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AMERICAN INDUSTRIES.—No. 58.

THE MANUFACTURE OF NON-CONDUCTING COVERINGS FOR STEAM PIPES, BOILERS, ETC.

All questions which touch the relation of the actual amount of power in a pound of coal to that which is practically obtained therefrom, are just now receiving closer attention than ever before. The fact that, in the average working of the better classes of steam engines in general use, we only obtain about ten per cent of the value of the heat that is expended in the furnace, has long been known, but the various styles of compound engines, the Loftus Perkins system, and all the thousands of inventions and improvements in furnaces, engines, and boilers, for more completely obtaining the full power of the coal consumed, have fallen so far short of success as to leave the question of its perfect utilization almost untouched. The principal difficulties in the way of making and using steam at about the temperature of the furnace fire, which would obtain the theoretical value, excepting losses in combustion, are of a mechanical nature, as it has thus far been found practically impossible to work under the high pressures this would give. But the way in which the temperature and the pressure of steam, in our ordinary boilers and engines, are allowed to drop in the steam chest, cylinders, and pipes after it leaves the boilers, as well as the loss in the boiler itself from the diminution of heat by radiation, indicates a want of economy in one of the simplest matters of detail, where comparatively inexpensive provisions would many times repay their cost.

In the illustrations below we show the processes followed in making the Chalmers-Spence non-conducting and "air space" coverings for boilers, steam chests, cylinders, pipes, etc., through the proper application of which the loss of heat by radiation may be almost entirely prevented. The name of the company is taken from the patentees, Messrs. Chalmers and Spence, who were first to make a practical success of this method, and it has now been in use sufficiently long to have thoroughly demonstrated its efficiency, the list of testimonials which the company shows embracing not only the engineering department of the United States Navy, but hundreds of the largest steamship companies and manufacturing establishments in the country. These coverings have also been applied with great success on the hot air pipes of blast furnaces, and wherever hot air is to be conveyed to a distance, their use in this way offering relatively the same advantages as are obtained when steam pipes are thus covered.

In most of these coverings asbestos is used in larger or smaller proportions. Its strong yet delicate fibers, with the fact that it is entirely unaffected by fire, peculiarly fit it for this purpose. It is a variety of hornblende and pyroxene, generally of a clear or grayish-white, and is mined to some extent in almost every part of the world, our supplies coming principally from the Mediterranean, China, and Canada. The view at the left shows a mill for crushing the asbestos, care being taken that in this operation there shall be no friction or attrition from the rollers to grind the material or break its fibers.

As generally applied in the coverings of boilers, cylinders, tubes, etc., the asbestos is made into a kind of plaster with a mixture of hair and other materials, and this portion of the work is shown so that it will be easily understood by a reference to the engraving. The tearing up of the hair, the tank, barrels, and piles of material ready to place in the revolving drum, and the barrels in which the prepared mixture is received as it comes out, give a graphic idea of the process.

The view at the bottom of the page illustrates various ways of putting on the covering. In the center the workmen are seen applying it with trowels around a boiler, very much as a mason would plaster a room. At the left is a boiler thus covered, with a section torn off to show a portion not covered, and to the right stands a pipe on which the "air space" covering has been applied at the bottom, while above and around the pipe is shown the wire cloth frame on which the covering is plastered. This frame is kept at the proper distance from the pipe by studs of a greater or less length, according to the amount of air space it is intended to leave around the pipe, and the covering is plastered on this frame,

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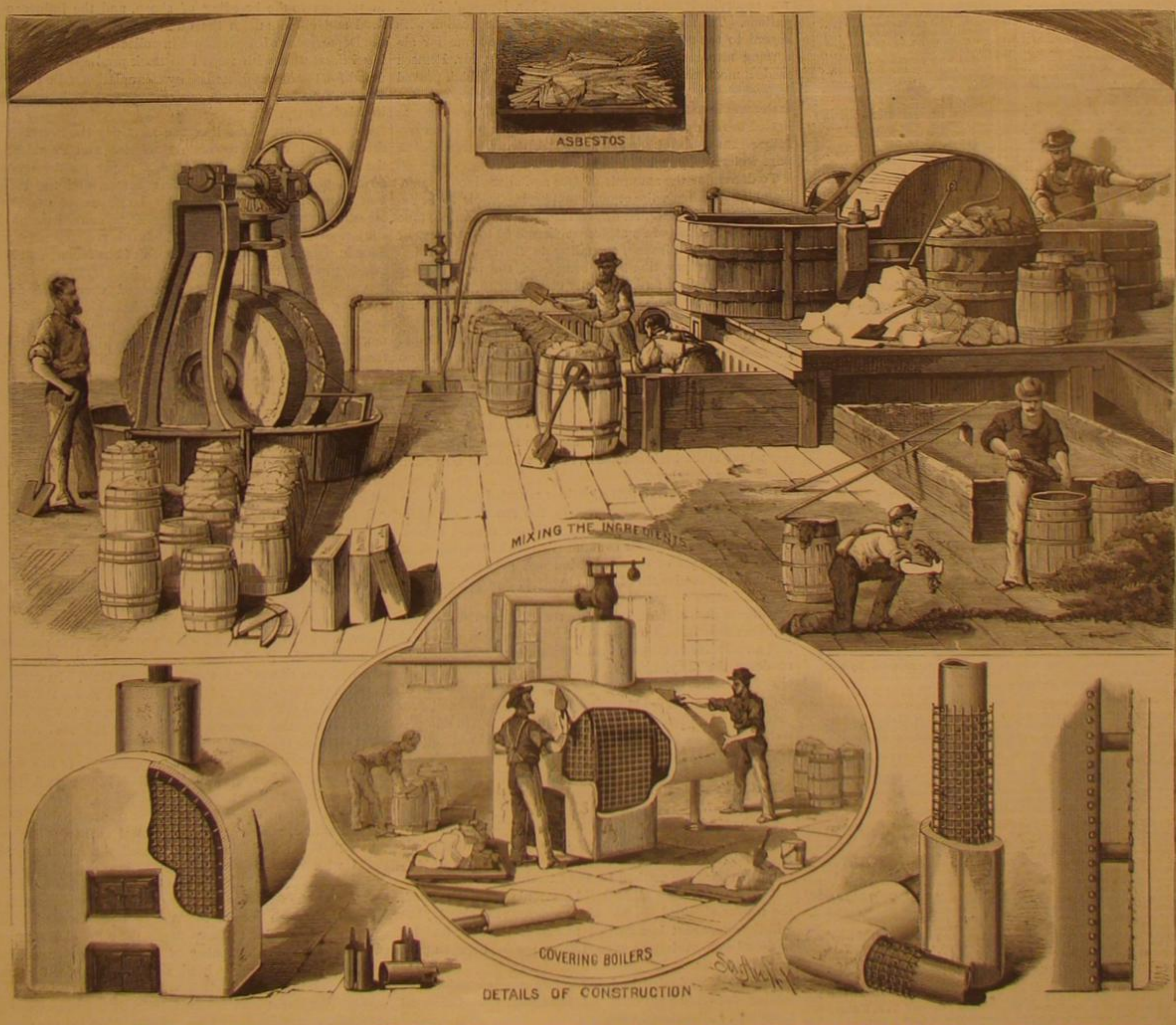

MANUFACTURE OF NON-CONDUCTING COVERINGS FOR STEAM-PIPES AND BOILERS.—THE CHALMERS-SPENCE CO., NEW YORK CITY.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 250.

For the Week ending October 16, 1880.

Price 10 cents. For sale by all newsdealers.

ORGANIC MATTER IN THE AIR.

About a year ago, at the request of the National Board of Health, the well known and very capable chemist, Prof. Ira Remsen, undertook an investigation of the methods employed for the detection and determination of the nature of the organic matter known to exist in air. A preliminary report, giving an outline of the work, but no details in regard to the methods employed, was published in the *Bulletin* of the Board last winter.

In the *Bulletin* for September 11, appears a more extended report, with details of experiments and such results as seem to have been established by them. The importance of the work, in which Mr. Remsen has been assisted by Mr. W. Mager and Mr. T. W. Day, will be appreciated by all who have any knowledge of the grave questions of public and private hygiene which hinge upon the possible influence of organic matter in the air, and the great need of some trustworthy and if possible simpler method of detecting its kind and measuring its quantity.

While air is often contaminated by carbonic acid and other gaseous results of vital, chemical, and industrial processes, the mischievous effects of "impure air," as popularly defined, most probably arise from the presence of refuse organic matters of a nitrogenous character. These, when taken back into the system, are apt to cause serious vital disturbances, and it is probable that they do cause not a few of the maladies which afflict mankind. The great problem is to discover the best method of determining the presence and nature of such impurities in air.

The first to attack the problem seriously was Dr. R. A. Smith, of Manchester, England, as early as 1870. He first endeavored to collect the organic matter in the air of city streets and foul places by washing the air in pure water. In some cases as many as a thousand volumes of air were successively washed with one volume of water, a process which required infinite patience and care, and so much time as to forbid its use as a practical method.

A different and more complicated though less laborious method of washing air, more recently devised by Mr. E. M. Dixon, Chemist of the Sanitary Department of Glasgow, has yielded valuable results, both there and at the Observatory of Montsouris, near Paris.

Something more simple and accurate, however, seemed requisite for general use; and the devising of such a method was accordingly made the first step of Mr. Remsen's investigations. Taking advantage of Chapman's suggestion with regard to the use of finely powdered pumice stone for absorbing nitrogenous organic matter from air, Mr. Remsen made a modification of Chapman's apparatus, which proved at once simple, efficient, and reliable in its results. Before each experiment the coarsely powdered pumice stone was heated to redness in a platinum crucible, then put into carefully cleansed absorbing tubes, and moistened with a little pure water.

To determine the amounts of free and albuminoid ammonia obtainable from the organic matter in the air to be examined, the air was first drawn through the pumice stone absorber by means of an aspirator. From 50 to 100 liters of air were drawn through, according to the amount of impurity. The absorption being completed, the pumice stone was conveyed to a flask perfectly cleaned with pure water; then 500 c.c. of the same water and 5 c.c. of a specially prepared sodium carbonate solution were added. Connection was then made with a clean condenser, and 100 c.c. distilled off (distillate A) and put aside for treatment with Nessler's solution. A second distillate (B) of 100 c.c. was then made, after adding to the contents of the flask 20 c.c. of a specially prepared solution of potassium hydroxide and 50 c.c. of a solution of permanganate of potassium. The first distillate Nesslerized gave the free ammonia, and the second the albuminoid ammonia, in the volume of air drawn through the absorbers.

In the course of the investigations reported upon, to determine the variations produced in the amount of nitrogenous organic matter in air by different causes, experiments were made with air contaminated with decaying meat in various stages of decomposition and dryness, air contaminated by the breath of dogs closely confined, laboratory air, etc.

Hitherto the opinion has been that the nitrogenous organic matters in bad air are the really injurious ones, and that an increase in the two forms of ammonia is sufficient to condemn the air yielding it. Mr. Remsen, however, is inclined to think that the question whether the amounts of ammonia and albuminoid ammonia yielded by air can be regarded as reliable measures of its impurities is still an open one. The main results established by these investigations he sets down as follows:

1. The nitrogenous matter of the air may be thoroughly collected by means of the pumice stone absorber described in this report.

2. The total amounts of ammonia found in experiments performed at the same time with the same specimens of air agree fairly well with one another; so much so as to warrant the use of the method for the examination of the air.

3. When free and albuminoid ammonia are determined, the results obtained do not always agree very closely, but still the agreement is sufficient to enable the experimenter to detect such variations as are likely to occur between pure and impure air.

4. Air contaminated by being drawn through water containing decaying meat does not yield more than the usual quantity of albuminoid ammonia.

5. Air contaminated by being drawn over comparatively dry decaying organic matter yields more than the usual quantity of albuminoid ammonia.

6. Air contaminated by respiration yields more than the usual quantity of albuminoid ammonia.

7. It is necessary in judging of the purity of air to take all the facts known in regard to it into consideration. The simple determination of any one constituent can never be a sufficient basis for the formation of a competent judgment.

8. It would be useless to have examinations of air made by any but the most careful workers. It would be time thrown away to have such analyses made by the average practical chemist.

Among the questions left unanswered an important one is this: Is the air which has been deprived of its nitrogenous matter also deprived of its injurious constituents? Another is this: Does the amount of organic matter in the air vary with different conditions of the air, as, for instance, with its hygrometric state?

The first question must be answered by the physiologist, not by the chemist. The effect of the air on fermentable liquids must be studied, and its effect when breathed by animals. The second question can be answered only by long continued systematic series of examinations of the air, such as are now being made at Glasgow, at Montsouris, and at some places in Germany.

THE PHILADELPHIA SHEEP AND WOOL SHOW.

An international sheep and wool show was held in Philadelphia during the latter part of September, under the auspices of the Pennsylvania State Agricultural Society. A large and interesting collection of sheep, sheep dogs, wool, and woolen manufactures was exhibited. The show of machinery was small. The chief object of the exhibition was to bring together breeders and manufacturers to promote a better understanding of their mutual interests, and to give a greater impetus to the rearing of sheep, in order that the country may grow at home the fifty million pounds of wool now annually imported by our manufacturers.

In furtherance of this object an international convention was held, beginning September 22, to discuss questions relating to sheep breeding, wool growing, and wool manufacturing. The first paper presented was by Mr. A. M. Garland, President of the National Wool Growers' Association, in relation to the breeding of sheep, and the influence of food and climate upon the quality of wool. The work of the Department of Agriculture in collecting and disseminating information with regard to flock products and the demand for them, was described by Commissioner De Luc, and discussed by a number of gentlemen prominently interested in this industry.

At an adjourned meeting the next day the Secretary of the National Wool Growers' Association and President of the New York Association read a paper on the relative advantages of our sheep-breeding States, and the breeds best adapted to them. Mr. John L. Hayes, of the Wool Manufacturers' Association, addressed the convention on the subject of the grades of wool which this country must produce in order to supply the demands of our looms, and how best to produce them.

Among the other subjects discussed were methods of shearing and handling sheep and of packing and grading wool for the market; increasing the production of the mountain lands of the Atlantic States by the systematic extension of sheep husbandry; benefits resulting from the introduction of pure blood into our native flocks; breeds capable of yielding from a given acreage the most profitable returns in mutton and wool taken jointly; management of sheep in summer and winter—of lambs most profitably for market; national registration of herds; recent inventions in wool manufacture and their relative importance; recent discoveries and inventions in the production of dyes and the art of dyeing—their relative importance.

A popular part of the show was the competitive exhibition of the working qualities of sheep dogs.

ORIGIN OF THE MERINO SHEEP.

As the ancient Greeks had no cotton nor silk and very little linen, and as sheep's wool was the principal texture from which their clothes were made, they took peculiar care to cultivate with especial care such breeds of sheep as produced very fine wool. Such breeds were those of the Greek city of Tarentum, situated on the Tarentine Gulf. In order to improve the fine quality of the wool still more, the sheep were covered with clothes in cold weather, as it was found by experience that exposure to cold made the wool coarser. Thus clothing these sheep from generation to generation resulted in a very delicate breed with exceedingly fine wool, according to the law established by Darwin in regard to selection and adaptation to exterior conditions.

This product of Greek industry was transmitted by them to the Romans, whose great agricultural author, Columella, states that his uncle in Spain crossed the fine Tarentine sheep with rams imported from Africa, and obtained a stronger breed, combining the whiteness of fleece of the father with the fineness of the fleece of the mother, and having obtained such results the race was perpetuated. The absence of other fine textures made these Spanish sheep so valuable that in the beginning of our era they were sold in Rome for $1,000 in gold a head, an enormous price for those times, when money had much more value than now.

When the Barbarians invaded Italy these sheep were all exterminated, while the greater portion of the Roman possessions were laid waste. But in the less accessible mountains of Spain the Moors preserved the breed, and it is to them that modern Spain owes the merino sheep, which are the direct descendants of this cross breed of the Greek and African ancestors referred to. It is a valuable inheritance, too, which that country owes to the combined Greek, Roman, and Moorish civilization, and of which our California wool-growers also earn the advantages, by the prosperity of this breed of sheep, which was there a few years ago.

PROGRESS OF COTTON SEED OIL MANUFACTURE.

The industries of the South have, since the close of our civil war, been extending in different directions, whi.e some peculiar branches have attained a degree of importance never dreamed of in the days of slavery. One of these is the manufacture of the oil of cotton seed and the art of refining the same, by which it is made as sweet as olive oil, and not only used as such in the United States, but it is now largely exported to Italy to compete with the native olive oil, which is a staple article. It is there used for adulterating the native article, and then it is exported again as genuine olive oil. This has already become a serious matter, as of the six million gallons of cotton seed oil which were exported from the United States during the last year, the greater portion went to Italy. The Italian Government, therefore, in order to check this adulteration, has imposed a heavy duty upon the importation of cotton seed oil from the United States. The exportation, which in 1877 and 1878 was about one and a half million gallons per year, reached in 1879 nearly six millions, and this will be surpassed in 1880. Our home consumption of the article is over two million gallons per year.

Mississippi and Louisiana have each 9 cotton oil mills; Tennessee, 8; Texas, 6; Arkansas, 4; and Missouri, Alabama, and Georgia, 2 each; together, 42. At present 410,000 tons of the seed are now pressed, yielding 35 gallons of oil and 750 pounds of oil cake to the ton of seed. This oil cake has admirable fattening qualities, and is largely used for cattle.

Progress of the Brush Electric Light.

The Brush Electric Light Company, of New York, have opened offices at 860 Broadway, and the officers expect that before the end of October a large number of lights will be in operation in the vicinity of Madison and Union squares. Negotiations for a building near Madison square, in which to place the engines and other machinery, are about completed. In the district to be illuminated there are many public buildings, restaurants, and stores. It is said that no attempt has been made to subdivide the light for use in private dwellings, but for lighting large areas the Brush system is entirely successful.

The Brush Company of New York is distinct from the general company having its headquarters in Cleveland. The New York company was recently incorporated, and holds the privilege of using the Brush light on Manhattan Island only.

The officers of the new company are: President, W. L. Strong; Vice President, A. D. Juilliard; Secretary and Treasurer, A. A. Hayes, Jr.; General Manager, C. M. Rowley.

Postponement of the Prize.

