be accompanied by a general specification of the method of construction proposed to be adopted, the scantlings of timbers, etc., with a general statement of the reasons that have influenced the designer, and the dimensions of the several rooms.

7. Particular regard will be paid to the constructive and sanitary merits of the designs submitted.

8. The drawings to be sent in under motto, accompanied by a sealed envelope containing the name and address of the designer, to the editor of the *Building News*, London, on or before the 25th day of January, 1876, carriage paid.

9. The decision will be published in the columns of the *Building News*, with a report of the judges.

10. The editor reserves the right of publishing any or all the designs.

11. The sum of \$50 is offered for the best design; \$35 for the second; and \$15 for the third, all in gold.—*The Building News*.

Tænia and Raw Meat.

“Seventy years ago tænia (tapeworm) was such a rare affection in France that many physicians of large experience had not met with it; or if they had, the cases were extremely few. To-day tænia has become so common that every practitioner meets several or many cases yearly. To what is due this sudden multiplication of tæniæ? It is twenty or twenty-five years since Trousseau first, and many physicians after him, and more recently Professor Fuster, began to employ raw meat as a remedial agent; and it was at first received with distrust, but at present it has become of general use. This coincidence alone permits us to suppose that raw meat may have something to do with the production of tænia, and most physicians have adopted this etiology, which appears absolutely certain. Beef frequently contains the germ of tænia, which germ, transported into the stomach of man, develops, taking the form of the tapeworm. In Abyssinia, where the use of raw meat is general, every one has tænia. At St. Petersburg, Dr. Weisse observed, according to Cauvet, that children fed upon raw meat were frequently attacked by tænia.

“For my part, I have observed a great number of cases of tænia during the past few years, and in every case the individual had made use of raw meat or was at the time under that regimen. In a convent I recently administered raw meat to four nuns, three of whom were seized with tænia afterward.

“M. Laborde (*Tribune Médicale*, page 472) does not believe that raw meat is the cause of the increased production of the worm. ‘Each of the three varieties of tænia which are found in man,’ says he, ‘argues its origin in an absolute manner. The *tænia solium* results from the transformation of the *cysticercus cellulose* of pork. The *bothriocephale tænia* is produced by fish. The *tænia mediocanella* is the only one that can be communicated by beef or mutton, and we all know how rare the *tænia mediocanella* is.’ There is precisely where the error lies. The *tænia mediocanella* is not rare:

on the contrary, it is at least as frequent in our time as the *tænia solium*; and it is readily recognized by a simple magnifying glass. If M. Laborde were to examine the tænia that follows the ingestion of raw meat, he would see that the *tænia mediocanella* has become very common in France from our new therapeutical habits, while the frequency of the occurrence of *tænia solium* has not increased, for pork meat slightly cooked or raw remains exceptional. Thus we see that it is beef or mutton which furnishes these frequent cases of tænia. Have we any means of doing away with this terrible inconvenience?

“It is at least probable, if not certain, that the addition of alcohol to raw meat, following the method of Fuster, of Montpellier, suffices to kill the germ. For that, the alcohol employed must needs be strong, and the meat should be well mixed with that liquid and allowed to macerate for some time. Thanks to heaven, the moment tænia becomes frequent, the *materia medica* enriches itself with the knowledge of a new tæniifuge, at least as efficacious as any other, and superior, inasmuch as it is absolutely innocuous, and that its abundance and low price place it within the reach of every purse. Freely administered pumpkin seeds constitute a sure and inoffensive tæniifuge, that seldom misses its effect. Some precautions are necessary in the employment of this medicine.

1st. The intestine is previously emptied by recommending the patient to abstain from eating on the eve of the day on which he proposes to take the remedy.

2d. Early in the morning we administer on an empty stomach 60 grammes (1 oz., 7 drachms) of pumpkin seeds, deprived of the skins and ground with sugar, then mixed with water, forming a sort of milk of almonds.

3d. When the patient feels the worm detaching itself, we administer 70 grammes (2 oz., 125 grains) of castor oil in a cup of hot broth or black coffee, and the worm, in all probability, will come away during the day.

If the head of the worm is not found, the same treatment is repeated in eight or ten days, or the day following the first treatment, if desirable. To recapitulate: It is certain that raw meat as prescribed to-day expose the patient to tapeworm. The species observed in such cases is the *tænia mediocanella*. Mixing the meat with alcohol lessens the danger. The tænia, once developed, is easily removed by pumpkin seeds properly administered.”—G. Régnault.

Punctuality in all Things.

It is astonishing how many people there are who neglect punctuality. Thousands have failed in life from this cause alone. It is not only a serious vice in itself, but it is the fruitful parent of numerous other vices, so that he who becomes the victim of it gets involved in toils from which it is almost impossible to escape. It makes the merchant wasteful of time; it saps the business reputation of the lawyer, and it injures the prospects of mechanics who might otherwise rise to fortune: in a word, there is not a profession, nor a station in life, which is not liable to the canker of this destructive habit.

In mercantile affairs, punctuality is as important as in military. Many are the instances in which the neglect to renew an insurance punctually has led to a serious loss. Hundreds of city merchants are now suffering in consequence of the want of punctuality among their Western customers in paying up accounts. With sound policy do the banks insist, under the penalty of a protest, on the punctual payment of notes; for were they to do otherwise, commercial transactions would fall into inextricable confusion. Many a man a time has the failure of one man to meet his obligations brought on the ruin of a score of others, just as the toppling down, in a line of bricks, of the master brick causes the fall of all the rest.

Perhaps there is no class of men less punctual than mechanics. Do you want an upholsterer? He rarely comes when he agrees. So with carpenters, painters, and nearly all others. Tailors and shoemakers often do not have their articles home in time. The consequence is that thousands remain poor all their lives, who, if they were more faithful to their word, would secure a large run of custom, and so make their fortunes. What would become of the SCIENTIFIC AMERICAN if it were not punctual in going to press? or if our paper makers were not punctual in delivering paper? or if our compositors were not punctual in coming to work? Be punctual, if you would succeed.

RAILWAY IRONCLADS.—Cologne is to be surrounded by a chain of forts in the same manner as are Metz and Strasbourg. The works, which are now in course of construction, are connected with each other by a protected circular railway, which, now used for transporting material, is designed as an additional means of defence, as it will convey portable ironclad batteries from point to point. Within the outer fortifications there is to be a second line, and a series of revolving iron turrets.

PROFESSOR JAMES ORTON, of Vassar College, proposes at an early day to make an exploration of the Madeira and Beni rivers, which are branches of the Amazons, with the view of opening to science and commerce that portion of South America which is watered by those rivers. The Chamber of Commerce of New York city heartily seconds Professor Orton's project, and has addressed a memorial to the Secretary of the Navy, urging the importance to the United States of a knowledge of that district, and asking his cooperation in the enterprise. Professor Orton has had much experience on the Amazons.

“WRINKLES AND RECIPES” is for sale at all book stores.

Milk Preserving.—How an American Invention is Worked in England.

The Anglo-Swiss Milk Condensing Company has three establishments in England, one at Middlewich, one at Aylesbury, and the other at Chippenham. Perhaps a better situation for a milk-preserving depot could not be found than at Chippenham, a town long famous for the excellence and the large quantity of its dairy produce, and in the heart of one of the richest milk counties in England. By the kindness of the company's manager, Mr. Bosworth, we were lately allowed the privilege of going over the works in that town; and thinking that what gave us great pleasure might also interest our readers, we give a short account of what we saw and heard there.

