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PROGRESS OF THE HUDSON RIVER TUNNEL.

The larger of the three engraved illustrations on this page shows very clearly the manner in which the work of excavation and construction is carried on in each of the two parallel drifts of the double tunnel under the Hudson River between Jersey City and New York. The smaller cut on page 356 shows a section of the same working for about 80 feet of the advanced end of a tunnel, including the entire length of the pilot tunnel. Fig. 3, is a view of the shore ends of the tunnels from the working chamber of the caisson, looking toward the river. On the right is the entrance to the upper air lock, reached by a safety shaft extending to above the level of the river. The lower air lock, communicating with the bottom of the open shaft, is at the side of the cais-

[*Continued on page* 356.]

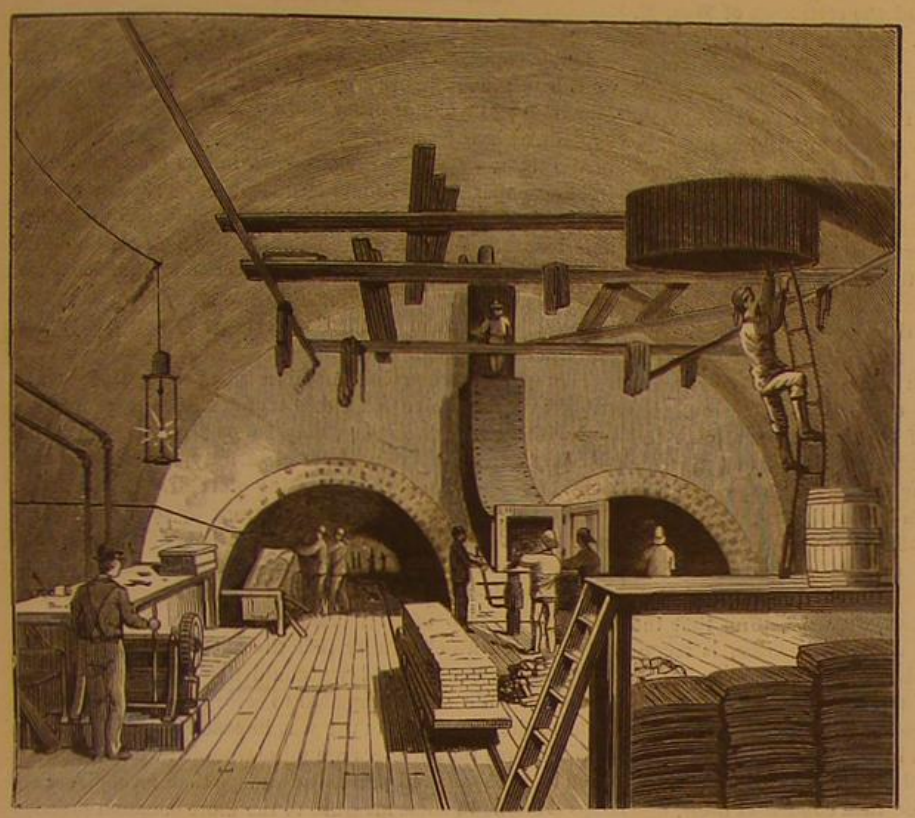


Fig. 3.—SHORE END OF TUNNEL.