Mr. Edward Lee Brown, Chicago, Ill., President of the American Humane Association, writes us that the time for receiving models and plans in competition for the prize of five thousand dollars offered by the Association for the most approved cattle car, has been extended until January 1, 1881.

THE UNICORN.

The unicorn is generally regarded as belonging more to the realm of fancy than of fact, yet according to M. A. T. de Rochebrune, of the French Academy of Sciences, a race of animals exists in Africa which resemble the fabulous unicorn more than any other living beast does. It is true that this animal has two other horns like those of a cow, but since there are "mooly" cows having no side horns, there may be similarly unfinished animals among these beasts described by M. De Rochebrune, in which case they would present all the characteristics of the distinguished unicorn who is popularly supposed to be fighting the British lion for the possession of the crown. M. De Rochebrune says: Naturalists and travelers, for some unknown reason, have kept the most absolute silence as to a race of domestic cattle belonging to Senegambia. Belonging, like the greater part of its African relations, to the group of great zebus (*Bos indicus*, Auct.), it appears to be indigenous to the high plateaus of the Fouta-Djallon, whence the Pouls, a pastoral people, have scattered the animals for commercial purposes along the whole coast, from Cape White to the Point de Galle. The Negroes and Moors use them for beasts of burden under the name of carrier cattle. An eminently exceptional characteristic distinguishes them from other races; this characteristic consists of a genuine horn in the nasal region, identical in its nature and even in its mode of development with the frontal horns. Belonging to the females as well as the males, this horn, sometimes conical but more frequently developed in the form of a four-sided truncated pyramid, reaches a height of 2¼ to 2¾ inches, a width of 2 inches, and a thickness of 1½ inches; its faces are furrowed with vertical furrows and crossed by stratified horizontal ridges from base to summit. Out of a herd of one hundred of these animals about sixty will have this well-defined nasal horn, while the remaining forty will not have it, but will have a nasal hollow in the roof of the mouth, covered with a horny plate, thin and rough. There are some other anatomical peculiarities of this animal, but the chief one is the nasal horn.

INSECTICIDES FOR THE PROTECTION OF COTTON.

BY PROF. C. V. RILEY.

In some remarks at the recent meeting of the A. A. A. S., I gave an account of some of the more recent practical results of the investigation now being carried on by the United States Entomological Commission, to ascertain the best means of controlling the insects affecting the cotton plant. I herewith give you the substance of that portion referring to insecticides.

The experience of the year has so far given us nothing superior to the substances previously tested. We have over five tons of extracts and decoctions of various native plants centered at Selina, made either by Prof. R. W. Jones, of the University of Mississippi, or by Mr. James Roane, agents of the commission. But two or three so far give any promise, and these not much. Yeast ferment or beer mash, which Mr. Hagen so strongly recommended, has proved entirely useless. Of the various arsenical poisons, Paris green still proves the best, so far as efficacy and harmlessness to the plant are concerned, but the use of this and of different preparations of white arsenic is to-day so well understood that they need no further mention.

LONDON PURPLE.

Of this arsenical refuse, which I introduced for this purpose a year ago with a good deal of hope as a cheap substitute for Paris green, it will be well, however, to say a few words.

The testimony in regard to it is very generally favorable the present year, as I anticipated would be the case from the experiments we made in 1879. But some reports are less favorable, and such mostly come from parties who have not understood how properly to mix and use it. Pound for pound it should be made to go twice as far as Paris green; *i. e.*, a pound of the purple is sufficient to eighty, or even one hundred gallons of water, and if used dry, should be in proportion of one to forty parts of the diluent.

It should be borne in mind that great care is necessary in mixing it in water to prevent its forming lumps, and that it acts more slowly than Paris green. To this last fact is due most of the unfavorable experience and judgment. If a rain follow too soon after an application, the purple kills comparatively few worms. Its good effects are fully seen only under favorable circumstances on the second or third day, while the green shows its good effects a few hours after application, and particularly the day following. In the early use of the green the same diversified experience was had, and from defective methods or adulterated material unfavorable results were quite frequent. One source of failure with both these materials in liquid is the lack of provision to keep them stirred up and well suspended; another, in not bearing in mind that the poison has greater specific gravity than the water in which it is carried, so that in poisoning many rows at a time, the finer spray falls on the furthermost rows with little or no poison.

London purple is exceedingly fine and sifts through the slightest crevice. This is an advantage to the planter who uses it on his cotton, but necessitates great care in shipping. The manufacturers have shipped it for the most part in barrels, which have permitted it to leak and stain other goods, as well as the vehicles of transport, thus doing more or less injury and prejudicing freight agents against it. This defect should be remedied.

Experience seems to indicate that it is less dangerous to use than Paris green. We know of two negroes who stole some flour in which it had been mixed in the ordinary proportion for use on cotton, and made biscuits thereof. Both were made sick, but neither seriously, and Prof. Barnard found that the steward on one of the Mississippi steamboats (the decks of which get quite purple from carrying it) has made regular use of the wastage, so easily obtained on every hand, for coloring his pastry and ice cream. That no ill results have followed is no reason for perpetuating the practice. Some of the unfavorable experience with this purple, I am constrained to believe, has resulted from adulteration.

PYRETHRUM.

This powder, of which, since last year's experiments, I have had great hopes, fully warrants them. No other vegetable substance approaches it. Last year, while it was found by Prof. Hilgard, of California, that an alcoholic extract of any part of the plant possessed the insecticide property, I had serious doubts whether it could ever be successfully used in the cotton field because of its cost. The simple powder mixed with flour as a diluent could then be made to go over more ground than the alcoholic extract. The present year we have found that an ordinary fluid extract, made after the usual formula of the Pharmacopœia, will go much farther, and that the extract from a pound kills all young worms when diluted in one hundred and twenty gallons of water. Nay, more, one of the most important discoveries is that it acts equally well or even better when the powder is simply mixed with water, and even one pound to one hundred and fifty gallons is effective, and one pound to two hundred gallons will cause the destruction of most young worms. Its action is really marvelous, but as it kills by contact, its effects are not lasting, as in the case of arsenical poisons, which act through the stomach. It produces convulsions and paralysis, so that all young worms it comes in contact with soon writhe to the ground, from which they rarely recover, even if the pyrethrum fails in the end to kill, for once on the ground and enfeebled, and a host of enemies are always ready to finish the work begun by the powder. This insecticide acts quite differently on different insects, but Aletia is one of the most susceptible to it.

I have not a doubt but that when it is once produced in this country so that the cost of the powder will be nominal, it will be extensively employed by planters, and to this end I have taken steps to have it introduced and cultivated. Its harmlessness to man, the small quantity necessary, and the fact that it may be grown by the planter himself, will offset the greater permanency of the arsenical powders.

OILS.

Nothing is more deadly to the insect in all stages than kerosene, or oils of any kind, and they are the only substances with which we may hope to destroy the eggs. In this connection the difficulty of diluting them, from the fact that they do not mix well with water, has been solved by first combining them with either fresh or spoiled milk to form an emulsion, which is easily effected; while this in turn, like milk alone, may be diluted to any extent so that particles of oil will be held homogeneously in suspension.

Thus the question of applying oils in any desired dilution is settled, and something practicable from them may be looked for.

Fraudulent "American" Cottons.

During a recent tour through Lower Egypt an American correspondent was astonished to find at Rosetta, Damanhour, Zagazig, and especially at the great fair at Tantah, a great quantity of cotton goods offered for sale purporting to be of American manufacture. These goods consisted of a wretched flimsy fabric, filled up with "sizing." A large portion of them bore the word "Mexican" in large English letters and underneath the word "American" in large Arabic letters. The traveler found on consulting the official report of the Director of the Egyptian Statistical Bureau, M. Amici Bey, that no American cotton goods have been entered at the regular Egyptian custom house during the past five years. A small quantity of American cotton goods have entered Egypt by way of Smyrna, where the greater part of the duty was paid; but all such goods were found upon inquiry to have been of uniform excellent quality. The presence of the fraudulent "American" goods is explainable only on the theory that the English manufacturers, who now monopolize the Egyptian market, have found a new way of "spoiling the Egyptian," by palming off upon them their "cheapened" goods as American, and thus momentarily avoiding the consequences of their cheating in the fabric and at the same time doing untold harm to American manufacturers.

Spurious Indian Implements.

A Western journal announces the finding of a fine specimen of the discoidal stone, a kind of stone implement rarely found, and deserving notice on account of the growing interest in American antiquities. The name has been given to this form of stone for reason of its double convex shape. It is said to be made of quartz, very smooth, and it is remarked that its manufacture without the use of metallic tools must have cost the ancient mound builder who made it the labor of many months. Its use cannot be accounted for. We are inclined to believe of such stones what the State Geologist of Indiana, Prof. Cox, said of a similar but elongated specimen exhibited at the late meeting of the American Association for the Advancement of Science, in Boston, found in the Wyandotte Cave, and pretended to have been some kind of tool of the early cave dwellers. Prof. Cox considered it simply as a natural production, a piece of water-worn rock, made smooth by continual rollings; the marks of wear upon its ends he declared to be recent, and formed by collectors of mineral specimens who found it a handy substitute for a hammer to knock off pieces of rock. He said that the tendency to consider every peculiarly-shaped stone as an Indian implement is running wild, that every splinter of quartz is considered an arrow-head, every small bowlder an Indian hammer or ax, etc., and warned collectors only to trust to undoubted marks of human workmanship.

Diamond Cutting in New York.

Among the curious and interesting industrial facts brought to light during the census inquiries not the least is the fact that the recently introduced art of diamond cutting has been so admirably developed here that diamonds cut in Amsterdam are now sent to this city for recutting. Hitherto Amsterdam has monopolized the work of diamond cutting; and the aim there has been to remove in cutting the least possible weight of the gem. The American plan is to cut mathematically, according to recognized laws of light, so as to secure the utmost brilliancy for the finished stone. The greater loss in weight, as compared with the Amsterdam cutting, is thus more than made good by the superior brilliancy of the product. From the inquiries made by chief special census agent, Chas. E. Hill, it appears that the average increase of value given to diamonds by the New York cutting is $5,000 for each person employed for twelve months; also, that our dealers are receiving the best Amsterdam-cut gems from abroad to be recut here and returned.

The Stevens Battery Sold.

The costly experiment in naval architecture, known as the Stevens battery, was sold at auction, by order of the New Jersey Court of Chancery, September 29. Something like $2,000,000 have been spent on the undertaking. The hull of the vessel, as far as completed, with the engines and boilers on board, a locomotive boiler and Worthington pump, and a quantity of rope and trestle work, and shed beneath which the battery was housed, brought only $55,000. The buyer was Mr. William E. Laimbeer, of this city. The old iron and articles in the machine shop, blacksmith shop, shed, storeroom, and yard, brought $7,790, making the entire proceeds of the sale $62,790. Two years ago the estate refused $125,000 for the battery.

MAXIM'S NEW FOCUSING ELECTRIC LAMP.

Very nearly all focusing electric lamps have until recently been imported from England and France. The Duboscq was the first electric lamp ever made and regularly placed in the market for sale. It was originally intended by its inventor for use in the theaters of the French capital.

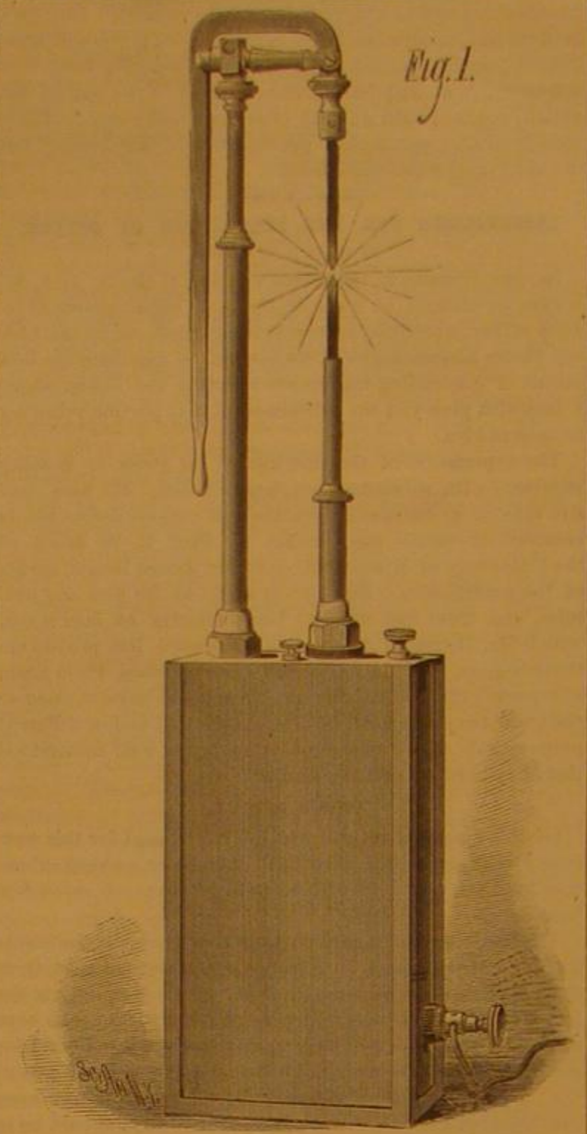
In the Duboscq lamp there are two opposing forces, one for pushing the carbons together, and one for drawing them apart. Each is provided with a separate system of clockwork, and a vibrating detent is balanced between the two in such a manner that it unlocks one system at the same moment that it locks the other. If the current is too strong from a too short voltaic arc, a magnet pulls the detent away from the system that pushes the carbons together, and at the same time unlocks the system that pulls them apart; while if they are too far apart a contra result takes place.

The next electric lamp to meet with popularity was the "Serrin," in which the carbons were fed together by the weight of the positive carrier, their position being nicely regulated by a single system of clockwork. This lamp had quite an extensive sale prior to the introduction of the celebrated Jablochkoff candle into France.

The Siemens lamp may be described as one with a small electric motor inside its case, so arranged that it moves the carbon in either direction, up or down, as may be required.

All the above-named lamps are beautifully made and operate very well in laboratory experiments. For rough usage in the hands of the unskilled they are liable to become disarranged and out of order.

Hiram S. Maxim, M.E., has lately produced a new focusing lamp, of which we herewith give illustrations. It is especially intended for use at sea in connection with his marine projector. This lamp is very strongly and substantially made, all the parts being of considerable weight, with no delicate points requiring fine adjustment.



MAXIM'S NEW FOCUSING ELECTRIC LAMP.

Fig. 1 shows a side elevation of this lamp. In Fig. 2, which shows the internal mechanism, A is a tube in which the positive carrier operates, and B is the tube of the negative carrier. On the positive carrier there is a rack, C, which meshes into the train of gears. D is a pulley on the lower extremity of the negative carrier. E is the coil of an axial magnet. F is a stop for arresting the movement of the gears when extinguishing the light. G is an adjusting screw which determines the length of the voltaic arc.

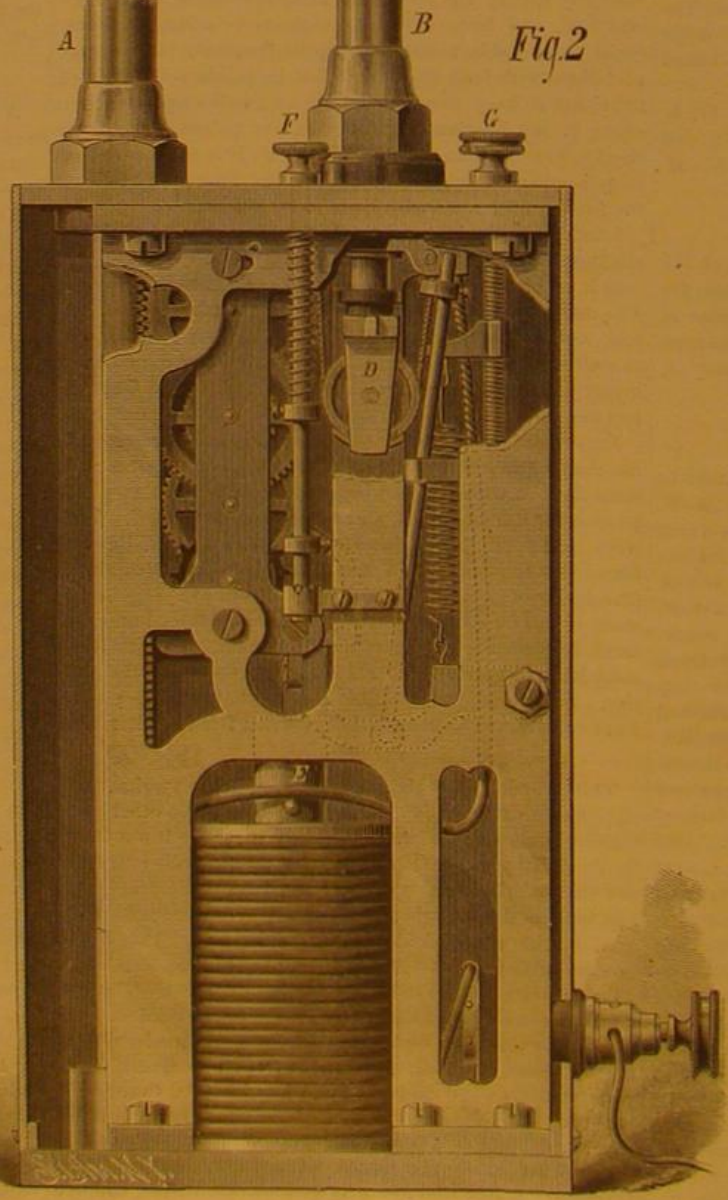
The operation of this lamp is as follows: The positive carrier being drawn upward to its fullest extent and carbons placed in the holders, the weight of the positive carrier sets the train of gears in motion. As the positive carbon descends it winds up the cord and draws the pulley, D, upward. When the two carbon points touch the circuit is completed, the current passes, the helix is excited and draws the coil, E, downward, which, being attached to a detent, locks the gears which prevent any further advance of the positive carbon, and at the same time establishes the voltaic arc by the downward movement of one end of the cord which holds the negative carbon. As the carbons become consumed and the arc becomes lengthened, the degree of excitement in the helix is correspondingly lessened. The spring draws the coil upward until the detent unlocks the gears, when the carbons slowly approach each other until the arc is reduced to a proper length, when the current is brought back to its normal strength, the coil drawn upward, and the gears again locked.