Close by the side of the Avon (not the Swan's Avon), on the right hand side as you walk from the railway station to the ancient town of Chippenham, a nice, clean, white stone building attracts the eye. A tall brick chimney suggests a factory of some description, but the general appearance of the building is so clean, and there is so little noise or bustle, that at first one is inclined to think that, whatever work it is dedicated to, business has not yet been commenced. This, however, is not the case, for a busy and successful summer has just been concluded. Entering the large double doors we went upstairs to the office; and on making our desires known, a gentleman, Mr. Page, kindly undertook to show us round. Like Alice in Wonderland we wished to "begin at the beginning and go right on to the end"; and so we went to the other end of the building, where the farm carts bring in the milk every morning. At present this yard is open, but preparations are being made for roofing it in, so that the horses may stand there in comfort while the unloading is proceeded with. In the first room, into which the milk is taken from the carts, we noticed a number of tin saucers with brass plates on them, all numbered, and about half filled with milk. These, we were informed, were used for testing the cream-producing qualities of the different lots of milk; a small equal quantity from each farmer's consignment being poured into one of these neat little saucers, and allowed to stand until the cream was thrown up. It struck us that testing cream must be a most agreeable occupation. Here the milk is carefully weighed (measures are not used) and tested. It is then poured out of the farmers' cans into those of the company, and taken into the next room, where the cans containing the milk are placed into large tanks full of hot water. In the first room the milk cans used by the farmers are washed, the company prudently preferring to have this important duty performed in a thorough, systematic manner by its own servants rather than to trust to the tender mercies of the farmers' servants, and risk the loss of milk in hot weather. The way the cans are washed is at once simple and effective. First, they are roughly rinsed in a large tank nearly full of water; then the can is taken to a table, on the top of which a round hole is cut, the exact size of the can's mouth. In this hole are two pipes, pointing upwards, on a level with the table. The can is placed mouth downwards over this hole; and a handle being turned, a jet of spring water rushes with great force up one of the pipes into the can, thoroughly cleansing it. After this another handle is turned, when a jet of steam acts in exactly the same manner. Another turn of the first handle, and the cold spring water finishes the washing. Thus a very large number of cans are thoroughly washed in a marvelously short time, with very little labor. Leaving this room, we went into the next, where, as we said, the milk cans are placed in tanks containing hot water. From these the cans are lifted, and the milk poured into large open round copper tanks, and boiled by the action of steam. After remaining here for some time it is pumped up into the condensers in the room overhead. These condensers, of which there are three in this room, are also worked by steam, and in them the milk remains for from three to seven hours, according to the quantity. In these condensers a vacuum is created of about 20 lbs. to the square inch, and thus the vapors are drawn off from the milk, which we understand to be one of the most important details in the process, and that on which the future keeping properties of the milk chiefly depend. When the milk has remained in these condensers sufficiently long, it passes into another room, when it is cooled by being put in cans and placed in cold water. The final process is unknown to us, being the one secret of the establishment, but we have a shrewd suspicion that, like many other secrets, there is no great mystery connected with it. Be that as it may, when next we saw the milk it was in exactly the condition we see it in when the little cans are opened for table use. The filling room is a large airy apartment; and as the little cans are filled, they are closed up and sent to the room above to be packed away ready for the market.

Everything is made, and all the work is done, on the premises, upwards of 100 people being employed, of which about forty are boys and girls. One engine of four horse power is sufficient to do all the work, but the boiler requires to be much larger in proportion, in consequence of the amount of steam used for other purposes. Owing to this the boiler is large enough to supply working steam for a forty horse power engine. Not the least interesting part of the establishment is the portion devoted to the making of the tins, in which the milk is put when ready for sale. Here nearly all the work is done by boys and girls; and as each has only one part of the tin to make, the work proceeds rapidly. Thus, one boy cuts the sheets of tin into the proper sizes for the sides or barrel of the tin; the next boy passes three pieces between two little rollers, which curl them up ready for joining. From here they go to another little fellow, who sits and solders the two edges together, and so quickly is this done that a boy can turn out 2,000 a day. After this, the

ends, which are punched out by machinery, are fitted on, and milled, or squeezed tightly to the top and bottom of the little cylinders which form the tins, when they are soldered and the tin is labeled. The milk is then run in through a small round hole left in the top, and then this hole is covered; the tin is rolled in paper and packed, which work is entirely performed by girls. The chief characteristic in their milk-condensing is cleanliness, and the quantity of water used for this purpose is enormous. Ventilation is another necessity, and thus the employment is pleasant and healthy. With foot and mouth disease increasing, it is satisfactory to be able to get a pure article of food for children, and as the milk from diseased cows cannot possibly be used by the Preserving Company, it is particularly suitable for young or delicate persons. It has also the great advantage of being always at hand, ready at a moment's notice, and in any kind of weather, which is a matter of some importance. Condensed milk has long been largely used on board ship and in yachts, but it is only lately that it has begun to come into general use in families; so that, with increased consumption, it is probable that other establishments will have to be formed by the energetic Anglo-Swiss Condensing Company, and if so we wish it the same success which has hitherto attended it.

[The above from *Land and Water*, describes the valuable process invented by the late Gail Borden of Texas, and by him first put in operation in this country about fifteen years ago. Since that time it has spread to all parts of the world, and his condensed milk has become a staple article of commerce and manufacture. The adoption of Mr. Borden's invention in England is only one of many examples of American improvements there worked.—EDS. SCI. AM.]

Uncertainty of Wealth.

"The absence of the law of primogeniture causes a frequent change of ownership in the private residences which contribute so much to the adornment of our cities. While the head of the family lives, the home may be retained—though very often a reverse of fortune compels him to seek humbler quarters—but when he dies the heirs are obliged to get rid of the too expensive luxury. How many of the houses built in St. Louis twenty years ago are now owned by the men who erected them, or their descendants? How many of later date, now occupied by their builders, will be in possession of their present tenants, or their descendants, twenty years hence? Other influences beside the lack of primogeniture contribute to this, in some respects, unfortunate result. There are more ups and downs in life in the new world than in the old. Fortunes are made much more quickly, and disappear much more rapidly. Wealth is seldom transmitted beyond the second generation, and in many instances does not last through the first. The boy born with a silver spoon in his mouth frequently has to taste pewter before his pilgrimage is over, and he may have the pleasure of being splashed with mud from the carriage wheels of the man who was once his father's porter. This is a free country, very free indeed, and among the consequences of that freedom is the exceeding uncertainty of financial matters. Yet in no country is less provision made for the evil day so far as our children are concerned. The wealthy parent brings up his sons and daughters as though there were not the remotest possibility that they could ever be poor. If a rich father should insist upon his boy learning a trade he would be set down as a mild-mannered lunatic. If a rich mother should instill into her daughter rigid ideas of economy and industry, she would be looked upon as either very mean or very foolish—probably both. Yet every day we are taught the necessity of this preliminary discipline; every day we see men and women falling from affluence to poverty, who, if properly trained, might not have fallen at all, or, if they did fall, could have risen again. It is a shame and disgrace that, in a land where labor is supposed to be honorable, and where the law recognizes no distinction of caste, so small a proportion of the sons of the wealthier classes learn trades. No young man has a right to consider himself thoroughly independent unless he has some avocation by which, health permitting, he can always make a living. And the best and surest avocations are those for which there is always a demand. Lawyers, doctors, preachers, professors, clerks—all these and their kindred are frequently a drug in the market; but how seldom is it that a good carpenter, blacksmith, machinist, wagon maker, shoemaker, tinsmith, book binder, or printer has to travel far in search of remunerative employment! We shall never be thoroughly republican until there are fewer genteel drones in the national hive."

There is probably no subject on which more has been written than the above. Almost everybody has seen evidences of the fact about them; and how many who will read this article (from the *St. Louis Republican*) can realize its truthfulness!

Gas for Heating Purposes.

We confidently look forward to the time—and we hope it is not far distant—when, in all large cities, at least, a heating gas will take the place of solid fuel for culinary and general heating purposes. What the consumption for that use would be, were the price sufficiently low, can scarcely be calculated; but if the consumption of illuminating gas on the island of Manhattan alone may be roughly estimated at fifteen million feet per day, the consumption of heating gas would, probably, amount to one hundred million feet; and since it must be made on an enormous scale, at a very low cost, and sold with a narrow margin for profit, there is reason to hope that the efforts to solve the question of an economical heating gas will solve also the problem of cheap illuminating gas; for though the essential properties, and even the

composition, of these two will differ greatly, yet any process that will enable us to make a heating gas, at, say, 20 cents per thousand feet, can, probably, be adapted to the manufacture of a cheap illuminating gas. In the interests of metallurgy, of manufacturing, and of general needs of civilization, we welcome every step toward the attainment of this great desideratum; and it seems, indeed, that no more inviting field for the application of science, skill, and economy exists than that of gas-making. This art has stood almost stationary for nearly half a century, while every other branch of productive industry has made enormous progress; and if the signs of the times are not deceptive, the day is approaching when the demands of consumers will force gas-making out of the rut of conservatism into the path of progress that is characteristic of our time and people.—*Engineering and Mining Journal*.

How to Reach the North Pole.

C. S. says: "I propose to reach the north pole by the construction of an overground tubular railroad, under the auspices of several governments, which should pay sufficient money to construct suitable shops for the making of a wooden tube, 5 or 6 feet in diameter, to be made in light sections for transportation. After some suitable landing place has been chosen, the road could be commenced at the dock. The sections of the tube could be placed on a car which would run inside of the tube and be propelled by hand, and furnished with a light, strong, convenient dummy engine and boiler, to be used when required. Theoretically this idea has many points of great benefit to the explorers. A car can be made and furnished with nearly all the comforts of a home; and the tube, getting covered with snow in the winter, would be quite warm. With properly constructed stoves, plenty of provisions, and fuel, a scientific party could pass a winter in the tubes quite comfortably. I have no doubt but that there are plenty of civil engineers who would jump at the chance of constructing a road of this nature if solid government support was guaranteed. If this idea proved feasible, and the barrier of 120 miles that is supposed to exist could be overcome, and the unexplored supposed open sea found, this road could be made the means of carrying material for the construction of suitable fishing vessels. If the open sea does exist, there is no doubt but whales are to be found there in immense numbers, so as to make the road profitable, and furnish oil for the people when the products of the oil region commence to give out. Shelter in nearly all emergencies would be found in a road of this description. Who can tell of the benefits that might come to the nations if the mysteries of the vast unknown region could be brought to light? The outlay on a road of this character would be a mere bagatelle to the results that would accrue from it."