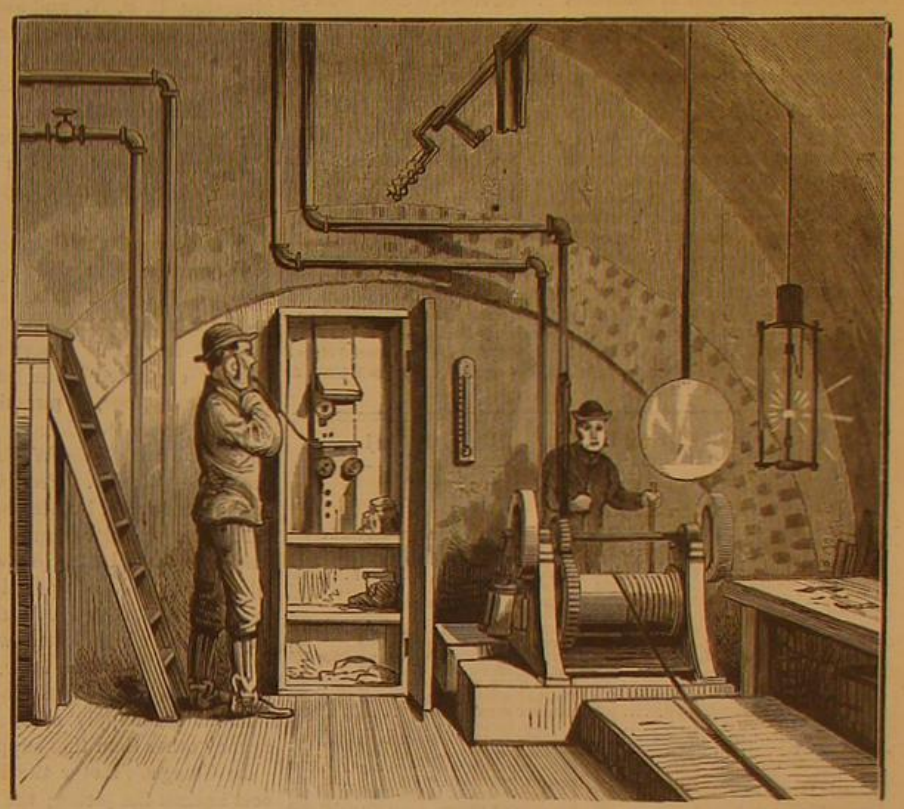
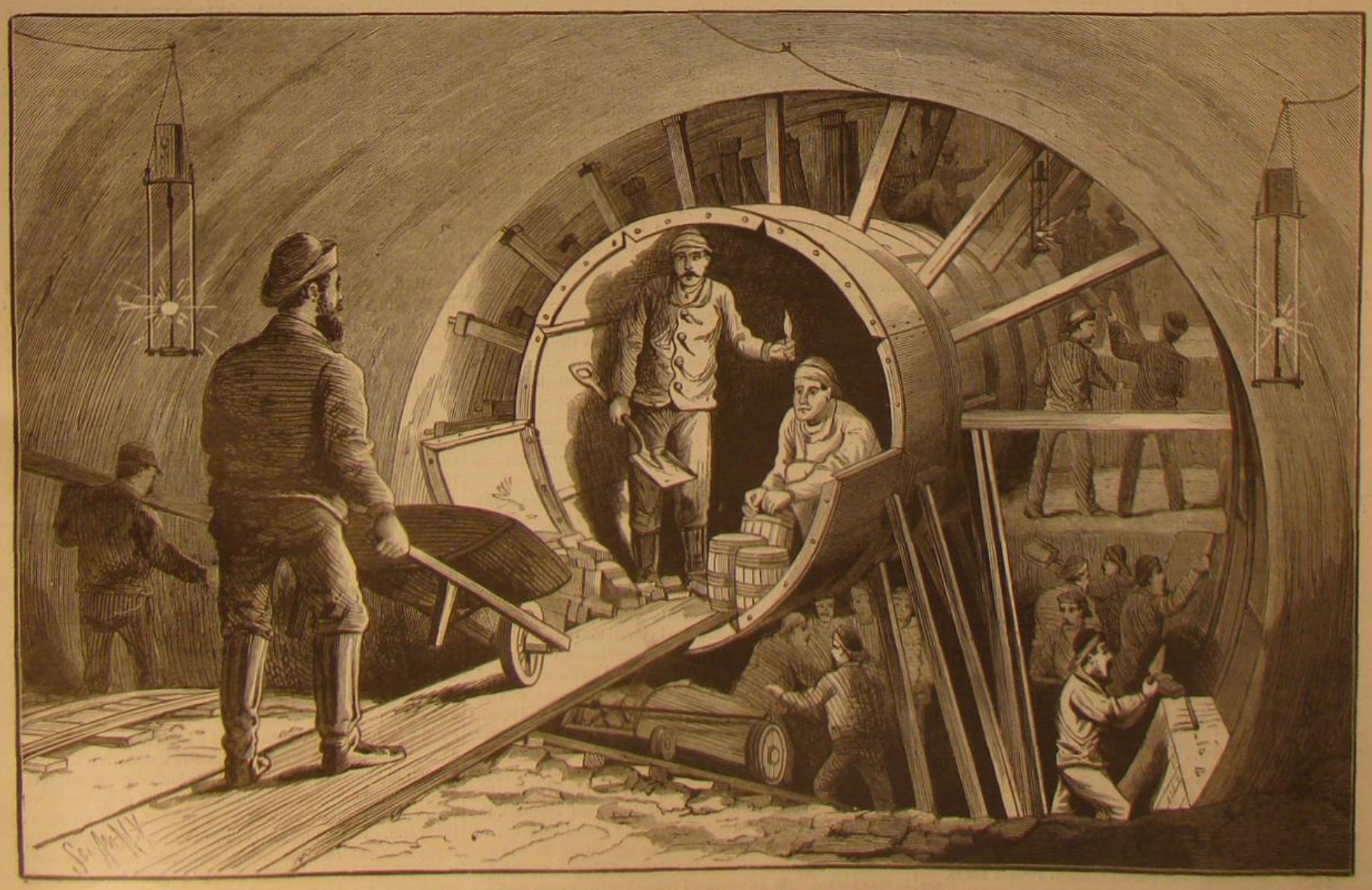


Fig. 4.—TELEPHONE AND WINDLASS IN CAISSON.