All the parts being nicely pivoted, very little change in the electromotive force is required to lock or unlock the gears. In places where a special engine operates the dynamo machine it is desirable to use as small an engine as possible. Space can thereby be economized, and the first cost of the apparatus for operating the machine, as well as the steam used, demand that the machine should run as lightly as possible.

When the carbons in a lamp run together or approach very near to each other, much more power is required than when a proper distance is maintained between them. With this lamp, however, very little margin has to be allowed, as the construction of it is such that the carbons can draw apart to the desired distance at any time.

Tests have shown that machines of all makers run lighter on this lamp than on any other, and with much less fluctuation of power.

Any further information may be obtained from the United States Electric Lighting Company, 120 Broadway, New York.



MOVEMENT OF MAXIM'S LAMP.

ENGINEER AND INVENTOR.

Among the recent deaths in this city was that of Col. Eugene H. Angamar, of New Orleans, La. He was a highly educated engineer, and before the war one of the most successful sugar planters of St. Landry Parish. He devised and practically demonstrated during the year 1859 a method of closing crevasses, which quickly checked those terrible overflows that so often inundated the finest portion of his State. It is of record that through the efficiency of his apparatus—tested on our coast before and after the war—many dangerous crevasses were closed in a remarkably expeditious manner. He invented several methods of exploding torpedoes and otherwise proving his engineering skill. He filled the office of engineer of the State of Louisiana, having special charge of the levee system and the connection with the Mississippi of some of the tributaries of the great river. He was later in charge of the method of applying compressed air to the uses of street cars in New Orleans. Subsequently he devised a method of applying steam to surface and elevated city railroads, which, while retaining all the especial power of steam, divests it of the objections to use in city streets. By charging the boiler at the station with highly heated water and his furnace with a few shovels of live coals, his car makes a run of twenty miles without attention to either the fire or water supply during the trip. Obviating all smoke, gas, or exhaust of steam while in service on the most crowded streets, from the large volume of water used, nearly three times that of other boilers, rendering the boiler entirely safe, his method was successfully demonstrated recently by a continuous run of three months on the Third Avenue horse railroad of this city.

THE Extension Water Gauge Company, whose apparatus we recently illustrated, have their headquarters at Cheshire, New Haven county, Conn. Mr. C. N. Marcellus, 91 Liberty street, New York, is agent. The company have no office in New Haven, as erroneously stated in the article referred to.

RECENT INVENTIONS.

Mr. John Collins, of Brooklyn, N. Y., has patented apparatus for generating gas for mineral waters. This is an improvement in that class of carbonic acid gas generators in which the discharge of acid into the chamber containing lime or other carbonate is regulated automatically by the variation in the pressure of gas, which acts upon a piston that, in turn, tilts a pivoted lever, and thereby opens a valve that controls the escape of acid from its tank or holder.

Mr. John Collins, of Brooklyn, N. Y., has patented a wagon for mineral water and other gaseous liquid fountains, so constructed that the fountains can be readily placed in and removed from the wagon, and will be held securely in place while being carried.

An improvement in gates has been patented by Mr. Robert M. Grier, of O'Fallon, Mo. The objects of this invention are, first, to prevent the trouble arising from sagging of gate posts; second, to provide for widening the gate entrance when an unusual width is required; and, third, to furnish a gate of durable construction and requiring but a small quantity of lumber for its manufacture.

Mr. Henry W. Fleming, of Denver, Col., has patented a drill which will bring out a solid core of rock from any desired depth at which it is practicable to drill or bore.

An improved measuring pump, designed to draw out all the fluid from a barrel, and to correctly measure molasses, oil, or any other liquid, and to dispense with oil tanks, measures, funnels, and tapping devices, has been patented by Mr. Fradelshon Harris, of Rockport, Ill.

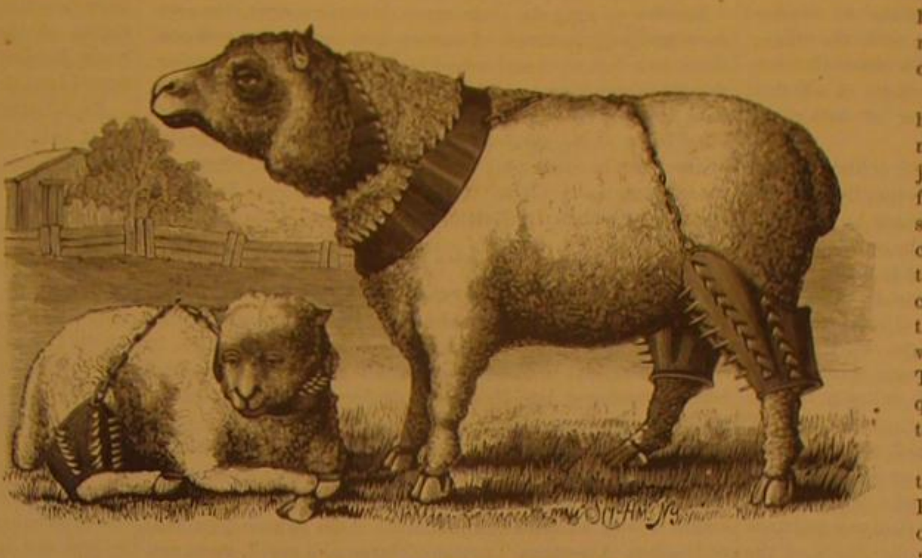
An improvement in the class of pendulums designed for use in connection with clocks requiring compensating pendulum has been patented by John W. Hile, of Leavenworth, Kan. This improvement consists in the construction and arrangement of parts, whereby the bob or weight is adjusted up or down automatically to compensate for changes in the length or extension of the pendulum due to changes in temperature of the surrounding air or adjacent surfaces or objects.

Mr. Alden B. Richardson, of Dover, Del., has patented an improved device for soldering tin cans, which is an improvement on that form of device shown in Patent No. 74,290, in which a copper block is notched to receive the edge of the can, and this notch is filled with solder which is kept in a melted condition by a flame beneath, while the can is soldered by singly turning its edge in the notch of the copper block.

Mr. Israel V. Ketcham, of Brooklyn, N. Y., has patented an improvement in milk pails used by dealers for delivering milk in small quantities to consumers. The object of the invention is to furnish a self-measuring pail from which a regulated quantity of fluid shall run at each inversion of the pail.

NEW SHEEP PROTECTOR.

The engraving shows a curious device intended to protect sheep from the ravages of dogs and wolves; but whether sheep would be safer with a machine of this sort than with the dogs and wolves is a question which we leave to the reader to decide. This device was recently patented, and is thus described by the inventor: The invention consists of two collars for the neck of the sheep, which are provided with sharp pointed projections, and are coupled together by two or more links. To the upper side of the rear collar is attached a chain, strap, or strip of metal or other material, which passes along the back of the sheep and branches off toward the thighs of the hind legs, and is attached to a shield on each hind leg, which shields conform to the parts of the hind legs above the knee, the shields being perforated and furnished with outward projecting points. It has been observed that dogs often attack sheep at the points covered by the shields, hence the employment of them in combination with the collars. The projections or points on the collars and shields operate to lacerate the mouth of the dog in case it should attack the sheep, the point of attack, as a rule, being the parts covered by the collars and shields.



NOVEL SHEEP PROTECTOR.

Spontaneous Combustion of Charcoal.

Among the substances subject to spontaneous combustion, according to the *Fireman's Journal*, pulverized charcoal is said to be one of the most remarkable. Incidental to this phenomenon a story is told that a load of charcoal was delivered in an outhouse of a clergyman in Leipsic, and showed no signs of burning until the door by accident was left open, when the wind blew sprinklings of snow on the charcoal. The rapid absorption of oxygen from the melting snow caused the charcoal to ignite, and as the day was windy the whole range of buildings was burned to ashes. In this connection a fruitful and unsuspected source of fire suggests itself to those of our American housekeepers who burn wood as fuel, and who store the ashes in boxes or barrels. The accidental disturbing of such ashes, even after years, will cause them to ignite, provided the air is damp or foggy. The phosphuret of potash from decayed wood renders wood ashes highly inflammable, and mysterious cellar fires in the rural districts are, no doubt, in some cases, caused by this form of spontaneous combustion.

MACHINE FOR ORNAMENTING METAL SURFACES.

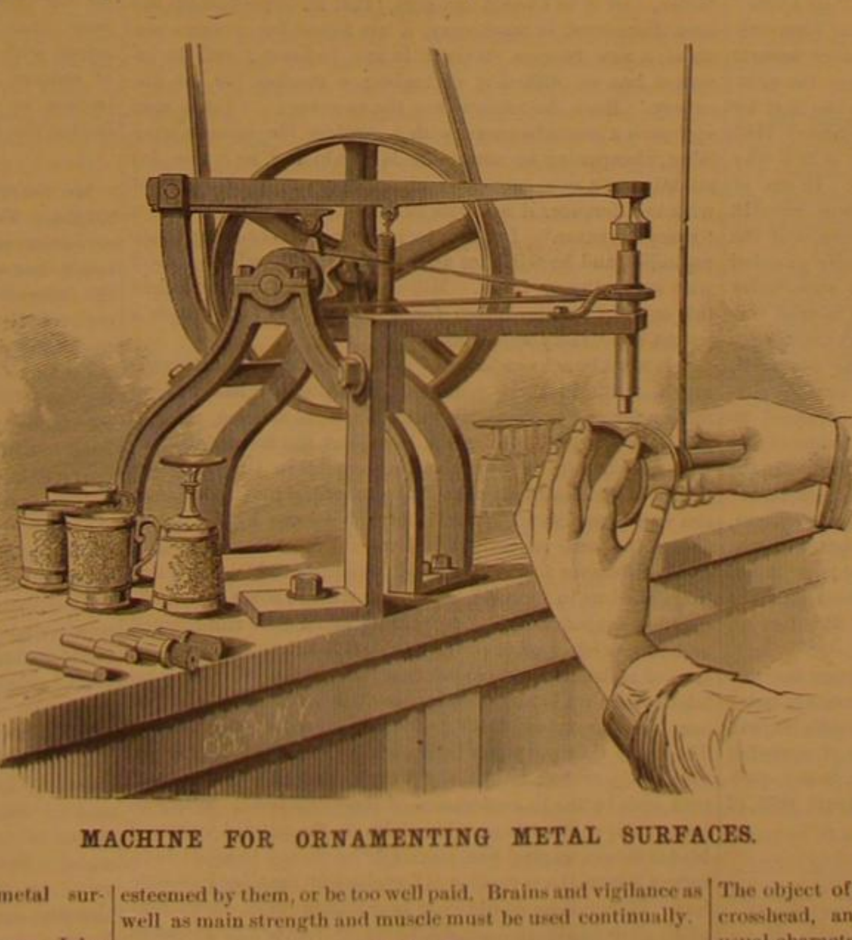
The machine shown in the engraving produces all kinds of chased or matted surfaces, but is more particularly designed for producing a peculiar surface called the "snow flake" finish. The tool used in the machine is of novel form, and has a combined rotary and impacting movement.

A standard rising from the base of the machine supports an arm, which carries at its outer end a sleeve containing a vertical mandrel, which is supported by a spiral spring in the lower part of the sleeve. This mandrel receives its motion through a quarter twist belt from a pulley on the driving shaft, and carries a chasing tool whose face is composed of fine parallel ridges and center punch indentations.

Above the mandrel there is a hammer, which is alternately lifted and allowed to fall by the action of the cam on the driving shaft. The hammer is drawn downward by a spring which insures a positive and elastic blow.

The tool intermittingly advances against the surface to be finished with an impact derived from the blow of the hammer, having meanwhile a rotary motion about its axis from the action of the belt. The sudden impact of the tool against the surface to be finished causes a set of parallel indentations on the metal surface, which appear in patches, with the parallel lines of one patch appearing at a different angle to those of the next. As the time of contact between the tool and surface to be finished is only momentary, the parallel lines are not obliterated by the rotary action, the latter serving only to place the patches in different angular relation on the metal surface.

This invention was recently patented by Messrs. John Hewitson and Elijah Tolman, of Taunton, Mass.



MACHINE FOR ORNAMENTING METAL SURFACES.

How to Fire Steam Boilers.

Mr. J. F. Tallant, in the *Milling World*, tells its amateur engineer readers how to set and fire steam boilers.

In placing a steam boiler in a furnace, says Mr. Tallant, it is usual to employ grate bars, even for coal, about four feet long, the same length that was necessary where wood fuel was used. The rear end of the bars should be at least the thickness of a brick, or upwards of two inches, lower than the front. The boiler should also be placed two inches lower at the rear than at the front, and the bridge wall should come within three inches of the boiler, if the draught is good.

The best grate bars now used are of a zigzag shape on the top, so closely placed that coal lumps upwards of one-eighth of an inch through cannot drop between. Three stoking pokers should be used—one a plain straight poker, another with claws, and another like a hoe. In firing, the coal should be so distributed as to be totally consumed without smoke, if possible. The more smoke the worse the firing.

After steam is raised and work is fully begun, in replenishing the fire, the glowing coals should be pushed back with the iron hoe toward the bridge wall, and if any clinker is seen, remove with the claws. The fresh coal should be well scattered over the front, so that the smoke will pass over the red hot coals and be consumed by them. Avoid making piles of coal on the bars. It is often beneficial to have a very small steam pipe open into the furnace, to give a spray of steam to the flaming mass. Water being composed of two most combustible ingredients, oxygen and hydrogen gases, when the steam is decomposed the heat becomes most intense. This pipe should be regulated by a cock, and its use requires considerable skill, as an oversupply of steam will quench the fire instead of increasing it.

To permit a boiler to run too full of water is as wasteful of fuel as it would be dangerous to have too little. Of the two extremes, the latter is most common, generally through carelessness. To fire efficiently yet economically is a very skillful, intelligent operation, and the man who can do it and actually does it for his employers cannot be too highly esteemed by them, or be too well paid. Brains and vigilance as well as main strength and muscle must be used continually.

The World's Wool Clip.

The wool clip of the world has increased five times since 1830, when it was about 320,000,000 pounds in weight. In 1878—the latest year for which there are complete figures—Europe produced 740,000,000, River Plate 240,000,000, United States 208,000,000, Australia 350,000,000, and South Africa 48,000,000 pounds, making a total of 1,586,000,000 pounds. Great Britain and France consume each about the same quantity of wool—380,000,000 pounds a year. Germany consumes about 165,000,000 pounds; United States 250,000,000 pounds; and Russia, Austria, and other countries, 400,000,000 pounds.

ENGINEERING INVENTIONS.

Messrs. Peter Vanbriggle, Lewis Vanbriggle, and Henry Vanbriggle, of Kempton, Ind., have patented an improved rotary engine. The invention consists in regulating the supply of steam to the engine by forcing air from the steam cylinder into a connected air chamber to operate a cut off valve therein, increased speed of the engine causing a corresponding reduction in the supply of steam.

Mr. William C. Perry, of Brattleborough, Vt., has patented an improvement in automatic couplers, which consists of two hooked coupling bars pivoted in suitable recesses in each drawhead and resting on springs, of spring actuated catches for holding the hooked heads of the coupling bars, and of recesses within said drawheads to admit of coupling with the old style of link and pin.

Mr. Gordon W. Hall, of Havana, N. Y., has patented a steam boiler having central magazines or reservoirs for fuel. The object of the invention is to insure more perfect combustion and to superheat the steam. The invention consists in a vertical boiler provided with a steam dome containing tubes placed above a combustion chamber at the upper end of the boiler, the tubes of the steam dome being fitted with removable caps at the upper end. The caps give access to the boiler tubes as required, and also cause return of the draught to the smoke box around the ash pit.

An improved car coupling has been patented by Mr. Robert E. Pogue, of Quincy, Ky. This invention relates to that class of car couplings which are known as "self-acting couplers;" and it consists in a novel combination and arrangement of a coupler, a cap, and a series of levers, whereby provision is made for coupling the cars automatically and for uncoupling them without the necessity for going between the cars.

Messrs. Samuel Barrow, David Barrow, and Jacob Barrow, of Indianapolis, Ind., have patented an improvement in steam boilers, which consists in a heating box combined with a tubular flue boiler in a manner to form one side of a chamber into which the flues discharge. This heating box is hinged to the main boiler, and the inlet and outlet pipes from the box are provided with separable joints, so that the box may be swung out to give access to the flues. The box is also provided with a filtering chamber between its inlet and outlet for filtering the feed water.

Messrs. Samuel Barrow, David Barrow, and Jacob Barrow, of Indianapolis, Ind., have patented an improvement in rotary engines, water motors, or pumps, wherein a wheel is fitted eccentrically in an elliptically shaped chamber or steam and water way, and fitted with two pistons, which are projected from the periphery of the wheel and travel in an elliptical path.

An improvement in the class of steam-generating apparatus for use in cooking feed for live stock, has been patented by Messrs. Mortimer B. Mills and Charles B. Rice, of Chicago, Ill. The apparatus is compact in form, adapted for heating the water quickly, and provided with means for automatically regulating the supply of water.

An improved construction of boat designed more particularly for use on canals, shallow rivers, etc., has been patented by Mr. John O. Smith, of Savannah, Ga. It is formed with a view to the production of the least possible waves in the water, so as to avoid the washing of the bank. It is an improvement in that general class of boats which are propelled by an endless chain revolving in a longitudinal channel around two sprocket wheels.

An improvement in the class of clutch and spring mechanism which is so constructed and attached to a car axle that the spring may be wound up when it is desired to retard the speed of the car, and allowed to unwind or expand when it is desired to start the car, has been patented by Mr. T. Judson Langston, of Johnstons, S. C.

An improved reversing and cut-off mechanism for steam engines has been patented by Mr. William L. Miller, of Cleveland, Ohio. The object of this invention is to dispense with the guides, crosshead, and link required in reversing mechanism of usual character, and to move the valves for cutting off and reversing by the use of a single eccentric.

Honoring an Old Inventor.

The ceremony of unveiling a bronze statue in honor of the seventeenth century inventor and precursor of Watt in applying steam as a motive power, Denis Papin, took place in the little town of Blois, France, August 29. Among the prominent speakers was M. De Lesseps, who gave an interesting account of the life and discoveries of Papin. Like so many early inventors, Papin suffered cruel persecution at the hands of the people whose descendants now unite to do him honor.