A New Fumigator.

A new and excellent fumigator has recently been devised by Mr. Thomas Shaw, of Danville, Pa. (P. O. Box 612). We are indebted to the inventor for one of the machines, which we have practically tested to our satisfaction. It consists in a hopper in which the tobacco, sulphur, or other fumigating material is placed, resting on a perforated bottom. A pipe from the hopper enters a miniature fan blower, above the casing of which the hopper is placed. There is a hand wheel which is belted to the fan shaft, so that the latter is very rapidly revolved, causing a down draft through the material ignited in the hopper, and a strong current of smoke to be delivered through the outlet tube of the blower. The device is made large enough for use in large greenhouses or of a size convenient to be carried in the hand. It will also be found admirably adapted for smoking plant lice from window gardens, and for burning coffee or other disinfectants in hospitals and ships.

TO PREVENT GLUE FROM CRACKING.—Glue frequently cracks because of the dryness of the air in rooms warmed by stoves. An Austrian contemporary recommends the addition of a little chloride of calcium to glue to prevent this disagreeable property of cracking. Chloride of calcium is such a deliquescent salt that it attracts enough moisture to prevent the glue from cracking. Glue thus prepared will adhere to glass, metal, etc., and can be used for putting on labels without danger of their dropping off.

ENGINEERS and shipbuilders on the northern rivers in England feel the effects of the general depression. At some of the engineering shops and shipyards there is scarcely sufficient work to employ foremen and apprentices. Nothing better is expected till the spring of 1876, when it is hoped that the trade will vie with the promising season of the year.

A GERMAN astronomer has discovered two new small planets, not visible with the naked eye, in the constellation *Aries*. This makes the number of the lesser planets one hundred and fifty-three.

AT Bonn, Germany, headaches, dyspepsia, etc., affecting several patients, have been traced to evening studies pursued under the baleful influence of a green lamp shade, from which arsenic was set free by the heat of the flame.

EUGENE SCHNEIDER, the French statesman and mechanical engineer, died recently, at Paris, at the age of 70 years. He was called to the Paris Cabinet in 1821.

RECENTLY there was a lifting match at Eureka, Nevada, between two men, for a prize of \$200, the winner lifting a 15 lbs. dumbbell at arm's length the greatest number of times. The loser lifted it 1,130, the winner 1,144, times.

PLATE SHEARING MACHINERY.

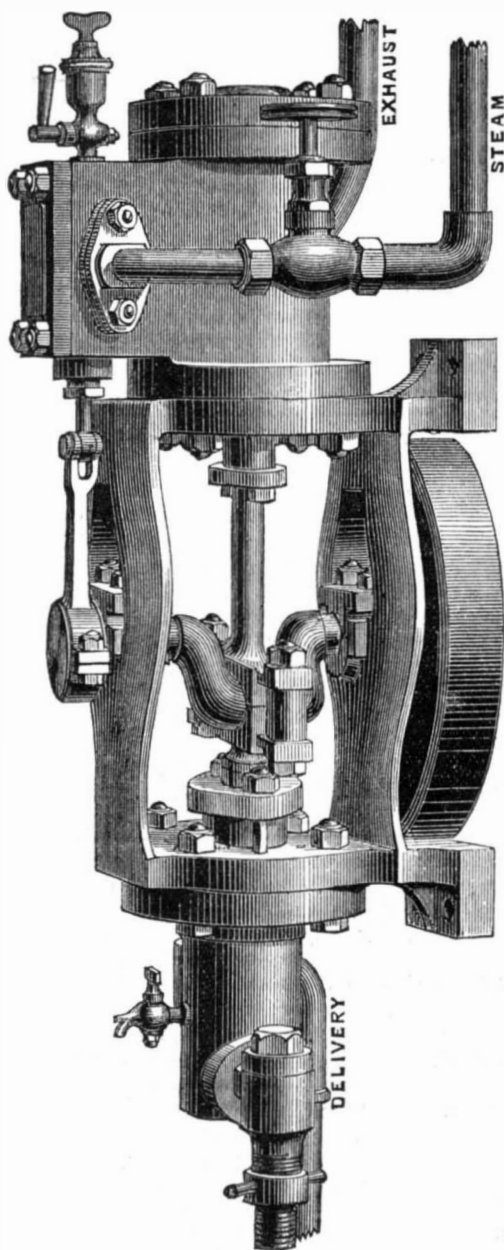
A plate-shearing machine, with revolving cutters, of which we give an engraving herewith, was recently exhibited at Manchester, England. It is provided with an adjustable grooved table and sliding bar, with a stud on the latter, for shearing plates to different radii. A special feature in the machine is that the top cutter shaft is mounted in eccentric bushes, so that by turning these bushes it can be brought nearer the bottom shaft, so as to take up the wear of the cutters. The eccentric bushes are graduated on the edges, so that the two may be turned equally, and the two shafts be thus maintained parallel. The machine will shear plates up to three sixteenths of an inch thick, and it is altogether of a neat and good design.

Natural Gas Fuel.

A few weeks ago a line of pipe was laid from wells in Butler county, Pa., to the mills of Graff, Bennett & Co. on the West Pennsylvania Railroad, in Sharpsburg and Aetna, a distance of eighteen miles. It was not known before the connections were made whether there would be a sufficient pressure of gas to make the scheme a practicable one. At a fixed time, however, the connections were made at the well; and the air having been exhausted from the eighteen miles of pipe, the gas rushed through, and in twenty minutes was pouring in great quantities out of the pipe at the furnaces [The velocity maintained is doubtless a mistake.—*EDS. SCI. AM.*] When the gas was lighted the flames flared up 40 feet high, with a volume sufficient to supply double the quantity of heat required. It is expected that in these two furnaces a saving in fuel of from \$40,000 to \$50,000 a year will be made. In Rogers & Burchfield's rolling mill, the gas has been used for more than a year, and the saving in fuel is estimated at \$60,000 per annum, although only 125 men are employed there. The gas has been flowing with apparently undiminished force for ten or twelve years, and there is no known limit to the supply. Some enthusiasts in Pittsburgh prophecy that within a few years the majority of the furnaces and mills in that great manufacturing city, as well as the parlor grates and kitchen cooking stoves and ranges, will be heated by this new fuel.

DONKEY PUMP.

Subjoined we give a perspective view of a form of donkey



pump which is now being made by Messrs. Hayward, Tyler & Co., and which was exhibited by them at the recent show

of the Royal Agricultural Society at Taunton, England. As will be seen from the view given, the pump is adapted for being bolted up against a wall or boiler, and it is of a neat and compact form, while the pump valves are very readily accessible. The arrangement is so clearly shown by our engraving that no further description will be necessary.

Hygiene for Smokers.

The following are Dr. Berthand's precepts and advice to smokers: Never smoke more than three or four pipes or

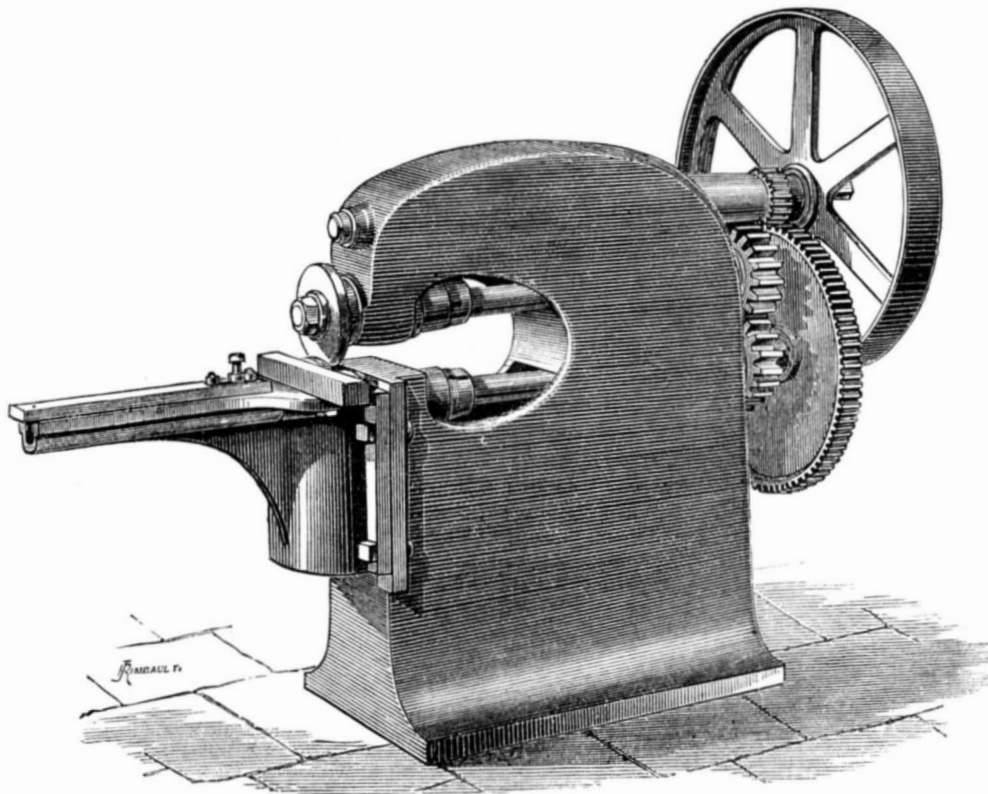


PLATE SHEARING MACHINE WITH REVOLVING CUTTERS.