THE HUDSON RIVER TUNNEL—SHOWING PILOT TUNNEL AND BRACING.

Scientific American.

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NEW YORK, SATURDAY, JUNE 4, 1881.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 283,

For the Week ending June 4, 1881.

Price 10 cents. For sale by all newsdealers.

PERPETUAL MOTION DELUSIONS.

We publish in another column sundry paragraphs relating to the zeromotor and other perpetual motions, among them a letter from Professor Gamgee. This communication is of interest, as showing that the Professor considers himself to be a persecuted saint and martyr, chiefly because he has, as he avers, supported himself and his schemes for the past two years. He also grieves that a man who has so clear and profound a knowledge of the zeromotor principles as Chief Engineer Isherwood, should be misunderstood and misrepresented to the degree of being charged with indorsing a perpetual motion.

It is a singular circumstance that such arrant deceptions as the Keely motor and the Gamgee motor should each have had for its godfather a prominent officer of the United States Navy. In the case of the Keely motor it was the former Engineer-in-Chief of the United States Navy, Prof. Charles H. Haswell, who supported the deception, in a report, from which extracts were given in the SCIENTIFIC AMERICAN of May 2, 1874. The Keely Company at that time also referred to William W. W. Wood, Chief of the Bureau of Steam Engineering, U. S. N., and also had the certificate of Wm. H. Rutherford, Chief Engineer, U. S. N., as to the correctness of their statements concerning the operation of the motor. We believe that it was chiefly on the strength of the certificates of these gentlemen and of Prof. Haswell's favorable report that the Keely operators succeeded in milking the New York bankers and brokers out of the thousands of dollars which they originally paid over for shares in the silly scheme.

In the case of the Gamgee perpetual motion, its claims to consideration rest mainly upon the report of Chief Engineer Isherwood, U. S. N., date of March 19, 1881, and published in the SCIENTIFIC AMERICAN, date of May 21, 1881. We inferred from this report that the Navy Department had already expended some of its resources on Isherwood's recommendations, in pursuit of the Gamgee delusion. He strongly urges the Secretary of the Navy to authorize the continued use of the Washington Navy Yard facilities for the same purpose. Prof. Gamgee, however, says that the expenses are paid by him, which is consolatory.

Another singular feature of these twin deceptions is that they are both based (or were originally) upon the same alleged principle of operation. It was claimed for Keely's motor (see SCIENTIFIC AMERICAN, June 10, 1876) that the vapor "does its allotted work upon the engine, is recondensed into its former state, and again becoming vaporized, starts again upon its mission of mighty pressure." All this without the supply of fuel, electricity, galvanism, or any agency other than that supplied by the machine itself.

In Gamgee's motor the liquid expands into vapor, which acts against the piston; the vapor then condenses itself, and runs back to act again against the piston, and so on in one perpetual round or "cycle" of duty. All this, too, according to Prof. Gamgee and Chief Engineer Isherwood, "by the working of the machine itself."

An improvement on the Gamgee plan, suggested in the letter of a correspondent, elsewhere published, consists in the use of ammonia cream or jelly.

Another correspondent, whose letter we give, a young man without money or friends, wants help to develop his perpetual motion. Perhaps the Secretary of the Navy will give him the same facilities that he is now bestowing upon enterprises of this nature at the Washington Navy Yard.

We give, from *Engineering*, a letter from Mr. Kilbourn, in which he explains the frigorific dangers of using motors on the Gamgee principle, namely, liquefaction by expansion. May it not be possible that the last glacial epoch was brought about by a race of men now extinct, through the ill-advised use of too many Gamgee machines, they and their motors having become solidified?

POLARIZATION OF SOUND.

Professor S. W. Robinson has an article in the *Journal* of the Franklin Institute, the object of which is to show, by theory and experiment, that longitudinal vibrations, such as sound waves, can be polarized; and not only this, but also to show that it is irrational and improbable for vibrations in extended media generally to be primarily otherwise than longitudinal. All this is aimed especially at the "transversal theory" of light.