AMERICAN INDUSTRIES.

[*Continued from first page.*]

and keys itself into it in the same way as mortar is put on and holds itself to the laths in finishing the interior of a house.

The application of this plastic non-conductor was first made directly to the surfaces of boilers, tubes, etc., and this method is still followed to a great extent where the tubes are small, or only limited surfaces are to be covered, and the expansion and contraction from differing temperatures will not be too great. The covering after it is put on has not a metallic hardness and firmness, so that its elasticity is sufficient for purposes of this kind, while it may also be colored, grained, varnished, and finished, so as to make an exposed steam pipe in a room accord in appearance with the character of the place, when this is desirable. It is also sufficiently oleaginous to prevent the oxidation of surfaces to which it is applied, and thus acts as a preserver of boiler and piping.

The "air space" covering, the patent for which became the property of the company in 1875, undoubtedly affords a better non-conducting covering than that made by the application of the plastic material directly to the surfaces to be protected. In this way a dead air chamber is made, so that the air surrounding the heated surfaces must be of an equal temperature with them, and any amount of expansion and contraction cannot affect the durability of the covering. For large surfaces it is usually put on in two coats, a rough and a finishing coat, as plasterers make a wall, when it may be painted or otherwise ornamented as desired.

The first non-conducting coverings used were made of wood, hair felt, paper, etc., but these, owing to their combustible nature, had to be constantly renewed. The felt coverings, also, being of a spongy nature, absorbed any moisture in their vicinity, thus not only destroying the fibers of the felt, but from their direct contact speedily corroding the metal surfaces they surrounded. Cements and compositions of fire-clay, asbestos, etc., were next used, but these, on large surfaces, not being able to withstand the expansion and contraction of the metals on which they were plastered, would crack and fall off. In many cases, also, the cements were so dense as to act as conductors of heat rather than the opposite. The "air space" method has none of these objections, the confined, dead air making the best non-conductor possible, while the frame holds the covering solidly under any possible amount of expansion and contraction. Under this plan of attaching the covering to a framework removed from the heated surfaces, hair felt, compositions, and cements, other than those containing asbestos, may also be used to advantage, as they cannot bring moisture to the metal to corrode it, and will not crack off from expansion and contraction, so that a much lighter covering will in this way be more effective than the heavy coats formerly used when applied directly on the surfaces.

The number of "test" trials to which the "air space" method of covering steam pipes, boilers, etc., has been subjected is very great, and they have extended over several years, in all cases amply proving everything that the company claim for it. This method was chosen as the best by the Commissioners and Chief Engineer of Machinery Hall at the Centennial Exhibition, and the company in this way covered all the pipes there and in the Annexes. In one of the tests made, where the "air space" method was brought into competition with their own surface covering and the coverings of other firms, under the most carefully guarded conditions, the "air space" method proved its superiority so decidedly as to distance all competitors. The trial was made by suspending a thermometer in an air-tight box, with a glass face through which its register could be observed, and running the steam pipes, protected by the various coverings to be tested, through this box; each test occupied an hour, the box being closed, for the commencement of the trial, when the temperature of 97° had been reached. In the cases where coverings of the pipes other than the "air space" was used, the temperature, with 10 pounds steam pressure, ran up to from 102° to 105° within 30 minutes, but with the "air space" covering the temperature could not be got up to over 90° in the open box, and with the box closed and the application of 14 pounds of steam reached only 94° after an hour's trial.

Many tests have been made as between steam surfaces covered and similar surfaces without any covering, but a noticeable one is mentioned in an account of some experiments by J. C. Hoadley on the economic effect of applying the Chalmers-Spence covering to a locomotive boiler, published in the *Journal of the Franklin Institute*, April, 1877, of which the following is a summary:

Steam Pressure.	Per cent Radiation, Boiler Uncovered.	Per cent Radiation, Boiler Covered.	Ratio of Saving by Covering.
130 to 140 lb. per square inch	13·7	5·8	42·2
120 " 130 " " " "	13·3	5·3	40·4
110 " 120 " " " "	12·9	5·7	44·3
100 " 110 " " " "	12·8	5·7	44·8
90 " 100 " " " "	11	4·9	44·8
80 " 90 " " " "	10·7	4·3	40·5
70 " 80 " " " "	10·2	4·3	42·2
60 " 70 " " " "	11·3	4·5	40
50 " 60 " " " "	10·6	4·6	43·8

The advantages of these coverings in the practical working of steam engines, and in manufacturing establishments where a great amount of coal is consumed, are shown in a marked diminution in the amount of fuel used, or a greatly increased steam pressure, or both.

This system not only saves the great loss of power which always attends the working of an engine when a portion of the steam has been condensed, which often occurs where an engine is run at a distance from the boiler, but it so helps to keep stored up the heat from the fires that a materially increased steam pressure is the invariable accompaniment of its adoption, so that, while it may not go so far in aiding us to obtain in working power that theoretical value of coal for which all engineers are striving, its great economy in the way of saving the power which every one acknowledges is easily possible cannot be denied.

Besides owning the "air space" improvement, the company are manufacturers of various non-conducting compositions, hair felt, etc., and asbestos mill board, round packing, sheathing, wicking, and other articles of this class. They have factories at New York and Pittsburg, their New York office being at No. 40 John street, and they apply their improvements in every part of the country. The officers of the company are: John Roach, President; Geo. E. Weed, Treasurer; and R. H. Martin, Secretary and General Manager.

American Inventions Abroad.

A correspondent signing himself "Old Inventor," in the *Industrial Record*, published in London, calls attention to the alarming extent American inventions and machines are being introduced into England. Referring to the letter the editor quotes therefrom and comments as follows:

"In another column we publish a communication from an 'Old Inventor,' calling attention to the remarkably flourishing trade being carried on here in inventions, not of English origin, but of American production. 'Go where you will in London, American "notions," large and small, meet you at every turn—English inventions nowhere.' This is, no doubt, the case. We want no better evidence of the effect of the patent systems of the two countries. The smallness of the charges for a patent in the United States enables almost every inventor to protect his discovery, and to quickly find a market for it if it have any value, while the extortionate charges of the English tariff prevent all but a few from obtaining that protection which patent laws were designed to afford.

"But an 'Old Inventor' does not regard our scandalously bad patent laws as the only disadvantage which the British inventor suffers in comparison with his American rival. He finds in our moneyed and commercial classes a short-sighted disregard of the important services of inventors never characteristic of the same classes in America. 'Not only are her patent laws conceived and enforced for the encouragement and protection of inventors, but her capitalists and manufacturing classes are ever ready to assist inventors to develop and utilize their conceptions.' In the United States, 'let it be known,' he says, 'that an improvement has been discovered in machinery, a use found for a waste material, a new process devised in any industry, and the inventor has no difficulty in finding a market for his discovery.' Such, he adds, is not the case here. 'Let a man approach a manufacturer with a project for economizing labor, cheapening an article he is producing, or invite his attention to a new enterprise altogether, and he will be met with indifference, if not with suspicion, and dismissed as a "crazy inventor." Let him seek the assistance of a private capitalist, and he will fare no better. Rarely will he meet with sympathy or favor. Millions will be forthcoming in this country for any rotten foreign loan but to invest in a patent is a "risky speculation."'

"It must be acknowledged," says the editor, "that there is much truth in these remarks. If America has wanted money for any particularly rotten financial scheme, she has generally been able to get it here, but she has meanwhile been very careful to invest her own capital in the extension of her industries and the development of the inventive faculties and ingenuity of her citizens. We have by no means shown the same sagacity. But we think that the apathy and indifference to the claims of inventors which have distinguished us in the past, and must still, to some extent, be charged against us, are disappearing, and a more enlightened and enterprising spirit prevailing. But it has not been for lack of assistance and capital that the number of inventions lately taken up is not even larger than it is. The fault has been in too many cases with the inventors themselves. The value they put upon their own inventions is frequently very exaggerated, not to say absurd, and they defeat their own ends by the immoderation of their demands. When an inventor is content to rest his claim on the proved value of his invention, capital can generally be found to assist him, except where the invention is frivolous or manifestly worthless. If inventors would only bear this in mind, inventions of English production would be more frequently found in our markets and we should have less to fear from the formidable rivalry of America."

An Arctic Voyage Closed.

The unlucky Gulnare, of the Howgate Expedition, has returned to Newfoundland. The highest point reached was Disco Island, which the Gulnare reached August 9, badly battered by a storm. Two weeks were spent in repairing and taking in a half supply of coal. The return voyage was made mostly by sail, reaching St. John, September 24. Dr. Pavy, the naturalist, remained in Greenland to pursue his researches in natural history.

NEW INVENTIONS.

Mr. Benjamin Goodyear, of Carlisle, Pa., has patented a simple and inexpensive detachable bail or handle for crocks, that may instantly be applied or removed therefrom. The invention consists, essentially, of a stout wire bail in the shape of a figure 8, and having a curved clamp on each end, so that the said clamps shall be in a horizontal plane and with their concave faces opposite each other, so that when the clamps are applied to the opposite sides of a crock or other object, they will grasp the crock with a pressure dependent upon the upward pull exerted on the upper loop forming the handle of the device.

An improved faucet for dispensing mineral waters has been patented by Mr. John Collins, of Brooklyn, N. Y. The object of this invention is to furnish faucets for mineral water fountains, so constructed that the water can be introduced into the glasses without losing its sparkle.

Mr. Charles L. Bates, of New York City, has patented a gong bell, constructed so as to give a heavy blow with a short stroke. It can be adjusted for use as a right hand or a left hand bell, as may be required.

An improved wagon for gaseous liquid fountains has been patented by Mr. John Collins, of Brooklyn, N. Y. The object of this invention is to furnish wagons for gaseous liquid fountains, so constructed that the fountains will be securely held in place during transportation, and can be easily, quickly, and conveniently secured and released.

An improved berry basket holder has been patented by Mr. William J. Robinson, of Howlett Hill, N. Y. The object of this invention is to provide a simple device for holding a basket while picking berries, so that the berries shall not be spilled.

In the ordinary method of treating frozen paraffine oil for the separation of the oil from the wax, the frozen paraffine is inclosed in small cloths and folded and laid on plates in tiers of from twenty to twenty-five packages, and by the time the press is filled the frozen oil becomes warm, and consequently the crystallized wax melts and runs out as a liquid with the oil, and when the press is run down the wax in the cloths still contains oils, which renders it necessary for the wax itself to be again folded in cloths and again submitted to the action of the press, which process involves considerable labor, time, and waste of wax; and the wax is by this process rarely completely freed from the oil, while the oil always contains some wax, which injures the lubricating qualities of the oil. Mr. Herman Neahous, of Sharpsburg, Pa., has patented a process and apparatus that are free from the imperfections of the old method, and will make a thorough separation of the wax and oil, and do it economically.

Mr. Christian Heinzerling, of Biedenkopf, Germany, has patented a process of tawing hides for the purpose of adapting them to the uses of leather, which consists in first subjecting the raw hides to a solution of alum and zinc dust for the purpose of depositing amorphous alumina in the same, then to a solution of one of the chromic alkalies mixed with alum, or its described equivalent, and chloride of sodium, then fixing these in the hides by the chloride of barium, or its described equivalent, and finally greasing or fatting the hides.

How to Preserve a Carriage.

Mr. Starey, a prominent carriage manufacturer, of Nottingham, England, in a series of useful hints on their preservation, says that a carriage should be kept in an air tight coach house, with a moderate amount of light, otherwise the colors will be destroyed. There should be no communication between the stables and the coach house. The manure heap or pit should also be kept as far away as possible. Ammonia cracks varnish and fades the colors both of painting and lining. A carriage should never, under any circumstances, be put away dirty. In washing a carriage, keep out of the sun, and have the lever end of the "setts" covered with leather. Use plenty of water, which apply (where practicable) with a hose or syringe, taking care that the water is not driven into the body to the injury of the lining. When forced water is not attainable, use for the body a large soft sponge. This, when saturated, squeeze over the panels, and by the flow down of the water the dirt will soften and harmlessly run off, then finish with a soft chamois leather and oil silk handkerchief. The same remarks apply to the underworks and wheels, except that when the mud is well soaked, a soft mop, free from any hard substance in the head, may be used. Never use a "spoke brush," which, in conjunction with the grit from the road, acts like sandpaper on the varnish, scratching it, and of course effectually removing all gloss. Never allow water to dry itself on the carriage, as it invariably leaves stains. Be careful to grease the bearings of the fore-carriage so as to allow it to turn freely. Examine a carriage occasionally, and whenever a bolt or slip appears to be getting loose, tighten it up with a wrench, and always have little repairs done at once. Never draw out or back a carriage into a coach house with the horses attached, as more accidents occur from this than from any other cause. Headed, known here as top, carriages should never stand with the head down, and aprons of every kind should be frequently unfolded or they will soon spoil.

A carrier pigeon belonging to John C. Haines, of Tom's River, N. J., flew recently the distance of 36 miles in an air line in twenty-four minutes. Ten other pigeons released at the same moment reached home a minute later than their leader.

The Post-Glacial History of the Peninsula of Boston.

The geological history of the site of Boston, Mass., since the glacial epoch, is described as follows by Professor Shaler, in the history of the city called out by the 250th anniversary of its settlement:

"After the ice had lain for an unknown period over this region, climatal changes caused it to shrink away slowly, and by stages, until it disappeared altogether. As it disappeared it left a very deep mass of waste, which was distributed in an irregular way over the surface, at some places much deeper than at others. At many points this depth exceeded 100 feet. As the surface of the land lay over 100 feet below the present level in the district of Massachusetts Bay when the sea began to leave the shore, the sea had free access to this incoherent mass of *débris*, and began rapidly to wash it away. We can still see a part of this work of destruction of the glacial beds in the marine erosion going on about the islands and headlands in the harbor and bay. The same sort of work went on about the glacial beds, at the height of 100 feet or more above the present tide line. During this period of re-elevation, the greater part of the drift deposits of the region about Boston was worked over by the water. Where the gravel happened to lie upon a ridge of rock that formed, as it were, a pedestal for it, it generally remained as an island above the surface of the water. As the land seems to have risen pretty rapidly when the ice burden was taken off, probably on account of this very relief from its load, the sea did not have time to sweep away the whole of these islands of glacial waste. Many of them survive in the form of low, symmetrical bow-shaped hills. Parker's Hill, Corey's Hill, Aspinwall, and the other hills on the south side of Charles River, Powderhorn, and other hills in Chelsea and Winthrop, are conspicuously beautiful specimens of this structure. Of this nature were also the three hills that occupied the peninsula of Boston, known as Sentry or Beacon, Fort, and Copp's Hills. Whenever an open cut is driven through these hills, we find in the center a solid mass of pebbles and clay, all confusedly intermingled, without any distinct trace of bedding. This mass, termed by geologists till or bowlder clay, is the waste of the glacier, lying just where it dropped when the ice in which it was bedded ceased to move, and melted on the ground where it lay. All around these hills, with their central core of till, there are sheets of sand, clay, and gravel, which have been washed from the original mass, and worked over by the tides and rivers. This reworked bowlder clay constitutes by far the larger part of the dry lowland surface about Boston; all the flat lands above the level of the swamps which lay about the base of the three principal hills of old Boston—lands on which the town first grew—were composed of the bedded sands and gravel derived from the waste of the old bowlder clay. These terraces of sand and gravel from the reassorted bowlder clay make up by far the greater part of the low-lying arable lands of Eastern Massachusetts; and of this nature are about all the lands first used for town sites and tillage by the colonists—notwithstanding the soil they afford is not as rich nor as enduring as the soils upon the unchanged bowlder clay. The reason these terrace deposits were the most sought for town sites and cultivation is that they were the only tracts of land above the level of the swamps that were free from large bowlders. Over all the unchanged drift these large bowlders were originally so abundant that it was a very laborious work to clear the land for cultivation; but on these terraces of stratified drift there were never bowlders enough to render them difficult of cultivation. The result was that the first colonists sought this class of lands. One of the advantages of the neighborhood of Boston was the large area of these terrace deposits found there. There was an area of 15,000 or 20,000 acres within seven or eight miles of the town that could have been quickly brought under the plow, and which was very extensively cultivated before the bowlder-covered hills began to be tilled."

Practical Value of Science.

BY PROFESSOR S. H. TROWBRIDGE, IN "THE ADVANCE."

Our obligations to the branch of physics are almost unlimited, but we will mention only two or three applications of a single agent in this wide field. It would seem to roll back the world into the dark ages to take from it now the benefits of electricity in its multiplied and yet rapidly multiplying applications.

It seems incredible, from our present standpoint, that so short time ago, in our congressional halls, the electric telegraph was almost ridiculed and voted into oblivion, from which it could never rise. When a bill was presented appropriating $30,000 to be expended, under the direction of the Postmaster General, in a series of experiments to test the merits of Morse's electro-magnetic telegraph, one member moved an amendment requiring half the appropriation to be used for the encouragement of mesmerism. Another proposed to include Millerism in the benefits of the appropriation; others to appropriate part of the sum to a telegraph to the moon. And when the bill came to a final vote, this was so close that a change of three votes would doubtless have left us till this day without the benefits of the telegraph. After his invention was in working order, and transmitting messages between Baltimore and Washington, Mr. Morse offered it to Congress, to be attached to the Post Office Department, for the sum of $100,000. But it was declined, on the statement of the Postmaster General, who reported that, while the invention was "an agent vastly superior to any other ever devised by the genius of man," he was not satisfied that "under any rate of postage that could be adopted its revenue could be made to equal its expenditures." By this short-sighted want of appreciation of science, the United States government deprived itself of a source of revenue sufficient, doubtless, to liquidate the entire national debt in a single decade.

The application of electricity, now attracting world-wide attention, enjoys a vastly more hearty reception than did the telegraph. The *telephone* is constructed on the principle of the human ear. It consists of an elastic diaphragm, to receive vibrations of air from the human voice or from other sources, so connected with the wires of a battery (or even with wires without a battery) as to communicate the same vibrations in every respect to another membrane or diaphragm situated at a distance. The two diaphragms of a telephone in distant places correspond, in every practical sense, to the two membranes of the human ear, and the connecting wire to the chain of bones between the two membranes. Probably no invention has come more rapidly into popular favor. Already many thousands of them are in practical use in this country and abroad. "It is employed as a means of communication between counting room and factory, merchant's residence and the office, publishing house and printing office, and, in short, wherever oral communication is desired between persons separated by any distance beyond the ordinary reach of the human voice."