cigars a day, and, if it is possible, limit yourself to two. It is unwholesome to smoke on an empty stomach or immediately before or after a meal. Whatever be the mode of smoking, direct contact of the tobacco with the *mucus buccalis* (mucous lining of the cheeks) and the teeth must be avoided. Cigars should be smoked in an amber, ivory, or enameled porcelain mouthpiece. To smoke, by relighting them, portions of cigars that have been extinguished, together with the system of blackened and juicy pipes, constitute the surest way of being affected by nicotine. Every smoker would do well, if he could, to rinse his mouth after smoking. *A fortiori* is the same precaution applicable to chewers. For the same reason it would be well to subject pipes and bowls, in which tobacco has been burnt, to frequent washings either with ether or with water mixed with alcohol or vinegar. It is difficult to choose between the different ways of smoking. I give preference to the cigarette, by reason of its slight quantitative importance and the paper which interferes with the contact of its contents with the buccal mucous membrane. But to realize all the *desiderata*, it would be necessary to have the *papelito* made of flax thread and to abstain from the practice which has become the *ne plus ultra* method of its kind, retaining the aspiration at the back of the mouth, so as to pour it out of the nostrils afterward. The premature habit of smoking is certainly hurtful to childhood and during the adolescent period of organic evolution. The economy cannot but suffer, at this period, from the narcotic influence, be it never so slight, and from the salivation which is inseparable from this act. All persons cannot smoke with impunity. There are pathological counter-indications or idiosyncrasies to this habit that it would be imprudent and culpable to infringe. Diseases of the lungs, of the heart, chronic affections of the mouth, nose, eyes, throat, and stomach, are the results of the principal incompatibilities. The airing of apartments where smoking has taken place should be well attended to. To sleep in rooms where tobacco smoke exists, slowly constitutes a grave infraction on the elementary laws of hygiene."—*Tribune Médicale*.

Chloride of Silver Battery of 3,240 Elements.

Messrs. Warren de la Rue and H. W. Müller have constructed a battery composed on the one part of 1,080 elements, each consisting of a tube of glass 6 inches in length, and of 2,160 elements formed of glass tubes of 5 inches in length only. All the tubes are 0.75 inch in diameter, and are closed with stoppers of vulcanized india-rubber, perforated with a hole near the edge to permit the introduction of a rod of amalgamated zinc, 0.2 inch in diameter and 4 inches in length for the first 1,080 elements, and 3 inches for the remainder. At the bottom of each tube, powdered chloride of silver is placed, 220 grains in weight, compressed strongly with wooden rods, a flattened silver wire having been first introduced to the bottom of the tube. The silver wires are covered in their upper part, above the chloride of silver and up to the point where they emerge from the vulcanized stoppers, with leaf gutta percha, to isolate them and preserve them from the action of the sulphur in the stoppers. The electromotor force of this battery is to that of a Daniell's battery as 1.03 to 1

A SPLENDID HOLIDAY GIFT.—"Wrinkles and Recipes." See advertisement on another page.

God's First Temples.

Bayard Taylor, in his interesting work entitled "Home and Abroad," in a graphic account of the mammoth trees of California, thus describes the felling of one of the largest specimens of the Sierra Nevada: "After a steady labor of six weeks the thing was done, but the tree stood unmoved, so straight and symmetrical was its growth, so immense was its weight, and so broad its base, that it seemed unconscious of its own annihilation, tossing its outer branches derisively against the mountain winds that strove to overthrow it. A neighboring pine of giant size was then selected, and felled in such a way as to fall with full force against it. The top shook a little, but the shaft stood as before; finally the spoilers succeeded in driving their wedge into the cut. Gradually, and with great labor, one side of the tree was lifted; the line of equilibrium was driven nearer and nearer to the edge of the base; the mighty mass poised for a moment, and then, with a great rushing sigh in all its boughs, thundered down. The forest was ground to dust beneath it, and for a mile around the earth shook with the concussion." The work was performed by two sets of hands with the aid of long pump augers. The tree was a mass of solid wood ninety feet in circumference, containing some two hundred and fifty thousand feet of timber; and according to the annual rings, its age was three thousand one hundred years. The stump is now used for a ball room, and the trunk for a bowling alley. Dr. Bigelow said of this specimen: "It requires thirty-one of my paces, of three feet each, to measure its circumference at the stump; and the mere felling of it cost, at Californian prices for wages, the sum of five hundred and fifty dollars. An idea of the sublime proportions of these wonderful fathers of the forests can be formed after seeing a man on horseback riding a distance of seventy-five feet through a hollow trunk, and emerging from a knot hole in the side."

IMPROVED SCREW CUTTING DIE AND HOLDER.

We illustrate in the annexed engraving a new adaptation of an improved screw cutting die, made so as to be conveniently held in a bit stock instead of in the ordinary plate. The construction will readily be understood from Fig. 1, and also from the representation of the die taken apart in Fig. 2. The screws shown at A, in Fig. 1, serve to close the parts of the die together from the sides, and the taper screws, B, Fig. 2, spread the die when driven in, thus regulating the size of the cut. By operating either screws, A or B, the portions of the die may be adjusted and held with great nicety, while wear, at the same time, is compensated for in a very simple and effective manner.

The die does its work in a single cut, thus forming the

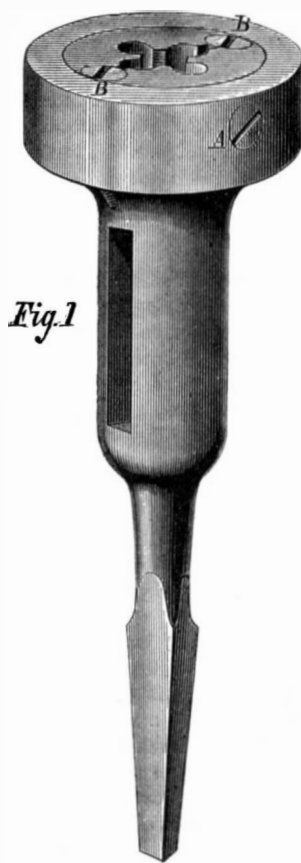


Fig. 1

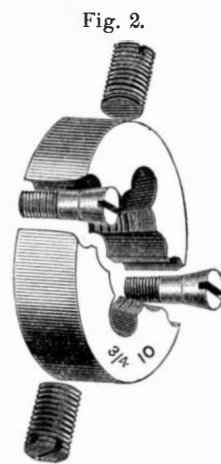


Fig. 2.

screw thread at once, neatly and sharply, and without raising the thread above the normal surface of the material operated upon. The die also allows of nuts and bolts for different purposes being made to fit together tightly or loosely, as desired.

For further particulars, address the manufacturers, the Wiley and Russell Manufacturing Company, Greenfield Mass.

THE KRUPP TWELVE HUNDRED POUNDER GUN.

In a recent issue we published an engraving showing the most important types of the armored vessels which have been built during late years. These floating forts represent the theories of one party, of the two which are contesting the question whether the victories in future naval conflicts will be gained by the thickest armor or the heaviest guns. The result of this competition is a constant transition in the prevalent system of warfare; and hence upon what strength, whether of shield or of gun, combatants will rely in conflicts yet to come, neither opinion nor prophecy can be predicated. The naval engineers construct vessels with solid iron walls, some 24 inches thick; but hardly are the ships launched before a gun is produced by the artillerists, capable of penetrating the armor at long range; then follows a new vessel, succeeded by a yet more powerful gun; and so the duel continues, each side gaining the advantage in turn until one can see no definite end unless he venture into the realms of theory, and vainly endeavor to imagine the impossible conditions of that time-honored mechanical puzzle, "the irresistible force meeting the immovable body."