The phenomena of radiation, refraction, diffraction, diffusion, interference, and polarization are, with the exception of the latter, common to light and sound, and it is for the sake of explaining polarization in light that physicists have set up the theory of transversal vibration. It is, therefore, only necessary to polarize the sound to place all the known effects of luminous waves in common with sound waves, or to make the theory of longitudinal vibrations universal. The author, after much study, became convinced about eight years ago that undulations generally could be polarized, and, after some preliminary experimentation, apparatus was devised by him last May, by means of which he obtained results which verified all his preconceived notions in the matter. The means adopted for polarizing the undulations was the same as that for polarizing light by reflection, but the apparatus can scarcely be described without the use of figures.

The results obtained by Professor Robinson establish the following facts for sound waves or for undulations: (1) A decided reflection occurs at a surface separating two gases of different density, confirming the views of Henry and Tyndall in this regard. (2) In repeated reflection from such surfaces the intensity of the final component varies with the relative positions of those surfaces, the same following the laws of polarization in light, from which we conclude that longitudinal undulations can be polarized.

With sound polarized, we complete the list of effects for longitudinal undulations which are known to light, viz., radiation, shadows, reflection, refraction, diffusion, diffraction, interference, and polarization; and the laws are common for like conditions.

The conclusions to which the author has been led are summed up as follows: (1) Vibrations in extended media, produced from the action of a remote single center of disturbance, can only be longitudinal, even in light. (2) Vibrations will be to a certain extent transversal when due to two or more centers of disturbance not in the same line, as when two or more independent coexistent systems of undulations combine into one, or when a simple system is modified by such lateral disturbance as a reflection or a refraction. (3) Undulations, to be in a condition called polarized, must consist of vibrations which are transversal, and no necessity exists for assuming vibrations transversal in front of a polarizer.

ELECTRICAL PAPER.

Letter paper, well heated and rubbed briskly by the hand or a brush, acquires, as well known, electrical properties. It adheres to walls or other flat surfaces, and even gives, in contact with the hand, small discharges, which are visible in darkness. The *Revue Industrielle* points out a method of treating paper so that these electrical properties may be increased to such a degree that the sparks shall be of considerable length. Ordinary Swedish filtering paper is immersed in a mixture of equal volumes of nitric and sulphuric acids, as in the process of making gun cotton. The paper thus pyroxylated is then washed in a large quantity of water, and afterward dried.

This paper, when laid upon a piece of oil cloth and rubbed very briskly, will exhibit very energetic properties, and with it, says the *Revue*, may be perfected nearly all the ordinary experiments in static electricity, such as the production of sparks, shocks, charging of the Leyden jar, etc.

Paper makers, as a general rule, know by practical experience that it is not difficult to get electricity into paper; and some of them would be glad to hear of some simple way to get the fluid—or what-is-it—out of the paper. We recently received a cargo of SCIENTIFIC AMERICAN paper that was so charged with electricity that the sheets would not separate without tearing, and we could not run them through the press. We were compelled to return the entire consignment to the maker, as its use was impracticable.

We believe that printers are more troubled with electricity upon their papers and presses nowadays than formerly. Perhaps it is due in some measure to the more common practice of running the sheets through the press in a dry condition. On the other hand, may not the rapidly increasing local uses of batteries and electric machines for telegraphs, telephones, lights, etc., yield such a superabundance of the mysterious element as to show itself in the press rooms?

The East River Bridge.

The work of laying the floor beams of the East River Bridge is now going forward quite rapidly. The manner of suspending these beams was illustrated in this paper a fortnight ago. There are now thirty-four beams in position on each of the land spans, and on the river span there are thirty-seven in position on both the New York and Brooklyn sides of the river. There are, therefore, one hundred and forty-two floor beams in position, or including the eight in the towers, one hundred and fifty in all.

Engineer Martin reports that three cargoes of creosoted yellow pine for the roadway of the bridge have been received. These beams, which are four and a half inches thick, will be laid directly upon the floor beams, and over them will be laid a covering of oak two and a half inches thick. The paving stones for the roadway are arriving in good numbers, and the work of paving will begin about the middle of June.

Flowers about Railway Stations.

For some years the Pennsylvania Railroad Company has endeavored to relieve the barren dreariness of the ordinary railway station by surrounding their country station houses with flower beds. More attention to this matter is being paid this year than ever before; and recently the company purchased 50,000 plants in this city for the adornment of the stations of the New York and Philadelphia division of the road. The practice is worthy of general imitation.