The speaking phonograph is also copied from the human ear. The vibrating diaphragm, in this case, has a stylus connected with it, which impresses the peculiarities of vibration, due to any particular sound, upon a roll of tin foil arranged to receive the impression. By reversing the process, the indentations and prominences of the tin foil cause the stylus to fall and rise, which results in vibrations of the membrane, and these reproduce the original sound. These impressed sheets of tin foil may be preserved or mailed to any part of the world, and by putting them into a similar instrument, may be made to reproduce the pitch, tone, and quality of the original sound thousands of miles or of years distant. By this instrument, voice may be phonographed, as the face is photographed and we may listen to the veritable voice of the dead, or preserve for future comparison the voice of a person from the first infant prattle and the manly utterances of mature life even to the feeble speech of old age. Public speeches and songs may thus be preserved and delivered indefinitely or till the tin foil wears out. In public libraries may be preserved languages of different nationalities spoken from century to century "with all the peculiarities of pronunciation, dialect, and brogue."

Correspondence.

A New Safety Sail Boat.

To the Editor of the Scientific American:

"Don't trust yourself in that craft; you'll be overboard sure." Such was the warning of a professional boatman at the barge office on the Battery, as I stepped upon a frail boat on a "fresh" afternoon. I think I know something of boats myself, and but that I knew this one to be provided with means intended to overcome the very danger against which the honest boatman warned me, I should have more than hesitated. But the pursuit of science must be deterred by no dangers, and, moreover, my pursuit in this instance was in behalf of the whole world, as represented by the SCIENTIFIC AMERICAN.

The Jane was an especially dangerous-looking craft, 18 or 20 feet long, whose bottom and deck formed the sharp V-shaped edge which proclaim an entire want of bearing power, while her immense sails, main and jib, were ample for a boat of twice her dimensions. Her captain was a New Zealander, whose motions were the reverse of safety-inspiring. My own conception of the care needful under the existing circumstances had no place with him, and, but for entire faith in my ability to swim, I should never have ventured.

As the Jane shot beyond the pier head, her huge sails were struck by a blast more than sufficient for instant destruction. Involuntarily I made ready for an impromptu bath, and the boatman tauntingly called out, "What'd I tell ye?" but *only the mast yielded*. The boat came to her bearings and moved on as steadily as though impelled by the mildest zephyr. The triumph was already complete; but more was to come. Presently we were in a large seaway, and, with our good speed, a large inflow of sea water over the low and sharp bow was a matter of course. In that, also, I was agreeably disappointed. The boat, instead of carrying the weight of the wind and being thus forced *through* the sea, rose to it and she glided easily *over*. Again it was the mast that yielded—yielded to the motion of the boat as easily as before it yielded to the force of the blast. The surplus force of wind, instead of racking the boat and making misery for her passengers, was simply "spilled" over the top of the sail. The motion was free from the thumps and jars usual under the same circumstances.

How all this was accomplished may be difficult of explanation without the aid of an engraving. Instead of being "stepped" in the usual way, the mast was held in a rocking shaft at the deck, and to the keel, on either side, springs were attached, having their opposite ends secured under the deck. Thus the mast, in the absence of pressure, remained upright, but under pressure yielded on either side. The amount of pressure needful to compel this yielding was regulated by nuts and screw on a guide rod inside the springs. A second pair of springs, placed longitudinally under the deck, were connected by pulleys with the shrouds, and these aided to stiffen the mast while they yielded to its movements under pressure.

For pleasure boats this spring mast is a great addition. It not only insures safety, but gives an ease of motion which cannot but prove especially delightful to those who are timid upon the water. More than this, it permits an unvarying course for the boat, and thus avoids the checks and delays inseparable from "luffing," as also the necessity of unusual skill and care in the management of even a "crank" vessel in a "flowy" wind. M. S. B.

New York, October, 1880.

[The invention, a practical trial of which is above described, is that of Mr. John McLeod, Hill's Pavilion, Flushing, N. Y. A patent has been allowed. It appears to be a really valuable and practical improvement.—EDS. SCI. AM.]

An Opening for Two New Articles of Manufacture.

To the Editor of the Scientific American:

I. In the Southern States 1,500,000 baskets are required for the harvesting of the cotton crop. These baskets are made of oak splits, and, except with extraordinary care, they last but one season, and are then thrown away. They require an expenditure on the part of planters of nearly $2,000,000 annually. Is it not possible that a basket may be made of iron, either wire or ribbons, which would last several seasons? The ribbons or splits might be made of some cheap quality of steel so as to be elastic, and if they could be made to weigh not more than 15 to 20 pounds each, and not to cost more than $2.00 to 2.50, they might prove a great success.

II. A great expense and trouble to the poorer people of the South is on account of cabin chimneys. On plantations and farms at a distance from cities, brick chimneys are so expensive as to compel owners of cabins to content themselves with stick and mud chimneys, which cost about $5.00 each, and which, if they do not burn up in the meantime, certainly fall down within a few years. A good substantial dirt chimney may be built up as far as the throat above the fireplace, but the shaft of the chimney, built of small sticks and daubed with mud, last but a brief time, and are always dangerous from fire. I would suggest to the manufacturers of concrete wares that a chimney stack with a flaring bottom (to sit on the dirt built jamb) might be constructed at a price which would commend it to the wants of thousands and tens of thousands of tenants of log cabins and cheap frame houses in this country. The form should be a square tube, 10 to 16 feet long, 16 to 18 inches square, flaring at the bottom to a size of 16x36 inches.

If there is any difficulty in this form, the flared portion and the stack might be constructed in different pieces, like joints of piping, with flanges to fit into each other. Here is certainly a great opening for industry in a new channel.

J. B. C.

Nodina, Ark., September 14.

AGRICULTURAL INVENTIONS.

Mr. Samuel E. Licklider, of Everett, Mo., has patented an improvement in the class of live stock feeders consisting of combined hay racks and mangers. The feature of novelty is the construction of the rack or hay receptacle and its arrangement relative to the manger.

Mr. Theodore C. H. Krüger, of San Marcos, Texas, has patented a machine for planting corn or cotton, that may be attached to almost any kind of plow. It is simple in construction, easily repaired by an ordinary blacksmith, and may be used for planting where stumps and rocks would interfere with the operation of machines of ordinary construction.

Big Farms on the Pacific Coast.

The "Mammoth Farm," of the Blacklock Wheat Growing Company of Washington Territory, comprises 60,000 acres of wheat land, of which 25,000 acres are fenced. Ground has been broken for a crop which is expected to foot up between 300,000 and 400,000 bushels.

Another large farm is that of Dr. Hugh J. Glenn, of California. It is in the Sacramento Valley, and comprises 65,000 acres, of which 45,000 acres were in wheat this year. The owner had provided 350,000 sacks, each holding 140 pounds, but at last reports they promised to be unequal to the task of holding the crop. Dr. Glenn has his own machine shops, blacksmith shops, saw and planing mills, etc. He manufactures his own wagons, separators, headers, harrows, and nearly all the machinery and implements used. He has employed 50 men in seeding and 150 in harvest, 200 head of horses and mules, 55 grain headers and other wagons, 150 sets of harness, 12 twelve-foot headers, 5 sulky hay rakes, 12 eight-mule cultivators, 4 Gem seed sowers, 8 Buckeye drills, 8 mowers, 1 forty-eight inch separator, 36 feet long and 13½ feet high, with a capacity of 10 bushels per minute; 1 forty-inch separator, 36 feet long; 2 forty-feet elevators for self-feeder, 1 steam barley or feed mill, and 2 twenty horse power engines. The forty-eight inch separator thrashed, on the 8th of August, 1879, 5,779 bushels of wheat.

RAPID TELEGRAPHING.—A political speech, of about sixteen thousand words, and occupying four hours in the delivery, was telegraphed to Cincinnati, from this city, September 24, in five hours and five minutes, by one operator on one wire. He used the Phillips system of steno-telegraphy.

A NEW ROAD WAGON.

The engraving shows a novel vehicle, having the combined advantages of a light speeding road wagon or adjustable vehicle for light and heavy work. It has a very light draught, and is easy riding. The friction on the axles and all of the wearing parts is light, and the shaft shackles, seat, and box are adjustable so that they may be readily adapted to their requirements.

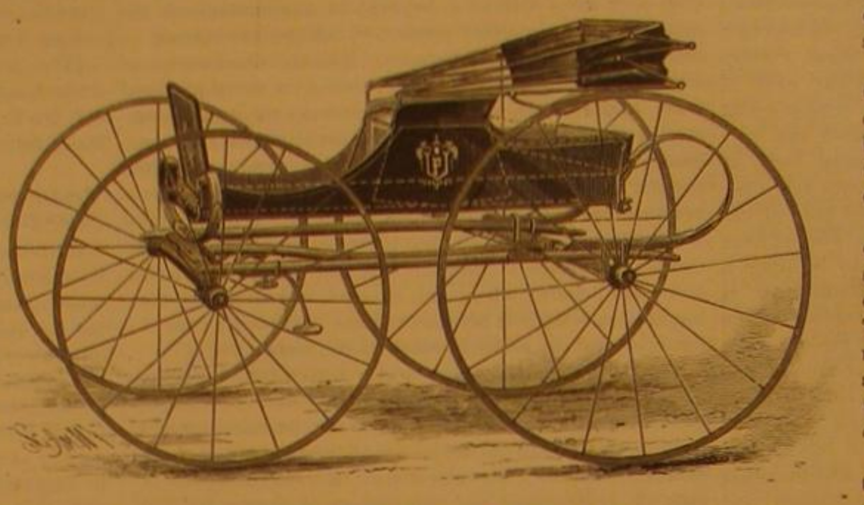
In this vehicle all the advantages of thorough braces and pliant platform are secured, with the addition of improved springs at the front and rear. The forward spring is of novel form, and arranged in line with the bolster, while the rear springs, which are of C form, are attached to and in line with the side bars. The springs are connected by leather or metal shackles with the bars attached to the slatted platform. The front bolster is connected with the rear axle by a central reach and by side bars which are secured by braces, clips, and bolts.

The platform is composed of slats which are thick in the middle and taper toward the ends. This construction gives strength and elasticity. The seat and box have curved bottoms to conform to the curvature of the pliant platform, and are made adjustable. There is no draught on the springs, platform, or box, and the friction and jar or quiver on the axles, wheels, king bolt, and shaft shackles are reduced to a minimum.

The springs have solid heads or metal tips, which render them stronger and more durable, and reduce the tendency to rattle. The springs, together with the pliant platform, form a combination which secures great elasticity and avoids most of the jar common to other vehicles when driven over obstructions, rough pavements, railroad crossings, crosswalks, ditches, etc., and it has very little swing or dip, and readily adapts itself to uneven roads, and, finally, it is peculiarly adapted for speeding and road purposes. It is used with or without a box, and it may have one or two seats or one or more boxes.

This wagon is made in different styles to adapt it to the wants of purchasers. It is made very light for speeding, a little heavier for physicians' use or for light driving. Another style is suited for liveries and general use; still another for farmers' use, provided with adjustable seat and box. A wagon is also made on the same general plan for sewing machine agents, grocery men, light express, and general use; and a still heavier wagon has two or more seats, and is well calculated for carrying a number of persons comfortably.

This improved vehicle was recently patented in the United States and Canada by Mr. James L. Phillips, box 342, Lowville, Lewis county, N. Y.



PHILLIPS' NEW ROAD WAGON.

NEW SASH HOLDER AND FASTENER.

The engraving shows an improved sash holder and fastener recently patented by Mr. John Harley, of Wallace-

HARLEY'S SASH HOLDER AND FASTENER.

burg, Ontario, Canada. The device is very simple, consisting of three principal parts: the wedge, A, casing, B, and the rubber spring, C. The upper end of the wedge is provided with a handle, and two flanges project from its face, one near the top and the other at the bottom. The back of the wedge has a notch near the middle to receive the end of the rubber spring, C. The casing, B, is secured to the window stop, and has a curved recess which contains the larger end of the rubber spring, C. The lower end of the wedge has a nib which prevents it from being drawn out of the casing.

When the window sash is raised the wedge is drawn by friction partly out of the casing and does not interfere with the opening of the window; but as soon as the sash is released the friction between the sash and the wedge draws the latter down into the casing and clamps the sash tightly, preventing it from descending further. When it is desired to close the window, the wedge is pulled upward, releasing the sash, when the window may be closed. The window is fastened, when closed, by hooking the flange near the upper end of the wedge over the top rail of the lower sash, as shown in the engraving.

Further information in regard to this invention may be obtained by addressing the inventor as above.

Brewers' Patent Suits.

The appointment of an advisory committee by the United States Brewers' Association, to counsel brewers who are attacked by "patent sharks" as to their best methods of defense, and if possible to combine interests in a common repulse, was decidedly a step in the right direction. "A child may lead a horse to water, but no man can make the horse drink." The advisory council exists, and so do patent sharks, but they have not as yet come in contact.

We are given to understand that ten or a dozen suits are pending against brewers in New York and vicinity for an alleged infringement of a patent that has been held in abeyance for a number of years, relating to the pitching of casks, etc., by means of hot air. Shultz, of Philadelphia, a long time ago, patented an arrangement for blowing hot air through a furnace into casks, heating them thoroughly so that the pitch would readily spread, thus saving much trouble. The principle was crude, and as times go it was antique. Stromberg, of Baltimore, improved on it. Holbeck went one better, and at last Gottfried, of Chicago, "collared the pot," and rested content until some one discovered that brewers were making a soft thing out of the "pitching patent." The cost of a machine was about $200, which sum fully covered the principle and the cost of apparatus. There was not enough money in it to "run" a big factory or to make a large income, so the patent fell flat, and was used by any ingenious smith who cared to apply it. Things went on thus until a celebrated firm of lawyers in Chicago "smelt blood," revived the patent, prosecuted claims, frightened some into compliance, and at last instituted suits for damages against brewers using the machine, in some instances, we are told, to the amount of $15,000, in equity. They expect, it is said, to hop out of New York with at least $200,000 damages obtained against brewers who have used this precious hot air arrangement. Those who have settled are referred to in proof of the validity of the claim, and an eminent trade journalist in Chicago gives testimony in its favor. We expect to hear of a patent on the breath of heaven yet.

To show the value in equity of this precious patent, we may state that on Wednesday, Sept. 15th, Henry Guenther, of the John Kress Brewery, New York city, pitched, on the old principle—*i. e.*, unhooping and taking out the head of the keg—twenty-four quarters in twenty-five minutes, beating the patent pitching machine all hollow, especially as to equity. For proof we refer to Mr. Stenger, of Eckert & Winter, and to Mr. P. Hoffmann, and to many others who witnessed the operation. Patent claims, in equity, must be careful in particularizing.—*Brewers' Gazette.*

A New Oil from Grape Vines.

The introduction of American vines into France to resist the ravages of the phylloxera is likely to receive a check, since it is claimed that only six or seven varieties do resist the insect's attacks successfully, while none of them produce wine as good as that obtained from the French vines. M. Laliman, a French *savant*, has discovered, however, that an oil can be distilled from the American vines which will not congeal above 8° Fah., while other oils congeal at 27½° Fah. M. Laliman, therefore, recommends this oil for watchmaking and similar uses.

MECHANICAL INVENTIONS.

An improved car coupling, patented by Mr. William R. Firebaugh, of Danville, Ill., consists of a link fastened to a shaft passing through and loosely mounted in a drawhead provided with a hook and a buffer, upon which shaft a cam provided with a weighted latch and acted upon by a locking spring is rigidly mounted. The shaft of the cam can be rotated by means of a crank shaft and chains, or by a crank directly; by this means the pivoted link is engaged with or disengaged from the hook on the opposite drawhead.

Mr. William B. Padgett, of Batesville, Ark., has patented an improved press for cotton, hay, or other material, that may be operated by hand or other power. The invention cannot be described without engravings.

Mr. Christopher C. P. McCord, of Walnut Grove, Ark., has patented a safety pulley for cotton gins and other machines, the object being to furnish devices by which the power may be quickly disconnected from the machine in case of accident.

A motor for driving sewing machines and other small machinery by either weight or spring power, has been patented by M. Léonce P. Ducournau, of New Orleans, La. The invention consists in a novel arrangement and combination of springs, gearing, and a fly wheel, and devices connected therewith which cannot be readily described without engravings.

Messrs. James A. Mell and Wesley Wortenbe, of Moline, Mich., have patented a self-adjusting wrench especially adapted for heavy work. It consists, essentially, of two jaws with legs of different lengths pivoted together; the longer jaw being also pivoted to a handle in such a manner that either or both jaws can swing and increase or diminish the opening between them within certain limits, as may be desired.

An improved rotary engine or pump has been patented by Mr. William B. Espent, of Spring Garden, Jamaica, West Indies. The invention consists in certain novel features of construction whereby the inventor obtains a minimum of friction surface with a maximum of piston space and speed and a reduction of joints requiring to be packed.

A NEW COMBINED BAROMETER AND THERMOMETER.

The engraving shows a short-leg mercurial barometer and thermometer combined. It consists of three tubes about half full of mercury dipping into a sealed cistern, B, full of the same. The tube, A, is open to the air; the tube, C, has at its top a sealed globe, D, full of air. Now, taking these two tubes alone, any variation in the atmospheric pressure would cause the mercury in A to rise or fall, communicating its movement to the mercury in C; but any variation in temperature would also move the mercury by expanding or contracting the air in the globe, D. To counteract this influence, which would in some cases materially alter the readings of the barometer, another tube, E, is arranged with a long bulb, F, something like a Sixe's thermometer; this tube, E, is, like the other, about half full of mercury, the rest of the tube and the bulb being filled with spirits of wine. Now the action of this thermometer for an increase of temperature is as follows: The spirit expands and drives the mercury into the other two tubes, but the air in the globe also expands by the heat, and prevents the mercury rising in the tube leading to it. All the rise of the mercury, therefore, takes place in the open limb, and exerts a greater pressure on the air within the globe, and thus prevents it from expanding; the height, therefore, of the mercury in the limb leading to the globe is not altered by differences of temperature, and it gives the reading of the barometer. A decrease of temperature acts in an opposite direction; the spirit then contracts, draws the mercury from the open limb, and reduces the pressure upon the air within the globe, which is thus prevented from contracting, so at all temperatures the volume of gas remains the same. Practically it is not altered by differences of atmospheric pressure, as the space in the globe is some hundreds of times larger than the space occupied by the variation of the mercury. The tube, E, also serves as a thermometer, for the spirit is, of course, incompressible. We have not yet heard how far the compensation is practically effected, but the design is certainly very ingenious.—*E. H. Hills, in English Mechanic.*

Combined Barometer and Thermometer.