The majority of the experiments, and very costly ones they are, are carried on in England. New ironclads are almost entirely of English construction, the exceptions being a few built by Russia. In the making of heavy guns, however, England is not alone, as Germany, through the great steel works of Krupp, enters the field as a rival—the German policy apparently being first to allow England to vanquish the armor of her own engineers, by the heavy guns of her own artillerists, and then to produce German cannon superior to the English gun. A very recent instance of this has occurred in the construction of the 81-ton gun by England, the tests of which are hardly concluded before Krupp announces the undertaking of a 124-ton cannon, capable of throwing bolts which will pierce 23.8 inch armor at seven and a half miles range. The distinctive features of the English guns we have already described. In the present article we give an excellent engraving of one of the large Krupp guns (which we take from the pages of Knight's "New Mechanical Dictionary"), from which the general characteristics of the German breech-loading system will be understood.

The gun itself is made of crucible cast steel, of a quality especially adapted for the purpose, and is constructed on the built-up system. It consists of an inner tube weighing 20 tons, upon which are shrunk cast steel rings, forming at the breech a three-fold, and at the muzzle a two-fold, layer of metal. Both tube and rings are formed from massive ingots without welding. The caliber of the gun is 14 inches, weight 50 tons, total length 17½ feet; weight of solid shot 1,212 lbs.; weight of shell 1,080 lbs.; charge of powder from 110 to 130 lbs. The breech-loading is on Krupp's patent plan. The shot or shell is raised by a tackle and is rolled into the side of the breech through an aperture closed by a slide. The gun is mounted on a steel carriage weighing some 15 tons, supported on a center pintle chassis weighing 25 tons.

Postal and Telegraph Service.

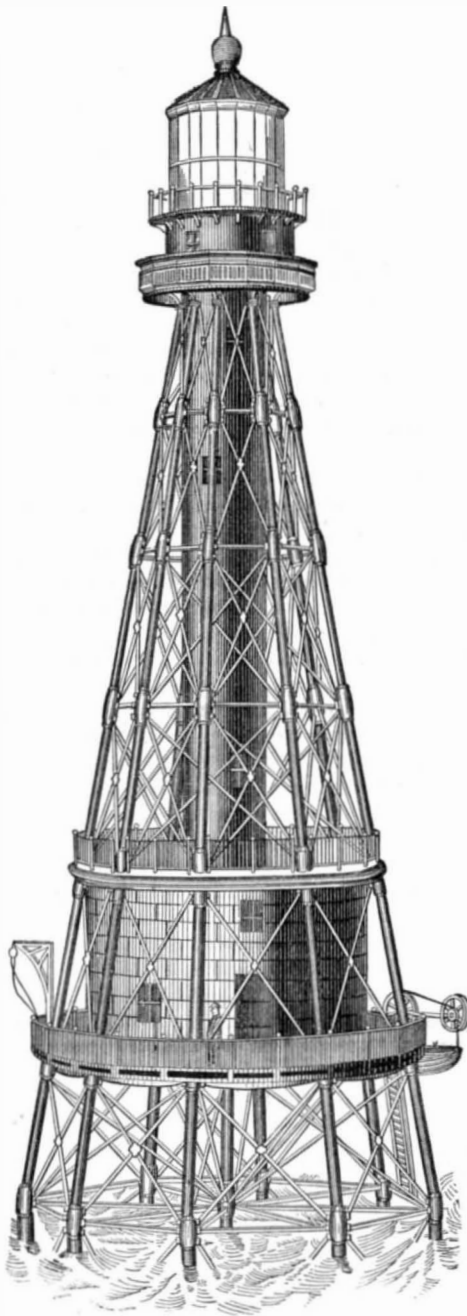
The twenty-first annual report of the British Post Office has just been issued, giving the postal and telegraphic statistics for 1874. It appears that the estimated number of letters sent through the post during the year was 967,000,000, besides about 79,000,000 post cards, and 259,000,000 newspapers and book packets. On an average there were 30 letters to each head of the population in the United Kingdom,

*Published in numbers by Messrs. Hurd & Houghton, New York City.

but the national average was 33 per head for England, 25 for Scotland, and 14 for Ireland, showing some interesting facts in regard to the comparative educational, social, and commercial relationship of each division. The return letters amounted to about 4¼ millions, giving an average of about one on each 220.

THE TRINITY SHOALS LIGHTHOUSE.

An interesting application of iron to the construction of



a building requiring exceptional strength and stability is represented in the annexed engraving of one of the two similar lighthouses erected at Trinity Shoals and at Timbalier, in the Gulf of Mexico. The structure is supported upon nine screw piles—a central one surrounded by eight others,

at distances of somewhat less than fifteen feet four inches | each being twenty feet distant from the central one and secured together at the ground by adjustable wrought iron links, and above by diagonal braces and by radial struts to the central pile. The summit of each pile is incased in a cast iron socket for receiving the column and the radial and diagonal braces. The jointed columns which support the lantern have a similar provision for their diagonal braces, the arrangement for which will be understood from the illustration, which we take from Knight's "New Mechanical Dictionary." The different series of columns are joined together by sleeves. The first series above the foundation is 20 feet long, the second 15 feet, the next two 18 feet. The fourth, fifth, and sixth are respectively 15 feet 6 inches, 14 feet, and 12 feet 6 inches. The columns of the first series are of wrought iron, forged tapering; those above are of hollow cast iron, each series successively decreasing in diameter. The lantern is supported on a cylinder of boiler iron, resting on a platform at the top of the columns.

Anthracite Coke.

The high calorific power of anthracite, consisting as it does of nearly pure carbon, and the low percentage of sulphur and ash contained in most varieties, naturally render it of great value as a fuel in the cupola and the blast furnace; while from its abundance in many districts, and the cheapness with which it may generally be worked, it should at once be the best and the cheapest fuel that could be used. The practical drawbacks to its use, which diminish its value and to a great extent restrict its employment, are the difficulty of utilizing the slack or small anthracite, of which a good deal is made in mining and handling, and in breaking the large pieces, and the tendency of many anthracites to split up into small particles if suddenly heated. In the blast furnace this decrepitation is especially injurious, as the fine dust is apt to form, together with the cinder, pasty masses that can neither be melted nor burnt away, and may choke the furnace up or seriously derange its working.

These difficulties in the way of using anthracite generally in its natural or raw state, have led to many attempts to make it into a serviceable coke, by coking it in admixture with a greater or less proportion of binding coal, pitch, or other bituminous substances. None of these attempts, until very recently, appear however to have been commercially successfully; none, at least of those made in South Wales, have been carried out largely or continuously; as, though coherent coke was made, it was friable and of inferior quality.

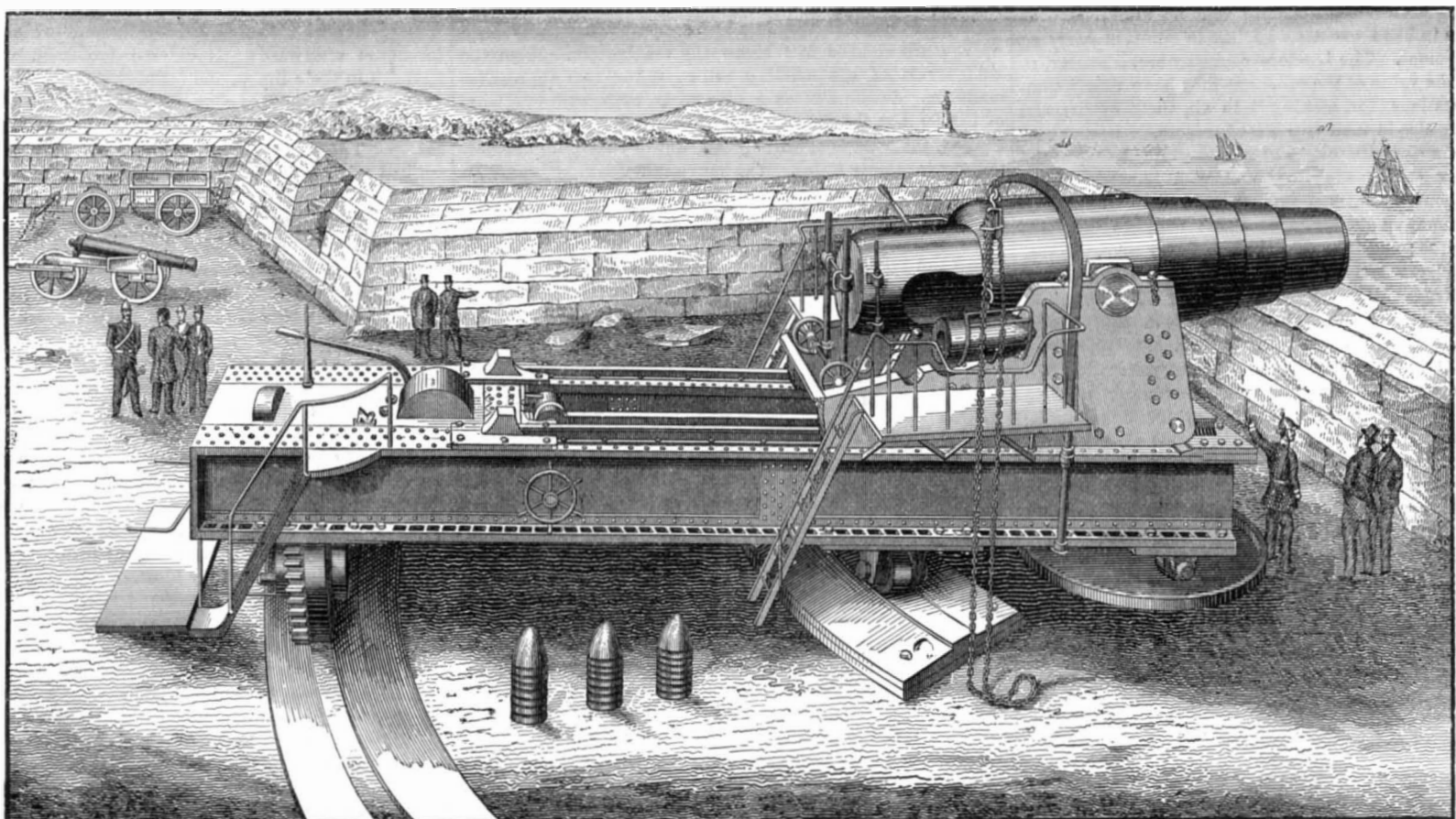
Some samples exhibited would appear, however, to show that the production, on a working scale, of a hard and sound anthracite coke is not at all impossible.