A MARINE COMMUNITY.

BY A. W. ROBERTS.

One of the most intensely interesting occupations that I ever entered into was that of dredging for specimens of marine life. I have drawn and engraved but a mere fragment, so to speak, of some of nature's wondrous handiwork secured during a day's dredging at Buzzard's Bay, Mass.

In this marine community fraternity and equality were exhibited in a manner far superior to any republic, ancient or modern. But there was very little liberty, particularly in the case of the old hermit crab, whose residence was the empty shell of a winkle, which was so occupied by a living community of annelids, zoophytes, shellfish, etc., that it was next to impossible for him to navigate. Yet with these curious creatures communism prevailed to its fullest extent,

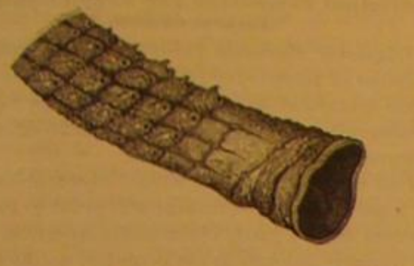


Fig. 1.—Lepralia.

one for all, and all for one. This mass of marine animals lived and thrived at the Aquarium for many months.

To begin, then, with the worms (or annelids, as they are called) contained in this community, I will select the *Serpula dianthus*, shown in the illustration as the central figure, and over which is shown a sea horse watching and waiting for small annelids, that he may suck them out of their tubes with his proboscis-shaped mouth.

The tubes in which the *Serpula* live are composed of shell. When a tube is broken it is immediately repaired or built up again by the *Serpula*. The *Serpula dianthus* always grows in a mass. At the base of the mass the tubes are twisted and contorted together, and where they come in contact with one another the outer walls of the tubes are joined together. In this way this united worm community obtain mutual strength for their otherwise fragile homes.

If a group of these annelids be taken into the hand they will appear to be empty, but if the tubes be not greatly contorted a something scarlet may be seen some distance down the tube, and by that sign the *Serpula* is known to be alive.

When *Serpulæ* are first placed in an aquarium they remain quiet for several hours, as if to become acquainted with the surroundings; but by very slow degrees the scarlet object is pushed nearer and nearer the mouth of the tube, and at last emerges, when it is seen to be a conically-shaped cork or stopper, its small end being prolonged into a kind of footstalk. In a short time a circle of scarlet feathery objects slowly and cautiously follow the stopper, which spread themselves out into a beautiful and elegantly-shaped plume. This plume is the feeding apparatus by which the minute forms of animal and vegetable life are arrested and conveyed to the stomach. Slowly as the *Serpula* protrudes itself from its tube, it is by no means slow in retreating. When one of these creatures is fully expanded in an aquarium, and the hand is rapidly moved outside without even touching the glass, the worm pops back into its tube with marvelous rapidity, so rapidly that the eye fails to follow the movement. The shadow of a person passing by will often have the same effect. It seems evident that the *Serpula* must be able to see, yet no eyes have been discovered.

The apparatus by which the *Serpula* performs its upward movement is a marvel of nature's mechanism. The body of the annelid is composed of seven distinc segments, and from each of these projects a pair of tubercles, each containing a bundle of bristles which can be thrust out at the will of the animal; at the end of each of the bristles are four short points, one being longer than the others. In ascending these bristles are thrust against the inner walls of the tube, which gives the creature an upward movement; contraction follows, when the hinder set of foot-like bristles are brought up, and so the movement is repeated till the end is accomplished. I extract the following from "Ocean Wonders," by my friend, W. E. Damon:

"Another curious little animal, also an annelid, is generally to be found rearing its cosy home amid the tubes of the *Serpulæ*. It cannot boast, perhaps, of as much beauty of color and waving plume, but its habits are so interesting and really wonderful, that I think it takes the lead as an object of curiosity of all the tube-building fraternity. Its tube is not homogeneous in its composition like that of the *Serpula*, but it makes an aggregation of separate particles, artistically welded or fitted together like a piece of mosaic work. This tube is not a secretion, like the cell of the coral-polyps; it does not *grow*, but is voluntarily and with great skill and care built up by the animal. In its construction it will use the very finest material—little specks of fine sand, and even dust that may chance to fall on the surface of the water. It also discriminates as to color, apparently preferring the brighter particles. For instance, I have ground red coral to powder, and put it into the water; upon this the little annelid would promptly seize, and immediately appropriate it for building purposes.

"A casual observer might see this wonderful worker many times without perceiving or appreciating its artistic movements; but get him once under a good lens, and you will see not only all the machinery in full operation, but also the object of its unwearied toil. Indeed this busy little work-

Fig. 4.—Chiton.

Fig. 5.—Purple Sea-urchin.

man lifts and carries bits of stone (hypothetical bricks), grains of sand, coral, glass, or shell, or any atoms which will serve its purpose, raises them to the top of its unfinished walls, and there places them with as much precision, neatness, rapidity, and in as regular order as the most experienced bricklayer. It is perfectly marvelous. One might watch them for hours together and never grow weary.

"But *how* do they do it?

Fig. 2.—Hydractinia.

"When the operation is seen, it is easily comprehended. The explanation presents some difficulties, though I have seen them build enough to create an annelidan city; but we will try to make it clear how the material for the construction of this little ocean tenement is hoisted up and placed in exactly the right position to complete its circular walls.

"In the first place, the creature has some twenty or thirty long, hair-like arms, which it propels out of the end of its tube. Extending these in every direction and to an incredible length, they become so attenuated as to be scarcely discernible in the water; but these fine, delicate cords or filaments, hardly discoverable by the unassisted vision, may be considered the ropes or tackling of its machinery for collecting the material which it needs for its sheath-like dwelling. Suppose a grain of sand, for instance, is lying at some distance from the animal: by some sense it perceives it, determines to appropriate it, and immediately sends forth one of its long, slender threads—*over* it or *to* it, for the extreme points are so fine as to be distinguished with difficulty, but the grain is reached. Watch it closely now! See! the bit of sand begins to move gradually along and upward, *gliding upon the surface* of this serviceable, rope-like filament. Observe, it is not grasped pincer-like with the end of the filament, but rides upward on the thread like that mysterious little wheel which thousands of our citizens see daily creeping up and over the wire which is one day to be a strand in the great cable of the East River Bridge. What the propelling or attracting force is which causes the grain of sand to rise up against the laws of gravity and approach the mouth of this annelid, I have not yet been able to discover; but in all probability there is a system of muscular contractile organs in this fine filament which a sufficiently strong magnifying lens may yet bring to observation and recognition. Be that as it may, we will in the meantime watch for what we can *see* of this process, and we find that when the object has reached the end of the filament it is placed for a moment in the mouth, where it is evidently coated with a glutinous

Fig. 3—Crepidula Fornicator.

mucus and is then passed out again, and finally deposited upon the edge of its walls. The true level is kept, one side being built up at exactly the same rate as the other, so that no excrescences are left on the edge, but when finished, all is of a uniform and even surface. The general appearance of the animal when at work forcibly reminds one of an immense *derrick*, full-rigged and in vigorous operation."

For feeding *Serpulæ* I used the stomachs of oysters and clams ground to a smooth paste, which were diluted with water. When this substance was mixed with the water of the aquarium it caused the water to assume a very milky appearance, which in a few hours time became as clear as crystal, after being worked over by the *Serpulæ*, which had devoured all the oyster held in suspension. On the tubes of most *Serpula* will be found a reddish-brown or gray incrustation; this incrustation is called *Lepralia*, and consists of innumerable spine-crowned cells of exquisite structure arranged in rows like the scales of a fish, as shown in Fig. 1, when greatly magnified. Each cell is armed with a spine. If the fingers are passed over the surface of the *Lepralia* from the base of the *Serpula* tubes upward a peculiar rough and harsh sensation will be perceived, which is caused by the finger coming into contact with the thousands of spine-crowned cells. In the channels of Canarsie Bay, Long Island, this zoophyte is found encrusting shells and other objects which have been submerged for any length of time.

On certain parts at the mouth of the winkle shell, which were free from the abrasion of the hermit crab's claws, grew a thick rose-colored moss-like carpeting, which consisted of thousands of minute hydroids called *Hydractinia*.

All members of a *Hydractinia* colony are connected at the base by a horny network, which rises occasionally into points of a conical shape. A single individual of such a colony when placed under a microscope appears as shown in Fig. 2. The pear-shaped protuberances, which might be taken for buds, in course of time burst and send forth a crystal bell, no larger than a pin's head, but of perfect organism. These are the minute jelly fish (*Medusæ*) that crowd the ocean in countless numbers, illuminating the crest of every tumbling wave and marking the wake of every ocean steamer.

Fig. 3 represents a mass of shell-fish (*Crepidula fornicator*) adhering together; the lowest one in the mass was fastened so firmly to the winkle shell that it could not be removed without injury. These "boat shells," as they are commonly called, adhere by means of atmospheric pressure; raising the central parts of their bodies from the objects to which they are attached, and, pressing down the rim of their shells, they produce a vacuum beneath themselves. And so firmly does the air hold them in place that the unaided fingers will find great difficulty even to stir them. The rims of their shells always exactly fit to the object or convolution of the shell to which they are attached. At the mouth of the winkle shell were also attached a number of living specimens of *Crepidula plana*.

Fig. 4 represents a curious little creature which I found tucked away in the interstices formed by the *Serpula* tubes. In color he so exactly matched his surroundings and was in form so very flat and unobtrusive that almost any one would have overlooked him. With his eight movable plates on his back he was suggestive of a tiny marine armadillo; but when I picked him out from his hiding place, which was no easy task (as he can maintain a better vacuum than the boat shell), he curled himself into a ball which you would have pronounced to be a very aged pill-bug (*Oniscus*).

In the mass of *Serpulæ* I also discovered several very young specimens of the purple sea-urchin, Fig. 5. The shell of the sea-urchin is made out of several hundreds of pentagonal plates, varying in size according to their position. These are so closely connected that their marks of juncture are not perceptible. As the

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shell is composed of these plates it is wonderful how the creature increases in size, as it cannot, like the crab, cast its old shell when too small and take to itself a larger one. But in order to overcome this the delicate lining membrane with which the entire surface of the body is covered insinuates itself between the edges of these plates and deposits round the margin of each particles of calcareous matter, so that each plate simultaneously increases round its edges, and the original form of the shell is preserved.

The surface of a sea-urchin after a certain age becomes thickly studded with spines (in young specimens the spines are much less in number), which are employed as a means of locomotion, and therefore are freely movable. If a single spine be removed, and note taken of the part it previously occupied, it will be seen that on the shell is placed a rounded tubercle, and that the base of the spine is furnished with a hollow socket into which the tubercle fits, so that the spine has perfect facility of movement. The spine is bound to the tubercle by a tendinous ligament, connecting the center of each much as is the case with the larger joints of vertebrate animals. The power of motion is communicated by the membranous covering that envelops the body during the life of the animal.

Besides the animals I have described as being members of the marine community, were also very small clump-clawed crabs, numerous *Neris* worms, a small variety of the *Cardum*, and minute acorn barnacles. In fact this single mass contained enough animal organisms to stock an aquarium for many months' study. The young sea-horses were introduced into the aquarium occasionally that they might enjoy an extra feed of small annelids.

THE KING PENGUIN.

Most interesting, by far, among all rookeries of penguins which I have seen was one of king penguins (*Aptenodytes longirostris*) which I met with at Marion Island.

The rookery was on a space of perfectly flat ground of about an acre in extent. It was divided into two irregular portions, a larger and smaller, by some grassy mounds. The flat space itself had a filthy black slimy surface; but the soil was trodden hard and flat.

About two-thirds of the space of one of the portions of the rookery, the larger one, was occupied by king penguins, standing bolt upright, with their beaks upturned, side by side, as thick as they could pack, and jostling one another as one disturbed them.

The king penguins stand as high as a man's middle. They are distinguished at once not only by their size, but by two narrow streaks of bright orange yellow, one on each side of the glistening white throat.

Penguins were to be seen coming from and going to the sea from the rookery, but singly, and not in companies like the crested penguins.

The king penguins when disturbed made a loud sound, like "*urr-urr-urr*." They run with their bodies held perfectly upright, getting over the ground pretty fast, and do not hop at all.

A good many were in bad plumage, moulting; but there were plenty also in the finest plumage.

On the small area of the rookery, which consisted of a flat space sheltered all round by grass slopes, and which formed a sort of bay among these, communicating with the larger area by two comparatively narrow passages, was the breeding establishment. These penguins are said by some observers to set apart regular separate spaces in their rookeries for moulting, for birds in clean plumage not breeding, and again for breeding birds. Here the breeding ground was quite separate, and the young and breeding pairs were confined to this smaller sheltered area. This was the only king penguin rookery which I saw in full action.

At Kerguelen's Land the king penguins were only met with in scattered groups of a dozen and twenty or so, and they were then not breeding, but only moulting. On this breeding ground, at its lower portion, numbers of penguins were reclining on their bellies, and I thought at first they might be covering eggs; but on driving them up I saw they were only resting. There was a drove of about a hundred penguins with young birds among them.

The young were most absurd objects. They were as tall as their parents, and moved about bolt upright, with their beaks in the air in the same manner; but they were covered with a thick coating of a light chocolate down, looking like very fine broom-fur. The down is at least two inches deep on the birds' bodies, and gives them a curious inflated appearance. They have a most comical look as they run off to jostle their way in among the old ones. They seemed to run rather better than the adults, but perhaps that was fancy.

Absurd in appearance as these young are, those that are just dropping the down and assuming the white plumage of the adults, are far more so. Some are to be seen with the brown down in large irregular patches and the white feathers showing out between these. In others the down remains only about neck and head, and in the last stage a sort of ruff or collar of brown remains sticking out round the bird's neck, and then when it cocks up its head it looks like a swell boy in stick-up collar.

The manner in which these young ones cock up their heads gives them a peculiar expression of vanity, and as they ran off on their short stumpy legs I could not resist laughing outright.

At the farthest corner of the breeding space, in the most sheltered spot, was a clump of birds of a hundred or more. The birds were, most of them, in a slightly stooping posture, and with the lower part of their bodies bulged out in a fold in front.

As I came up and bullied these birds with my stick a little they shifted their ground a bit with an awkward sort of hopping motion, with the feet held close together. It immediately struck me that they were carrying eggs with them, as I had read that king penguins do. Their gait was quite peculiar and different from the ordinary one, and evidently labored and difficult.

I struck one of them with my stick, and after some little provocation she let drop her egg from her pouch and then at once assumed the running motion.

These birds carry their eggs in a complete pouch between their legs, and hold it in by keeping their broad web feet tucked close together under it. They make absolutely no nest, nor even mark from habitually sitting in one place, but simply stand on the rookery floor in the described stooping position, and shift ground a bit from time to time as occasion requires. I suppose the egg is not dropped till the young one begins to break the shell.

Charles Goodridge says that the period of incubation is seven weeks, and that the birds commenced laying in the croyels in November, and continued to lay, if deprived of their eggs, till March. The birds with eggs were sitting close together. When, on my frightening them, some were driven against others, savage fights ensued and blood was drawn freely, the birds whose ground was invaded striking out furiously with their beaks.

Round about the brooding birds were others, I think males, in considerable numbers. The males probably feed the females with which they are paired. There were also some young downy birds.

If one of these latter was driven in among the brooders it was at once pecked almost to death. The young ones utter a curious whistling cry, of a high pitch and running through several notes, quite different from the simple bass note of the adults.

The egg of the king penguin is more than ordinarily pointed at the small end. It is greenish-white, like other penguin eggs.—*H. N. Moseley, Challenger Notes.*

The Menominee Iron Mines.

A correspondent of the *Iron Age*, accompanying the American Institute of Mining Engineers on its excursion among the mining districts of Lake Superior, anticipates a revolution in iron making to result from the inexhaustible stores of cheap ore in that region. He says:

We have questioned the propriety of calling some of the great openings of the Marquette and Negaunee districts "mines," as they might with more propriety be called "ore quarries;" but what shall we call these Menominee openings? They are not even quarries. You strip off the surface, and beneath lie deposits of ore such as the eye of man hath not seen. We are amazed, astounded, confused. Some of us who are interested in Eastern mines even turn away disgusted; and what wonder, when we see miners working these vast deposits of steel ore with pick and shovel as easily as they would dig a cellar on a sand hill; when we see ore of unapproachable richness and purity loosened, loaded, and put in cars for 25 cents a ton, including everything except the royalty of 50 cents. We have been impressed from the first; now we are appalled. I do not exaggerate in any respect the feelings of those who saw these mines for the first time on Tuesday, and who had enough acquaintance with the iron trade to understand the meaning of what they saw. "There is nothing like it in the world," says every one, and no one can intelligently question the statement that in this Menominee range, with its incalculable wealth of ore in sight and its unlimited possibilities of development, has been found the solution of the ore question for a longer time into the future than any one now in the iron business has any occasion to look. . . . Description cannot do justice to the subject, any more than it could to the Falls of Niagara. Even when we see the falls we wonder how this mighty cataract is fed, and when the supply of water which pours over the precipice in never diminishing volume will be exhausted. But our question is answered when we cross the great inland seas which are its unfailing fountains. So it is with Lake Superior iron ores. We see them steadily flowing into the port of Cleveland in increasing volume, and have allowed ourselves to be deluded by the mistaken predictions of such authorities as Mr. Bell, that they are drawn from pockets of known extent, and that the end of the supply can be predicted. When we go and look for ourselves we see that the supply is not a matter of years, but of centuries; that as yet we have but scratched the surface of a mineral wealth for which the world has no parallel, and that within two or three years at most, the abundance and cheapness of these ores will so reduce the cost of iron as to materially change the condition of national industrial development and international competition. If any one doubts this let him go and look, and his eyes will be opened. For the first time your correspondent appreciates the value of the Lake Superior ores as a factor in the problem of our iron development.