They are fair specimens of the coke now being made by the process of Messrs. Perrose and Richards, of Swansea, to whom the writer is indebted for them, as well as for the information as to the mode of manufacture, and the characters of the coke obtained, on which the present note is based.

The materials used are any quality of anthracite or semi-anthracite, if free from shale or stones, good bituminous or binding coal, and pitch, in the following proportions:

Anthracite, 60; bituminous coal, 35; pitch, 5.

Specimens have been shown of coke made of Messrs. Brock and Sons' anthracite, from Cwmllynfell Colliery, near Cwm Amman; of a mixture of this with Ynisedwyn anthracite; and of culm or semi-anthracite from Birch Rock Colliery, near Pontardylais. The bituminous coal used in making all the samples exhibited was that from Tyrissa Colliery, near Swansea.



KRUPP'S MONSTER FIELD GUN.

The materials are passed, together, through a Carr's disintegrator, to crush and mix them: the proportions in which they are mixed being regulated by supplying the feeding hopper of the disintegrator by three elevators, one carrying up each constituent, and each provided with buckets of such size and number as to bring up the relative quantity required. Samples are shown of the anthracite, bituminous coal, and pitch, in the condition in which they are supplied to the disintegrator, and of the crushed mixture produced.

The ovens used are of the oblong shape generally employed in South Wales: 15 feet long, by 5 feet 7 inches wide at the back and 6 feet 2 inches in front, and 4 feet 4 inches high to the under side of the arch. Each oven is charged, through a hole in the roof, with about four tons of the crushed mixture; this is leveled by a rabble put in through the door at the end; and a small quantity of bituminous coal, sufficient to form a layer about 2 inches thick, is thrown in and spread uniformly over the surface. The oven is then lighted, by throwing a few shovelfuls of hot embers on the top of the charge, immediately inside of the door, and the coking is managed as in working an ordinary charge of bituminous coal. The object of covering the charge with a layer of bituminous coal is to prevent the burning away of the pitch, and its use appears to be essential for the production of a hard and strong coke. Ordinary slack, of the same quality as that in the mixture, is used for the covering; this is mostly very small, but is not specially crushed.

Rather more than two charges per week are made in each oven; the coke is watered in the oven, and is then drawn out in one mass, by a chain and hand winch.

The yield of coke is 80 per cent of the weight of the charge. The coke is steel gray in color, and very much harder than the anthracite from which it is made: so hard, indeed, that it scratches glass with comparative ease. In a common fire, or under the action of a blast, it burns away without showing any tendency to crumble or decrepitate. It is about 23 per cent heavier than the best coke made from Welsh bituminous coal; so that in sending a cargo abroad recently, a vessel that could not carry more than 240 tons of ordinary coke was able to take in as much as 310 tons of anthracite coke. Another valuable consequence of the dense compact character of the coke, in addition to the saving in cost of carriage, is that, even if soaked in water, it takes up very little, only from 1.5 to 2 per cent of its weight; while many kinds of ordinary coke absorb readily 10 per cent or more. The coke is harder and more dense, the finer the materials are crushed, and the more intimately they are mixed.

In practical use, both in the cupola and in the blast furnace, the coke, so far as it has been tried, has given remarkably good results. These are probably due in part to its hardness and density, or rather to the high temperature required to set it on fire, which brings the zone of combustion closer to the tweers, and diminishes the waste of fuel in the upper part of the furnace caused by the transformation of $C O_2$ into $C O$: and in part to its freedom from water, and the small amount of ash that it contains.

In a small foundry cupola, in which 1 lb. of good Welsh coke, that from Bryndu, near Bridgend, melts 10 lbs. of iron, 1 lb. of anthracite coke melts 16 lbs. and the metal is hotter when tapped out; and in a trial carried out at Messrs. Tangye's Works, near Birmingham, anthracite coke melted well with 25 per cent more burden than that placed on ordinary coke, and would probably have done more, but the managers were unwilling to run any risk of deranging the working of the cupola, and did not push the experiment further.

In a trial made in one of the blast furnaces at Landore, working on spiegeleisen, the burden, in using anthracite coke, was increased 23 per cent; and the economy might probably have been raised to 30 per cent or more, but the stock of coke in hand was not sufficient to admit of carrying on the experiment. The Landore company are, however, so satisfied of the value of the coke that they have nearly completed preparations for making it in all their ovens, and using nothing else in their two blast furnaces.

The cost of anthracite coke is about the same as that of the best ordinary coke made in the district. Anthracite, in Wales, is about 48 cents a ton cheaper than bituminous coal—an economy in one constituent that balances the extra cost of the pitch; and in making best ordinary coke, the coal used is ground, at a cost of about 12 cents a ton, just as in the case of coke from anthracite. The yield of 80 per cent in coking anthracite, against 70 per cent or less in coking bituminous coal, is again in favor of the former.

The cost of the crushing and mixing arrangements, to grind 1000 tons a day, is estimated by the inventors at from \$10,000 to \$12,500. This would include a 6 feet 3 inch disintegrator, with driving power, elevators, and shed.

The process has been carried on near Swansea for about nine months; and though it was suspended for some time during last winter, on account of the colliers' strike, between 2,000 and 3,000 tons have in all been made.

The field for the application of any practical method of utilizing small anthracite is very great; the quantity available in Wales and in America is almost unlimited, and very much of that raised is now unsaleable, merely because it is too small to be used. In Pennsylvania, according to Mr. Bell, from one fifth to one half, of the material brought to the surface in the anthracite collieries, is thus thrown aside: partly shale and stones, but chiefly small and dust coal, perfectly clean and bright.

AN engine cylinder piston will not wear the packing in the stuffing box if it is incased with brass, and brass should always be put on the plunger of the feed pump.

The British Channel Tunnel.

The proposition to unite England and France by means of a railway tunnel beneath the waters of the English Channel, which has, during the past few years, figured largely among the items and comments of the engineering press and in the discussions of various learned bodies abroad, has at length assumed such definite shape that the actual undertaking of the enterprise in the near future is rendered highly probable.

To cut a tunnel of the enormous length of twenty miles, beneath the waters of the ocean, is an undertaking which, to most minds, will appear to be attended with so much hazard and uncertainty—to say nothing of expense—as to be practically impossible of completion; nevertheless, after a most thorough investigation of the subject, and full consideration of the difficulties, dangers, and uncertainties surrounding it, the most eminent engineers of England and France have pronounced their conviction that the project is feasible, and that the building of the Channel Tunnel is simply a matter of expense. We present herewith the main facts connected with the history of the projected enterprise.