The Menominee range is the latest and grandest development of this wonderful country. In 1877, 10,405 tons of ore were shipped; in 1878, 94,245 tons; in 1879, 269,089 tons. This year there have already been shipped 375,000 tons, and before the close of navigation between 500,000 and 600,000 tons will have gone forward. Every pound of this ore will make Bessemer iron. The average cost at all the mines will not exceed $2 per ton on cars. In the furnace they will melt like snow. In one instance the ore costs 20 cents a ton at the surface, and with a total force of 60 men at work the mine yields 400 tons per day. Nothing is shipped which does not contain 55 per cent of metallic iron or over. The 50 per cent ore is piled near the workings in the expectation that in the event of a sudden demand it may be wanted. This production can be increased as rapidly as it may be needed, and there will soon be no room for foreign Bessemer ores in a market so abundantly supplied from Michigan and Wisconsin. The time is not far distant when this ore will be delivered at Cleveland at $4 per ton, leaving the mining companies $1 per ton profit. At this point the purest ores will meet the Connellsville coke, the finest metallurgical fuel in the world, and the pure magnesian limestones of the lake shores, than which there are no better. The rest may be guessed.

Original Inventions and Supplementary Improvements.

The *Telephonic Exchange Reporter*, in its allusion to the large number of patents issued on the telephone since Professor Bell introduced his instrument, adds the following remarks concerning the importance of patenting supplementary improvements.

When an inventor, says the writer, files a proper application for a patent, the government will grant to him a patent for whatever he can justly claim as his invention. Such invention properly belongs to the inventor, not by reason of a government privilege, but by reason of his having been the creator of the property. The government grants no privilege; it simply recognizes a legal right. The Patent Office makes an examination into the novelty of the invention in order that official recognition may be given only to that which appears to be new. If the official inquiry be not subsequently proven at fault, the invention or improvement patented is solely for the use or let of the patentee. He may let it drop, and thus make nothing from it. He may put a prohibitory value on it, and thus get nothing from it. He may put a just value on it and reap a rich reward, if his invention has merit. The justness of the inventor's charges will be evidenced entirely by public acceptation. If he charges too much the public decline his invention.

Another man may add an improvement to the original inventor's device. The improvement may consist of an added element, or in a useful change in form of old elements. The improver can patent his improvement.

The fundamental invention thus belongs to the first man, and the improvement belongs to the second man. The first man is not at liberty to make, sell, or use the improvement without the consent of the party who owns the patented improvement.

The second party is not at liberty to make, sell, or use the fundamental invention without the consent of the owner of the patent on the fundamental invention. In the absence of an arrangement, the first party must do without the improvement, and the second party must do without the fundamental invention. The first party can operate his invention without the improvement, but the second party can do nothing with his, because he has no fundamental invention to which he can apply his invention. He invented and patented his improvement with the hope that the owner of the fundamental patent would appreciate its merits and arrange for the use of the improvement. Without the allowance of the fundamental inventor, the improver is rock bound. He may have fine quarters on an upper floor; quarters which the party down stairs might envy him the possession of, but if the down stairs party has a sole title to stairs and exit, the up stairs party must leave his quarters vacant, or come to terms with the base.

In the case of patented inventions there may be hundreds of improvers on a fundamental invention; there may be improvements on the improvements; and many of the improvements may not be improvements at all, but may be fallacies based on wrong observation or incorrect experiment.

The status of patents is generally well understood by inventors, and they also well understand that the reward of the improver is likely to be handsome if his improvement will create a marked advance in the merit of the invention improved upon. The wise inventor does not cease his labors because his invention is a tributary one. Howe patented the essential fundamentals of sewing machines, but Singer was not thereby deterred from patenting an improved Howe sewing machine which he could never make without Howe's consent.

Bee Keepers' Convention.

The eleventh annual convention of the North American Bee Keepers' Society met in Cincinnati, Ohio, September 29. About one hundred and fifty delegates, from nearly all the States of the Union and from Canada, were present at the first session. In the annual address by President W. T. G. Newman, of Chicago, the honey crop of this year was said to be but half the usual amount, owing to bad weather. Papers were read on honey-producing plants and trees, new discoveries in the cure of foul brood, the yellow race of bees, Cyprian bees, etc.

The Cologne Cathedral.

Since 1821 the public and private contributions to the building fund of Cologne Cathedral have amounted to $4,500,000. Adding the contributions of past centuries, notably the money expended on the colossal foundations, a German paper finds that as it now stands the cathedral represents about $10,000,000.

Treatment of Nickel with Phosphorus.

M. J. Garnier, of the French Academy of Sciences, recently presented the following interesting paper to that body, giving the results of his experiments with nickel:

Pure nickel after melting generally contains more or less oxygen, and the metal is brittle. To prevent this injurious action of the oxygen, it is necessary to incorporate with the molten nickel a substance which has a great affinity for oxygen, but which shall also have a great affinity for the nickel itself; furthermore, this substance must not make the nickel brittle. The injurious action of the oxygen is proven by the fact that pure nickel melted in an atmosphere free from oxygen is extremely malleable. Such is the case with that which is accidentally deposited on the nozzles of the furnace blowers surrounded by combustible material. This same nickel, remelted or simply brought into contact with the air while at red heat, may then be pulverized under the hammer. Satisfied of this fact since 1876, I thought of adding metallic manganese to the metal, as is done in making steel. I chose manganese as the proper combining substance on account of its low price in the state of ferromanganese; but other easily oxidizable metals, it is needless to say, would have given the same results.

The manganese, it is true, did improve the quality of the nickel; but, like all metals having a great affinity for oxygen, it disappeared after successive remeltings, leaving the nickel again brittle. Thus I found that the oxidizable metals would not serve my purpose in practice, and I then employed phosphorus with success.

Besides the advantage of not perceptibly diminishing in remelting, when used in the small quantity necessary, phosphorus absorbs a much greater quantity of oxygen than any metal that can be used for the same purpose, using equal weights; thus while one unit of phosphorus absorbs 1·25 of oxygen in passing into phosphoric acid and 1·50 in passing into simple phosphate, one unit of manganese will absorb only 0·30 of oxygen in becoming protoxide of manganese; one unit of zinc will take only 0·25 of oxygen, and one unit of magnesium only 0·66 of oxygen. Furthermore, the phosphorus acts on the metal in such a way as to give it the various qualities necessary for its use in the arts, and its effect upon nickel may be compared with that of carbon upon iron. Thus up to three thousandths of phosphorus the nickel is soft and very malleable; beyond this amount its hardness increases at the expense of its malleability.

One of the means which I use to incorporate the phosphorus with the nickel is to add to the molten metal, in the desired proportion, a phosphide of nickel containing about six per cent of phosphorus. I obtain this phosphide by melting a mixture of phosphate of lime, silica, carbon, and nickel. This phosphide is white, hard, and brittle.

I have easily beaten out both cold and hot nickel containing 0·0025 of phosphorus, obtaining without difficulty sheets of two thousandths of an inch in thickness, that is to say, as thin as they could be made without beating out *en paquets*, and there is every reason to expect even better results. I have noticed that the first blow of the laminator brings out all the defects of an ingot, but that hardly any others show themselves during the remainder of the work, the reverse of what happens with *maillechort* (a kind of alloy resembling German silver); it is, therefore, very important to have ingots very free from defects.

Phosphorized nickel, united with brass, zinc, and iron, has given me results very greatly superior to those obtained with non-phosphorized nickel; the ingots were more perfect, since the phosphorus in absorbing the oxygen in the mass of the metal produced a solid and not gaseous compound. Thanks to phosphorus I have been able to unite nickel and iron in all proportions, always obtaining a soft and malleable alloy. This explains why some distinguished chemists have contradicted each other as to the malleability of nickel and iron united, some alleging that that alloy was brittle, and others that it was malleable; these latter used phosphorous iron.

Lake Superior Copper Mines.

The recent Lake Superior meeting of the American Institute of Mining Engineers brought out a considerable amount of interesting information touching the mineral resources of that wonderfully productive region.

The copper region of Lake Superior is divided into three districts, to wit: 1. Ontonagon; 2. Portage Lake; 3. Keweenaw Point. The Ontonagon district commences at a point in the neighborhood of twelve miles southwest of the shores of Portage Lake, while the Keweenaw Point district begins about four miles northeast of the Calumet and Hecla mine. The only productive fissure veins developed on Lake Superior so far are those that have been wrought in the Keweenaw Point district, at the Cliff, Phœnix, Central, and Copper Falls mines.

The industries mining on conglomerates are the Calumet and Hecla, Osceola, Allouez, and Ahmeek. Those on the amygdaloid deposits are the Quincy, Pewabic, Franklin, Hancock, Atlantic, Huron, Tecumseh, Osceola, Schoolcraft, and Concord.

The members of the Institute visited but one of these three copper districts—the second. Mining is being carried on at the following points north of the lake:

Hancock Mine.—Started in 1859. Working on amygdaloid deposit. Has produced up to December 31, 1879, about 1,400 tons of ingot copper. Local superintendent, John C. Ryan.

Quincy Mine.—In active operation about twenty years. Working on an amygdaloidal deposit. Deepest shaft, 2,000 feet. Dressing mill fitted up with the "cam" style of stamp heads, and Scheuermann's mineral dressers and Evan's slime table. Total production of ingot copper to December 31, 1879, about 25,000 tons. A. J. Corey, local superintendent.

Pewabic Mine.—Commenced regular work in 1858. Adjoins Quincy on the north and is mining on the same deposit. Deepest shaft, about 1,800 feet. Ball's stamps, and Collom's washers and Evan's slime tables in dressing mill. Has produced in the neighborhood of 11,000 tons of ingot copper up to December 31, 1879. Johnson Vivian, local superintendent.

Franklin Mine.—Started to produce regularly in 1859. Is adjacent to Pewabic, and is under the same local and Eastern management. Deepest shaft, 1,600 feet. The outfit in dressing works the same as the Pewabic. Yield from commencement to December 31, 1879, about 14,000 tons of ingot copper.

Concord Mine.—Started in 1866. At work on an amygdaloid on the northern prolongation of the Isle Royale series. So far has produced about 400 tons of ingot copper. Under same management as Franklin and Pewabic.

Osceola Mine.—Lies in line about eight miles northeast of the Franklin. Was started in 1873, mining on conglomerate and amygdaloid deposits. From commencement to December 31, 1879, has produced about 6,500 tons of ingot copper. Deepest shaft, 800 feet. Ball's stamps and Collom's washers and Evan's slime tables in dressing works, which are located on the shore of Portage Lake. The stamp rock is transported from the mine to the mill over the Mineral Range Railroad. John Daniell, local superintendent.

Calumet and Hecla Mine.—Borders on the Osceola. Active work commenced in 1866. Mining on a conglomerate belt. Deepest shaft, about 2,000 feet. Produced from commencement to December 31, 1879, in the neighborhood of 111,000 tons of ingot copper. Two stamp mills, each containing Ball's heads and Collom's washers. J. N. Wright, local superintendent.

The only mines on the south side of Portage Lake are the following:

Huron Mine.—Operated extensively first in 1863. Mining on an amygdaloidal lode in the Isle Royale, or eastern mineral series of this district. Deepest shaft, about 700 feet. The mine has afforded, since its commencement, over 4,000 tons of ingot copper. Johnson Vivian, local superintendent.

Grand Portage Mine.—Commenced in 1862. Mining on an amygdaloidal lode in the Isle Royale formation. Production to December 31, 1879, about 850 tons of ingot copper. C. F. Eschweiler, local superintendent.

Atlantic Mine.—(Formerly South Pewabic.) First worked in 1865. Lies over a mile to the southwest of Huron, in the course of the west formation of the district. Deepest shaft, over 800 feet. Dressing mill has in it Ball's heads, Collom's washers, and Evan's slime table. Total production of mine from commencement to December 31, 1879, about 8,000 tons of ingot copper. Wm. Tonkin, local superintendent.

The geology of this district, as described in the circular of the local committee, is as follows:

The trap range at Portage Lake has a width of over three miles, and is made up of a series of compact, granular, and amygdaloidal traps, with intercalations of sandstone and conglomerate, the whole having a strike of north 32° east and south 32° west, with a dip of from 38° to 56°, the highest angle of dip being near the southeastern boundary of the range, while toward the northwestern limit the rocks become more and more horizontal. Occurring both in course and in dip, with the rocks of the range are the copper lodes of the district, which present no features of mineral bearing fissures, being beds of amygdaloid trap and belts of conglomerate, the former carrying small masses and grains of native copper, while the copper in the latter is in small particles. Both deposits carry a little pure silver.

Supplementing this statement, Prof. W. H. Pettee, of Ann Arbor, Mich., described the modes of occurrence of the copper in the different districts. A northwest and southeast cross section of the peninsula at Portage Lake shows upon the southeast a considerable body of sandstone lying nearly horizontal, and not rising much above the general level of the lake. Next to the sandstone there is a series of beds having a northeasterly strike and a northwesterly dip. These beds, the number of which is very great, are partly conglomerates and partly amygdaloids, or traps, the latter being of volcanic origin. They are all conformable in stratification. Further to the northwest there is another series of sandstone beds similar to those on the southeast. The copper-bearing beds are confined to the amygdaloids and conglomerates. Whether the copper-bearing beds are older than the sandstones, or are of the same age, is a question which is still open for discussion. The key to the solution of the question is to be looked for along the line of junction between the sandstones and the traps. In Prof. Pumpelly's report it is stated that the rocks belong to two distinct periods, though some more recent examinations of the district point to the opposite conclusion. There is also a difference of opinion as to where the whole series belongs in the geological column, it having been assigned at different times to the Azoic, the Silurian, and even to the Triassic. At present the accepted view is that they are either Huronian or Lower Silurian, or form a series by themselves between the two just mentioned. Not all the beds of the copper-bearing series carry copper; neither is any one bed equally rich in all its parts.

Prof. R. C. Irving, of the State Geological Survey of Wisconsin, expressed the opinion that the copper-bearing rocks are older than the Potsdam sandstone. From evidences of non-conformity obtained in Wisconsin he was inclined to the opinion that the rocks of the copper region come between the Huronian and the Potsdam, the base of the Lower Silurian.

An Average Summer Rainfall

While the rainfall throughout the United States generally, from all reports, has been lighter during the summer months of this year than in years past, the fall in this vicinity, though very moderate, was heavier than in 1879. This is contrary to the general impression, which is that the fall here was exceedingly light. Data taken from the reports of the Signal Service officers with respect to the rainfalls during the months of June, July, and August for the last ten years, reveal some curious variations. The aggregate fall for these months in 1873 was very fair, yet in June only 1 29-100 of an inch fell. This is supposed to be the lightest monthly fall recorded anywhere in the United States in the past twenty years. The next lightest fall was in June, 1875, when 1 66-100 of an inch fell. As in 1873, however, the aggregate fall for the summer was good. The third lightest fall recorded was last August, when 1 69-100 of an inch fell.

The heaviest fall in the last ten years was in August, 1875, when 10 42-100 of an inch fell. The next heaviest fall was in July, 1872, the fall in that month having been 9 45-100 of an inch. The following table gives the exact amount of the falls in the summer months since 1871:

1871.	1872.	1873.	1874.	1875.	1876	1877.	1878.	1879.	1880.
7·14	2·94	1·29	2·87	1·66	2·87	3·31	2·91	3·42	4·40
3·60	9·45	4·15	3·22	5·23	5·72	3·86	5.26	3·39	6·67
5·48	6·13	7·68	2·53	10·42	2·97	2·54	7·30	5·17	1·69
16·22	18·52	13·12	8·62	17·31	11·56	9·71	15·47	11·98	12·76

—*New York Daily Graphic.*

New York's Summer Excursions.

The *Herald* devotes several columns to a review of the summer's work and receipts at the more popular resorts about this city. The summing up is as follows:

Resort.	Visitors.	Expenditures.
Coney Island	4,500,000	$8,775,000
Long Branch	400,000	1,800,000
Highlands, etc.	250,000	1,000,000
Rockaway	1,000,000	1,500,000
Long Beach	300,000	750,000
Glen Island	750,000	562,000
Fort Lee	750,000	375,000
Totals	7,950,000	$14,752,000

Nearly a million people paid for baths at the four bathing stations on Coney Island. Mr. John H. Starin, whose barges and steamers carry most of the excursionists to less prominent points, estimates that one and a half millions of dollars were spent on excursions alone to such places as Glen Alpine and points up the Hudson, and all of the chosen resorts of New York's people about Staten Island and beyond Hell Gate. If one were to go further, and add what has been spent at the races, in visits to picnic grounds, by rail and sailing craft, and the money spent in a hundred ways of pleasure seeking, of which no account can ever be had, it might be found that the 3,000,000 people who live in and around New York expended this year over $18,000,000 in keeping cool and enjoying themselves.

The Excavation of Flood Rock, Hell Gate.

The mining of Flood Rock, Hell Gate, in the East River at the northerly part of New York city, preparatory to blowing it up after the manner of the Hallett's Point work, is being pushed forward rapidly. The expenditure last year amounted to $140,000, and a large part of the $200,000 appropriated this year for the improvement of East River will go to this work. Employment is now given to 135 men, divided into three shifts of eight hours each. The central shaft is fifty feet deep.

Running across the river are twenty headings; at right angles to these are eleven cross headings, none of which have yet been extended their entire length. They average seven feet high and ten feet wide, and are situated about twenty feet apart. Near the main shaft, however, where more light and space are required for working, they are larger. Three acres have thus been undermined, or one third of the whole. It is not intended to enlarge the headings until each one has been carried out to its full length. Then the chambers will be widened and made higher, so that the whole excavation will resemble an immense cave, the roof being supported by the rocky pillars which now form the sides of the headings. The thickness of the rock forming the roof will then be about ten feet, varying according to the character of the rock, whereas it is now from fifteen to thirty feet in thickness.

The work of tunneling proceeds very slowly, owing to the hardness of the rock of which the reef is composed. The rate at which it is now going on is from 500 to 600 feet a month, representing an excavation of about 1,500 cubic yards. It is impossible to tell when the whole will be accomplished even at this rate. Frequently a seam is struck in blasting which stops the work in that heading altogether, on account of the leakage. In such a case it is customary to work around the leak. According to the last report, the work done during the past year was much greater than in any previous year; 24,000 cubic yards of rock were removed, 43,000 blasts made, and 57,066 drills sharpened. The number of blasts made each night now averages 150. The rock thus broken up is loaded on scows and dumped in the deep water to the south of the reef. Part of it was also used to fill up the space between Big and Little Mill Rocks, which lie to the north.

ON SOME IMPURITIES OF DRINKING WATERS.

Prof. W. G. Farlow, of Cambridge University, has recently distributed an interesting essay "On Some Impurities of Drinking Waters Caused by Vegetable Growths," and the object of which is to present in a popular form a statement of what is at present known in regard to the effect of the growth of different plants upon the water in the ponds, streams and basins which supply cities and towns. The subject is treated from a botanical standpoint—only certain striking properties, such as taste and smell, being considered, without taking into account those subtile changes which can be detected only by chemical analysis. The public are now beginning to read much about the "germ theory" of disease; and hearing that fevers may be produced by germs, and being told that germs are found in water, they naturally but illogically infer that any small bodies found in water are the germs of disease. There is no doubt that sensational writers have done much to spread alarm among all classes by representing as germs of disease such microscopic plants as Prof. Farlow treats of in his paper, but which could not possibly cause any of the diseases attributed by scientists to the influence of germs of a vegetable nature.

The most striking plants which grow in fresh water are those commonly known as "weeds," such as pond weed, pickerel weed, eel grass, etc. Flowering plants of this nature, in this latitude, belong to a comparatively few botanical genera. All of these weeds, whether they grow from the bottom, like those above mentioned, or float on the surface, like the small disk-like plants known as duck meats, may be considered harmless as far as any direct effect produced on drinking water is concerned. The only sources of trouble to be apprehended from them are (1) the mechanical one of choking up streams or bodies of shallow water; (2) that of serving as points of attachment or shelter for some of the minute injurious plants which the author next proceeds to consider, and which belong to that division of the flowerless plants known as algæ.

These plants are vastly more numerous than aquatic flowering plants, and are also much smaller—many of them being invisible to the naked eye. Some of them occur in the form of filaments; others form slimy masses of indefinite extent; and others consist of single microscopic cells floating in the water and only visible when they occur in immense numbers. Whatever their shape, however, we may, in considering their effects, divide them into two groups—those which are grass green or yellowish-green, and those which are bluish-green or purplish.

The first of these, botanically considered, belong to three different orders, but only two of these orders contain species which form masses of any considerable size. They frequent rather shallow places, and grow attached to sticks and stones at the bottom, or grow on the surface, where they form entangled masses several feet in extent. Considered from a sanitary point of view, Prof. Farlow states that these grass-green algæ have no injurious effect upon the water in which they grow. On the contrary, their presence may be regarded as an evidence of its purity, for they do not grow in impure water. They may, however, grow so luxuriantly as to fill up small bodies of water, and thus prove a nuisance.

The second, or bluish-green, group may, like the grass-green algæ, be in the form of filaments, expanded masses, or scums on the surface. They may also float freely in the water: but in this case they do not consist of single cells, but rather of aggregations of cells united by jelly into colonies. Their color, which is due to a mixture of chlorophyl and phycocyanin, is of importance, because by its means any one of ordinary intelligence can distinguish them from those above-mentioned. It is to the presence and decay of these bluish-green or purplish algæ that is to be ascribed the cause of some of the most decidedly disagreeable tastes and odors which frequently make their appearance in potable waters. These algæ are placed by botanists in a single order, which is divided into two sub-orders; but, to divest the subject of technicality, we may apply the term *Nostoc family* to the whole group. All of the species of this family flourish in hot weather, and form masses of large size. So long as they are living and not excessively abundant they produce no perceptibly bad effect on the water. When they decay, however, trouble begins: they give off then a jelly or slime which is often astonishing in amount; the phycocyanin exudes into and colors the jelly a light blue color, but which changes to yellow and then to brownish as putrefaction advances; and the slime gradually dissolves in the water, giving it a slightly oily or greasy consistency. When such putrefaction (which is quite rapid) takes place among large quantities of the plants it gives rise to the "pig-pen" odor, as it is called, which in recent years has caused considerable trouble and still more alarm in several cities of the United States. In connection herewith it should be stated that, as far as known, the so-called "cucumber taste" is not due to the growth or decay of any species of plant; and, as yet, no cause—chemical, zoological, or botanical—can be assigned for it.

The question as to the exact amount of harm caused by the excessive growth of *Nostocs* is to be answered by physicians and sanitarians. The water immediately affected becomes too offensive to drink, and cannot be entirely purified by filtration or by allowing it to stand; the only practical question is whether the disagreeable properties are conveyed any considerable distance. In one respect, says Prof. Farlow, the fears of the public may be set at rest. The theory that certain diseases, as fevers, are produced by germs of some low forms of plant life, whether true or not, has no bearing on the present case. On the one hand, although we know that the species above noted do cause the disagreeable "pig pen odor," and do render the water affected unfit to drink, we know, on the other hand, that they do not cause the specific diseases whose origin is considered explainable by the "germ theory." The "germs," so-called, are all species of *bacteria*, distinct from the *Nostoc* family and much minuter. The public should receive with very great caution any statements about the dangerous effect of *bacteria* in our drinking waters; and, instead of worrying over the subject, had better leave the matter in the hands of scientists, who, at the present day, are the only persons who can be expected to follow the complicated and obscure relations of this difficult question.

The Model Workman.

The qualifications which constitute a model foreman being given in a recent issue, we copy what *Design and Work* has to say of shop honesty, energy, and judgment.

Honesty is as valuable in the workshop as in the counting house. That negative honesty which gives correct time on a job and scorns to take pecuniary advantage of an employer's mistakes is not meant; but the sound, old-fashioned honesty that reports a failure, or poor job, as well as acknowledges it when discovered. It is important that apprentices should form a character and acquire a reputation for honesty, a reputation that will be as good a recommendation as that of ability to do good work. Much of the annoyance of the foreman comes from the supposed necessity of watching the hands. They should require no watching. A reputation for telling the truth should be so strong that there will be no room for suspicion and no necessity for watching. It should be so strong that if a broken tool is found under the bench, or on the waste heap, the foreman can truthfully affirm: "This is none of Charlie's work, for he would have told of it; Charlie does not practice tricks."

The honest workman will not let a loose fitting stud pass, as he knows it may not only injure the reputation of his employers, but, like a diseased tooth, will be continually giving trouble, and must, at some time, come out. He will not peen around the edges of a poorly fitting joint to make it look tight, deceiving the foreman, and perhaps endangering the integrity of the machine. If the honest workman cracks a casting he will report it, even if the crack does not show, for he knows that, sooner or later, it may break, and the reputation of the concern for good honest work may be impaired.

Not only is the employer injured by the tricks of the dishonest workman, but his want of integrity makes necessary the cast-iron shop rules that are occasionally so irksome. These rasping rules are for the government of the dishonest, but they annoy also the honest workman. Almost every foreman has some men under him who require watching, men who will "sojer" when they have the opportunity, and who will "come Yankee" over their spoiled work unless they are watched. There are others who are shop honest, who will not "sojer" when the boss is out, who report their own mishaps promptly, who can be trusted at all times and under all circumstances, who do not dodge behind the lathes to wash their hands in oil five minutes before "shutting down," and drop under the bench pretending to be looking for something when the foreman comes. A sensible foreman could manage, easily, a regiment of these self-respecting men, who having no mean tricks have no necessity for evasion, and feel no fear of detection.

There is a valuable quality in workmen in a shop that is apt to be overrated by itself, which, combined with another, goes far toward making an excellent combination. Energy is frequently looked upon as the *ne plus ultra* of a workman, and it is stimulated by bustle, blow, and fuss, and these are frequently mistaken for the real thing. There is at least one man in every shop who makes a great stir about his work, and to a casual looker on is a very driving and valuable workman. But at the end of the week or month, or at the finish of a job, he does not appear to have accomplished any more than some steady, quiet worker who has made no particular display.

Energy drives his center punch into the end of a shaft for a center as a trial; but Judgment makes the center the first time. Energy places his piece in the chuck without unnecessary loss of time; but Judgment trues his piece before Energy has his right. Energy straps his work to the planer in a minute, and like Jack Horner with his pie, in Mother Goose, says, "What a smart boy am I," but perhaps he springs the work, and when the job comes from the planer it must be worked over for hours by the fitter before it is in proper shape. Judgment will be careful not to spring his work when he secures it to the planer platen, and generally it comes out all right. Energy may drill holes with great rapidity, but because they are not started right there will be more or less filing to do to make a fit. Judgment sees that the holes are started properly, and when he tries his plate over the studs it goes on without any file dressing of the holes. These parallels might be extended at length. Quick movements and bluster do not insure rapid work and productive energy. Many of the best workmen are deliberate in movement, but they never strike twice where one well-directed blow will do the work; they never make one crooked stroke with the file, requiring a dozen straight ones to remove its scratches; they never drill a hole too small for the tap and then wrench and strain to make the tap ream the way for the thread. The workman who combines judgment with energy does the right thing in the right way, and the results of his work count up more than those of the work of the driver and blusterer, whose work, supposed to be done, must be gone over and doctored.

These drivers are an annoyance to the foreman. It is very trying to his patience to find a job carelessly done when it was supposed to be all right; to have to square up here, file there, and finish in another place; to see that his confidence in the energy of the workman has been misplaced, and that the workman was making a show when he was pretending to do work.

The Pocket Handkerchief.

We may forget our purse, our penknife, and many other things, says the London *Hatter*, without experiencing any great inconvenience, and even without its being known at times, but to lose or mislay the handkerchief may be followed by very grave consequences, as we all know. Moreover, we make use of this article in many other different ways. All who make use of spectacles do not remove them from their nose in order to put them very carefully into the case without using the handkerchief, and they use it again before putting them on, wiping the glasses with great care. The majority of people pay by far too little attention to an object so indispensable. Many put it into the same pocket with their keys, their purse, their snuff box, without troubling themselves concerning the many strange substances with which its tissue will not fail to come in contact in so miscellaneous a company, and which might sully the purity which the handkerchief ought to possess. Does one go to pay a visit? Before presenting themselves to the person they wished to thank or solicit, some have been known to dust their boots with the handkerchief. Does the careful wife see some grains of dust left on her ornaments? She makes them disappear with her handkerchief. Boys in the school room clean their slates with them; in the playground the handkerchief is the necessary attendant of a multitude of games. With this they wipe off the dirt; they strike off the dust. It is used to stop the blood that flows from wounds—always very numerous in the age of leapfrog and prisoners' base; the age also of communism in handkerchiefs. With wounds come tears, and the handkerchief, full of dust, spotted with dirt, with the blood of bodies known or unknown, serves again for wiping the eyes, the nose, or the cheeks furrowed with tears. We do not wish, and we cannot tell here all the strange uses that people make of the pocket handkerchief. And then what signals have been conveyed by it! How many sad farewells, how many cheerful congratulations! The very method of waving it has a language, as the motions of the fan also have. But no one has hitherto discoursed on the language of the pocket handkerchief. And how useful it often is as a help to the pocket or the hand-bag! How many mushrooms, myrtle-berries, strawberries, and raspberries have been gathered into the handkerchief in young days, and more valuable things in later life! Then there may be evil results traced to it—a number of ailments of which one cannot guess the origin; diseases of the nose and eyes. Fortunate it is for him that incurs nothing worse; diphtheria, for example, which the handkerchief may heedlessly transmit. Let us not use the handkerchief except for its proper purpose; let us devote to it a special place; let us change it as often as possible, and inspire our children with a great disgust for another's handkerchief on account of the disagreeable, nay, dangerous consequences that may ensue. Much more might be said about the pocket handkerchief, but enough has been hinted at to set my readers a-thinking upon its importance, its uses, and its abuses.

Freezing Points of Fermented Liquids.

Mixtures of alcohol and water when subjected to very low temperatures congeal, but never completely solidify; the solid portion consists of pure ice, and can be separated from the alcohol by pressure. It has been suggested that dilute alcoholic liquids may be concentrated in this way, but we are not aware that the suggestion has yet been practically adopted. M. Raoult has determined the freezing points of various mixtures of alcohol and water, and has constructed a table which may be used for the determination of the strength of such mixtures. Without giving this in detail we may mention that his experiments show that in solutions containing from 0 gramme to 10 grammes of alcohol to 100 grammes of water, the addition of 1 gramme of alcohol lowers the freezing point by 0·377° C. (0·68° F.); in solutions containing from 24 to 51 grammes of alcohol to 100 grammes of water, the addition of 1 gramme of alcohol lowers the freezing point by 0·528° C. (0·95° F.). The same investigator has also determined the freezing points of various fermented liquors, which are always lower than pure alcoholic solutions of equal strength, in consequence of the presence of saccharine and other substances. The following table gives the determinations he has made:

	Per Cent Alcohol.	Freezing Point. C.	Freezing Point. F.
Cider	4·8	–2·0°	28·4°
Beer	6·3	–2·8	27·0
Red vin ordinaire	6·8	–2·7	27·2
White vin ordinaire	7·0	–3·0	26·6
Beaujolais	10·3	–4·4	24·0
Red Bordeaux	11·8	–5·2	22·6
Red Burgundy	13·1	–5·7	21·7
Red Rousillon	15·2	–6·9	19·6
Marsala	20·7	–10·1	13·8

As with pure mixtures of alcohol and water, the solid matter which freezes out is pure ice, and can be removed by pressure, the remaining solution becomes in consequence richer in both alcohol and extract, and it has been suggested to use this method for concentrating worts and beer.

Business and Personal.

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The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

For Superior Steam Heat. Appar., see adv., page 237.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 205.

H. A. Lee's Moulding Machines, Worcester, Mass.

New Economizer Portable Engine. See illus. adv. p. 238.

Jas. T. Pratt & Co., 53 Fulton St., New York. Scroll Saws and Designs. Send for circular.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 237.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 237. Totten & Co., Pittsburg.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

Vacuum Cylinder Oils. See adv., page 237.

Lightning Screw Plates and Labor-saving Tools, p. 190.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the Scientific American Supplement referred to in these columns may be had at this office. Price 10 cents each.

(1) F. S. S. asks: 1. Will a small (one or two man power) dynamo-electric run a lamp with sufficient quantity of light for projection purposes? A. Yes. 2. How would such a lamp compare with an oil lamp—what candle power? A. The power of the lamp will depend on its construction, on the efficiency of the dynamo, and on the power applied to it. The light, however, should be much stronger than that of an oil lamp. 3. Where and for about what cost can disks fit for condensers 4x3¾ be had? A. They may be procured from any manufacturing optician; the price we cannot quote. 4. Would emery wheel or grindstone rough them to shape more quickly? If emery, what grade? A. Sharp sand, used on a cast iron tool with plenty of water, is preferred by opticians for roughing.

(2) D. D. M. asks: Will a boiler in good condition, with two gauges of water, explode, no matter what the steam pressure is, or will it simply fracture at the weakest point? Please give what information in regard to boiler explosions you can. A. It will not "explode," in the strict technical sense, but will "burst," and do much damage. We refer you to the experiments of the Franklin Institute on boiler explosions, to "Robinson on Boiler Explosions," and to "Wilson on Steam Boilers."

(3) O. W. W. asks: 1. If a lump of lead was thrown into the deepest part of the ocean, would it sink to the bottom, or only go so far and float? A. It would sink. 2. What is the greatest depth ever actually sounded? A. 4,655 fathoms. 3. If a stout bottle of water, corked and sealed, is lowered into the sea to a great depth, will anything happen to it? A. The cork will be driven in or compressed, but as water is practically incompressible, nothing further will happen. 4. What is the strain on a rope with ten men on each end pulling in opposite directions? Is it the strength of 10 men or of 20? A. 10 men.

(4) J. R. S. asks: 1. What is the horse power of an engine 2 inches bore, 6 inches stroke, 250 revolutions a minute, and 80 lb. steam? I figure it a little over 1$\frac{11}{16}$. Am I right? A. You are right; but deducting 20 per cent for friction and losses, reduces it to 1$\frac{11}{32}$. 2. How many feet heating surface does the boiler require to have to furnish the amount of steam for two such engines working on the same shaft, the boiler to be upright flue boiler? A. 44 to 50 feet.

(5) F. B. D. writes: 1. I have a cell of Grenet battery, consisting of one zinc and two carbon plates, about 2x5 inches. I wish to make a single electro-magnet, or two single ones, to act alternately; what size of wire and core should I use? A. Use ½ inch cores 2 inches long, and wind with 6 or 8 layers of No 22 wire. 2. Please tell me how to charge a gravity cell consisting of a zinc suspended at the top and a thin sheet of copper, about 1½ inch wide, bent around on the inside of the cell at the bottom? A. If the cell is of the usual size, place two pounds of sulphate of copper in the bottom of the jar. Suspend your zinc and fill with water so as to cover the zinc half an inch. Connect the poles, and let it stand for ten or twelve hours, when it will be ready for work.

COMMUNICATIONS RECEIVED.

On Preventing the Firing of Oil Tanks. By E. G. H.
With What Do We Think? By T. B. McC.
On a Remarkable Group of Sun Spots. By W. R. B.
On Cause of Perpetual Snow. By C. B.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 14, 1880.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Leather and dress shoe, E. Ridley & Sons ... 8,039
Medicine for the cure of scrofula and similar diseases, J. A. Gates ... 8,029
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Journal bearings and composition therefor, H. G. Farr *et al.*, Brandon, Vt.
Lighting cities by electricity, H. C. Spalding, Boston, Mass.
Mines, destroying fire damp in, R. Blacklidge *et al.*, Enfield, Conn.
Paper fastener, G. W. McGill, New York city.
Screw threading machine, W. Erichson, Baltimore, Md.
Sewing machine, W. Webster, San Francisco, Cal.

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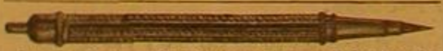

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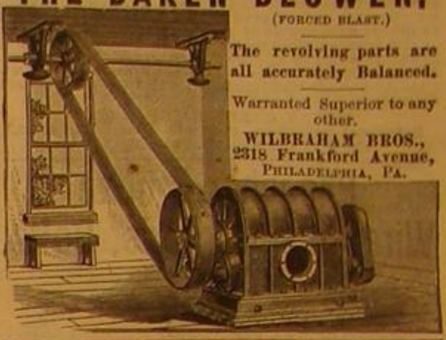

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