The Channel Tunnel Company was established in 1872, and comprises two societies—one French and the other English. It was first intended to form an international company; but owing to certain differences between the French and English laws, the promoters of the undertaking were forced to resort to the abovenamed combination. Under this arrangement each society, before expending money upon preliminary investigations, made application to its own government for the legislative concessions needed before the work could be undertaken, which concessions, it is announced, were obtained without difficulty. The first society will therefore open the door of France beneath the sea in conformity with French legislation, and the second society will do the same on the English coast according to English legislation. The assent of the two governments having been obtained, the preliminary work was begun. The first inquiry was a geological one, by carefully measuring to ascertain on each side of the channel the outcrops of the beds that lay underneath, accurately as could be done by that process. The gray chalk—a mass of strata about 500 feet thick and impervious to water—which forms the principal mass of the cliff at both Dover and Calais, strikes across the channel so with little divergence from horizontality that a tunnel could be pierced within the vertical bounds of its thickness, presuming it to be continuous all the way across. From the geological map constructed on the data thus obtained, it appeared that a line between St. Margaret's Bay (a depression in the chalk cliffs about four miles east of Dover) and a point on the French side, about midway between Calais and Sangatte, would be suitable to carry the tunnel through the lower chalk.

To verify this presumption, an examination across the channel was made by dropping from a steamer a weighted instrument in 500 places, the apparatus running with great velocity to the bottom, and bringing up chalk wherever it was expected. The device employed in this work consisted of an iron tube, over which a hollow shot, fitting loosely, was raised and let fall upon a flange attached to the tube, the end of which is in this way driven into the substance of the sea bottom, the core thus obtained giving the required sample of the rock perforated. The results obtained afforded a complete confirmation of the correctness of inferences drawn from the maps previously made, and were sufficiently satisfactory to establish the feasibility of the project on purely geological grounds.

The line of the main tunnel as proposed, which is to be large enough for a double line of railway, is drawn straight between the proposed termini on both sides. In longitudinal section it presents a slight fall of 1 in 2,640 from the center towards either extremity, and the vertical depth of the highest point of the floor is 436 feet from Trinity high water mark and 200 feet below the sea bottom. From the land levels of the existing railways, the two approaches make long descents of over four miles, each with gradients of 1 in 89 into the tunnel ends, over two miles being under the sea, the total of the whole amount of tunneling amounting to over thirty miles. The maximum depth of water on the line of the proposed tunnel nowhere exceeds 180 feet below high water mark, the water being deepest in the center, and gradually diminishing in depths towards the sides. Below the railway approaches, and continuous with the floor of the submarine tunnel, there will be at each end a driftway leading to vertical shafts ashore for ventilation and drainage. These terminal shafts and driftways comprise the preliminary work which it is intended to make as a test of the general practicability of the undertaking, and of which they will, when completed, form essential portions. On the French side the work of sinking the shaft has just been commenced, while that on the English side is nearly or quite completed. It is proposed to execute the work with the aid of the tunneling machinery recently invented by Mr. Dickinson Brunton. This machine works after the fashion of an auger, and the debris excavated falls upon an endless band which carries it to the wagons in the rear. By this means a driftway, seven feet in diameter, can be advanced at the rate of about a yard and a quarter per hour, at which rate it would only require two years to pierce the channel through, a machine being worked from both sides. For this preliminary work, the engineer's estimates of time and cost are four years and \$8,000,000 respectively, but experienced contractors declare that only half the time and money would be required. It has also been computed that, after the driftway is finished, four years' time and \$20,000,000 will complete the entire work.

It has been ascertained by actual experiment that, provided the chalk be solid, the water will not permeate it, in

proof of which, the Brighton tunnel (5½ miles in length, in close proximity to the seashore, and from 12 to 20 feet below the sea level, and excavated in the comparatively compact upper chalk) is offered in illustration. In this case comparatively little water was met with. Taking everything into consideration, therefore, it is reasonable to infer that the only natural obstacle that could hinder the completion of the work would be the existence of open, unfilled fissures in the bed rock, reaching from the sea bottom to the depth of 200 feet through the rock. The probability of the existence of such fissures and the chances of striking them on the line of the proposed tunnel are extremely small.

The preliminary work abovenamed is being steadily advanced; and should the results obtained continue to verify the anticipations formed by the engineers in charge, the actual undertaking of the tunnel proper will not be long delayed. The funds for the preliminary work are guaranteed by several prominent corporations and the Rothschilds, and there is every reason to believe that the two governments interested will come to the aid of the projectors of the work, at the proper time, by the grant of a liberal subsidy.—*Dr. W. H. Wahl.*

The Mass Copper of Lake Superior Mines, and the Method of Mining it.

BY PROFESSOR WILLIAM P. BLAKE, OF NEW HAVEN, CONN.

The occurrence of enormous masses of pure copper has given the mining districts of Lake Superior worldwide reputation. The first masses brought from there excited great attention, and directed the notice of the mining world to the few particular mines from which they were taken. It may not now be generally known that nearly all the veins which are worked, and which cut across the trap ridge, contain mass copper, and that large masses are continually being raised from them.

The largest continuous mass which has been taken out was probably that from the Minnesota in 1857, which is variously stated as weighing 420 tons and 470 tons. Its length was about 45 feet, its breadth or height 22 feet, and its greatest thickness 8 feet. All such masses are very irregular and ragged in their form and thickness, thinning out gradually from a foot to a few inches, and struggling through the vein until they connect with other large masses. This was the character of a mass found in the Phoenix mine, one of the oldest on the Lake, which mass altogether weighed some 600 tons. But this was really a series of masses more or less connected by strings of metal, yet no one large part of it weighed, singly, over 200 tons. A similar series of masses, weighing about 600 tons, was extracted from the Minnesota. Some of the Phoenix masses were four or five feet thick of solid copper. The Cliff mine has yielded masses weighing from 100 to 150 tons in one piece. One of 40 tons was taken out this year, besides numerous blocks weighing from 1 to 8 tons. This mine and the Central are now yielding mass copper in abundance.

It is of course impossible to pick, or to drill, or to break out such huge masses of solid metal, when they are found by drifting upon the course of the vein. The method is as follows: The miner picks out, or excavates, a narrow passage or chamber upon one side of the mass, laying it bare as far as possible over its whole surface. It is usually firmly held by its close union with the vein stuff, or by its irregular projections, above, below, and at the end. If it then cannot be dislodged by levers, the excavation of a chamber is commenced behind the mass, and this excavation is made large enough to receive from five to twenty or more kegs of powder. In one instance, in the Cliff mine, a charge of 21 kegs of powder threw down 200 tons of copper. Bags of sand are used for tamping, and the drift is closed up by a barricade of refuse and loose dirt. After such a blast the drift is, of course, charged with foul air, and it cannot safely be entered for hours afterwards. If entered too soon, men lose all strength in their limbs, and fall down.

The huge masses of copper dislodged in this way are too large to be handled and got to the surface. They have to be cut up. The copper cutters are called in, and the mass is marked off in squares or blocks of suitable size. Copper cutting is a distinct art, and requires considerable skill and experience. Ordinary miners, however skillful they may be cannot cut up copper without long training.

The tools are simply narrow chisels and striking hammers. The chisels are shaped like the parting tools of turners. They are made of flat bars of half inch steel, about 2 inches wide and 18 inches long. They are chamfered each way like a cold chisel, to form the cutting edge. This edge is made a little longer than the thickness of the bar. The cutter holds the chisel and two men strike it. A thin slice or chip of copper is in this way cut out in a narrow channel across the mass of copper. The operation is repeated until the narrow cut, but little over half an inch wide, has been carried through the mass. The chips cut out in this way are long narrow strips of copper only about half as long as the groove from which they are taken, the metal being condensed and thickened by the force of the blow.

This work is necessarily slow and tedious, and it costs \$12 per square foot by contract. At this price, the cutters make \$2 per day.

It is inconvenient to handle masses weighing over 6 tons. Such masses, when hoisted, are landed upon very strong platform trucks, and are then dumped in the rock house upon a large pile of dry pine logs. When a considerable number of masses has accumulated, the logs are fired and the whole pile is heated to redness, for the purpose of loosening the very considerable quantities of vein stone which are enclosed in the ragged cavities. This vein stone consists chiefly of calcite; and after cooling off, it is so much softened that the

Advertisements,

Back Page \$1.00 a line. Inside Page 75 cents a line.

Engine, Spindle, & Cylinder Oil. E. H. KELLOGG, 17 Cedar St., N. Y. manufactures the best.

WANTED, A Live Agent in every county in the United States and Canadas, to sell the

"TYPE WRITER,"

A machine now superseding the pen for all writing except book-keeping. It writes in plain type 80 to 100 words per minute, and a child can use it.

LOCKE, YOST & BATES, 707 Broadway, New York.

HAIR- FELT---HAIR- FELT. FOR COVERING BOILERS & PIPES. AMERICAN HAIR- FELT MILLS, 316 Front Street, New York.

PATENT RIGHT FOR SALE.—The one-half interest of the Riley estate in the Universal Wood Worker, to the highest bidder.

Shaping Machines. Have novel device for changing length of stroke while in motion, also, automatic down feed, and quick return. Four sizes. Patented 1868, 1871, 1874. Wood & Light Machine Co. Worcester, Mass.

Engines & Boilers, new & 2d h'd, perfect condition. Very cheap. Address BINGHAM & RICH, Oil City, Pa.

EXPERIENCED MILL MEN, who are using R. HOE & CO.'S New Patent Saws, concur in saying that the Chisel tooth is very superior, and will soon supersede all other circular saws, for cutting logs and timber.

BOGARDUS' PATENT UNIVERSAL ECCE-TRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guano, Oil Cake, Feed, Corn, and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Coconut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills.

Todd & Rafferty Machine Co. MANUFACTURERS OF The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Plug Boilers; Plain Slide Valve Stationary Hoisting, and Portable Engines.

MAGNETS—Permanent Steel Magnets of any form or size, made to order by F. C. BEACE & CO., 246 Canal St., New York.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and Molding, Tenoning, M'orising, Boring, Shaping, Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-Off, and Rip-saw Machines.

ELGIN WATCHES.



DECLARED by Railroad Officers, Engineers, Astronomers, Explorers, Navigators, Travelers and others, to be the Most Accurate, Durable timekeepers in the world.

26 GRADES now in the market, including Ladies and Gentlemen's sizes, Key Winders, Stem Winders, Stem Setters, Full Plate, Three-Quarter Plate, Plain, Full Jeweled, Etc.

PRICES ranging from a few dollars for plain timekeepers in Silver cases, to two hundred or more dollars for a highly finished and remarkably accurate one in fine Gold cases.

AVOID all C.O.D. advertisers and apply to dealers of known respectability, as Elgin Watches are not furnished to any party whatever to be sold on the disreputable C. O. D. plan, which is used to palm off imitation and pinchbeck goods.

DEMAND and receive with your watch the regular warranty medal of the Company, as noted below, and see that the name and number correspond.

THE WATCH named T. M. Avery is offered at such prices as to come within the reach of all, and is unequalled in the world for the money.

GUARANTEE The Company makes no watches at any price, low or high, which it is not willing to FULLY WARRANT. Each watch movement of any and every grade, made by the Elgin National Watch Company, and bearing its trade-mark "Elgin, Ill.," is accompanied by the official WARRANTY MEDAL of the Company, with number and name corresponding to the watch.

FOR SALE by respectable jewelers in nearly every town in the United States and Canadas, and also in the principal cities throughout the world. Call on your jeweler and ask to see them.



The TANITE EMERY WHEEL

Is a rotary file which runs a mile in a minute, and whose cutting points never grow dull. THE TANITE COMPANY publish monthly a first-class Mechanical Journal, called The Emery Grinder.

THE TANITE COMPANY manufacture the most uniform and reliable Emery Wheels ever made, and are constantly getting up novelties in Emery Grinding Machinery.

Address THE TANITE CO., STROUDSBURG, MONROE CO., PA

PURE EMERY,

Guaranteed equal to any in the market, at prices lower than any other first class Emery.

Engines and Boilers, New and Second-Hand. Portable and Stationary. For description, address GOODWIN & WHITE, Oil City, Pa.

Pyrometers, For showing Heat of Ovens, Hot Blast Pipes, Boiler flues, Super-Heated Steam, Oil Stills, &c. HENRY W. BULKLEY, Sole Manufacturer, 98 Liberty St., New York.

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOS. G. ROGERS & CO., Madison, Ind.

THE NATIONAL Steel Tube Cleaner.

For Cleaning Boiler Tubes. Adopted and in use by U. S. Navy. For sale by dealers. Send for Circular. THE CHALMERS SPENCE CO., foot E. 9th Street, N. Y.

NON-COMBUSTIBLE STEAM BOILER & PIPE COVERING WITH "AIR SPACE" IMPROVEMENT.

PORTLAND CEMENT For Walks, Cisterns, Foundations, Stables, Cellars, Bridges, Reservoirs, Breweries, etc.

IRON PLANERS. ENGINE LATHES, DRILLS, &c. NEW HAVEN MANUFACTURING CO., New Haven, Conn.

THE SOUTHERN STATES AGRICULTURAL AND INDUSTRIAL EXPOSITION Will be held on the Fair Grounds, at New Orleans, commencing February 26, 1876, and continuing Ten Days.

THE BEST INJECTOR For Locomotive and Stationary Boilers. FRIEDMANN'S PATENT. Over 15,000 Now in Use Here and in Europe.

THOMAS'S FLUID TANNATE OF SODA— Never fails to remove Scale from any Steam Boiler, using any kind of water.

NOYE'S Mill Furnishing Works are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills.

THE SCIENTIFIC AMERICAN SUPPLEMENT, 1876. \$5 a year by mail, post-paid. Send 10 cents for Specimen Copy.



TO ILLUSTRATE AND DESCRIBE the many interesting themes and objects presented in the GREAT CENTENNIAL INTERNATIONAL EXPOSITION OF 1876, and also to meet the wants of that large class of readers who desire an increased supply of Scientific Information, particularly of the more Technical and Detailed character, we shall issue a SPECIAL PUBLICATION, entitled the SCIENTIFIC AMERICAN SUPPLEMENT, to be printed weekly during the Centennial year of 1876, and, perhaps, permanently thereafter.

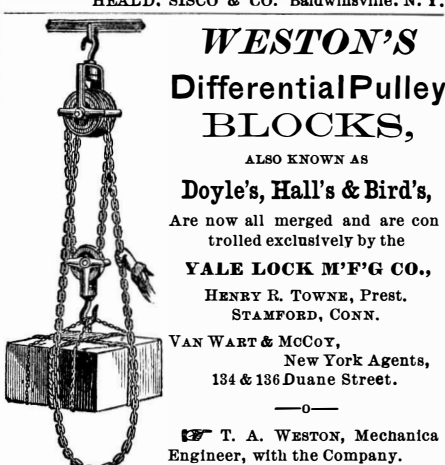
T. V. Carpenter, Advertising Agent. Address Box 773, New York city.

Diamond Solid Emery Wheels. Prices—8x1/2, \$1.25; 8x1, \$2.25; 12x1 1/2, \$5.50; 16x2, \$12.50; 18x2, \$16.00; 20x2, 18.50; 24x3, \$42. All other sizes at proportionate prices.

IRON AND STEEL DROP FORGING. Of Every Description, at Reasonable Prices. The Hull & Belden Company, Danbury, Ct.

THE HEALD & SISCO Patent Centrifugal Pumps. VERTICAL & HORIZONTAL. First Premiums at New Orleans, Cincinnati, and New York.

WESTON'S Differential Pulley Blocks, ALSO KNOWN AS Doyle's, Hall's & Bird's, Are now all merged and are controlled exclusively by the YALE LOCK M'FG CO., HENRY R. WESTON, Prest., STAMFORD, CONN.



THE SCIENTIFIC AMERICAN For 1876. THIRTY-FIRST YEAR. Only \$3.20 a year including Postage.

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

THE SCIENTIFIC AMERICAN, now in its 31st year, enjoys the widest circulation of any weekly newspaper of the kind in the world.

THE CONTENTS OF THE SCIENTIFIC AMERICAN embrace the latest and most interesting information pertaining to the Industrial, Mechanical, and Scientific progress of the world; Descriptions, with beautiful Engravings, of New Inventions, New Implements, New Processes, and Improved Industries of all kinds; Useful Notes, Recipes, Suggestions and Advice, by Practical Writers, for Workingmen and Employers, in all the various arts.

EVERY NUMBER contains sixteen large quarto pages, elegantly printed and illustrated with many engravings. The year's issue contains 832 large pages, equal to four thousand book pages, at a cost, including postage, of only \$3.20 a year to the subscriber.

THE SCIENTIFIC AMERICAN will be especially enriched during the current year by splendid engravings and descriptions of the most noticeable objects in the great Centennial International Exhibition.

Engineers, Mechanics, Telegraphers, Inventors, Manufacturers, Chemists, Photographers, Physicians, Lawyers, Clergymen, Teachers, and People of all Professions, will find the SCIENTIFIC AMERICAN most useful and valuable. Its pages teem with interesting subjects for thought, study, and conversation, and are an unfailing source of new and instructive information.

TERMS OF SUBSCRIPTIONS.—POSTAGE PAID BY US. One copy Scientific American, one year... \$3.20 One copy Scientific American, six months... 1.60 One copy Scientific American, three months... 1.00 One copy Scientific American, and one copy Scientific American Supplement, both for one year, post-paid... 7.00 One copy Scientific American, one year, and one copy Science Record... 5.20

MUNN & CO. 37 PARK ROW, NEW YORK.

THE "Scientific American" is printed with CHAS. BENEJOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia and 59 Gold St., New York