The Pepsine Treatment of Tapeworms.

The tapeworm is able to live in the stomach because of its ability to resist the digestive action of the fluids normal to the stomach. In a stronger peptic solution the live worm succumbs and is digested like any other flesh. Accordingly a French physician treated with strong doses of pepsine a child who had passed segments of a large tapeworm. About 45 grains of pepsine were administered daily for five days. The child experienced no harm and showed no special symptoms. Then a proper dose of sulphate of pelletierine with castor oil was given, and the discharges showed no signs of the worm. Subsequent experiments with vegetable pepsine—papaine—which is much more active, are said to have given very promising results. One child passed fragments of tapeworm ten inches in length, softened and partially digested.

Correspondence.

Plea for a Government Perpetual Motion.

To the Editor of the Scientific American:

In your issue (date of May 21, 1881) under the above heading, you urge, concerning my experiments in the Washington Navy Yard, that "no more of the public money be wasted on such stupid and irrational schemes." For over two years I have, at great personal expense and sacrifice, conducted work, in which I volunteered, at the urgent request of the late Surgeon-General Woodworth, with a view to the disinfection of ships by artificial refrigeration. The complete demonstration of the engineering side of the problem enabled me to prove to the satisfaction of, probably, the ablest engineer officer of any navy, that a low temperature engine, such as enabled me to abstract heat from air or water more cheaply than had ever before been accomplished, might take the place of the steam engine for all ordinary purposes requiring motive power. A clear and profound knowledge of thermo-dynamics enabled Chief Engineer Isherwood to recognize the step in advance I had reached. Thereupon the Secretary of the Navy permitted me, *still entirely at my own expense*, to make detail modifications of the machine, which has worked successfully since the 20th of last December, in an investigation to determine the practical feasibility of my zeromotor.

Those who never try, never fail. I have been willing to risk money and reputation, with no fair prospect of reward, in an attempt to check the inroads of a disastrous plague. The researches which enabled me to succeed in this had indicated, from the very first, the steps which might be pursued in a promising attempt to supersede the steam engine. Nothing but experiment could settle the question, and again I was willing to run the risk of failure without calling on the government for means to demonstrate the truth or error of a system which may, as Chief Engineer Isherwood says, "prove of more importance to the Navy of the United States than to the navies of the great maritime powers of Europe, with which it may come in collision."

I court fair criticism, and have sought objectors. Since the summer of 1878 I have steadily pursued researches without publicity, until this, with regret, became necessary, in obtaining a privilege almost essential to their completion. It is hard to believe that any competent American engineer should know so little of the history of heat engines as to lead him, for one moment, to suppose that Mr. Isherwood could indorse a "perpetual motion." If one so distinguished as he, in this special department of knowledge, can be misrepresented and misunderstood, it is not surprising that one who has labored in other fields should be regarded as a dangerous innovator. Failure implies my loss; success, the Navy's and the world's advantage, infinitely more than mine.

I am, sir, your obedient servant,

JOHN GAMGEE.

Riggs House, Washington, D. C., May, 1881.

The Electrical Self-Acting Steam Engine.

To the Editor of the Scientific American:

I would call the attention of Messrs. Gamgee, Keely & Co., to the following extract from Helmholtz's "Popular Scientific Lectures." As soon as their present jobs are finished, which will doubtless be ere long, here is a promising field for mechanicians of their peculiar ability.

"A speculative American set, some time ago, the industrial world of Europe in excitement. The magneto-electric machines often made use of in the case of rheumatic disorders are well known to the public. By imparting a swift rotation to the magnet of such a machine we obtain powerful currents of electricity. If these be conducted through water, the latter will be resolved into its two components, oxygen and hydrogen. By the combustion of hydrogen, water is again generated. If this combustion takes place, not in atmospheric air, of which oxygen only constitutes a fifth part, but in pure oxygen, and if a bit of chalk be placed in the flame, the chalk will be raised to its white heat, and give us the sun-like Drummond's light. At the same time the flame develops a considerable quantity of heat. Our American proposed to utilize in this way the gases obtained from electrolytic decomposition, and asserted that by the combustion a sufficient amount of heat was generated to keep a small steam engine in action, which again drove his magneto-electric machine, decomposed the water, and thus continually prepared its own fuel. This would certainly have been the most splendid of all discoveries; a perpetual motion which, besides the force that kept it going, generated light like the sun, and warmed all around it. The matter was by no means badly thought out. Each practical step in the affair was known to be possible; but those who at that time were acquainted with the physical investigations which bear upon this subject could have affirmed, on first hearing the report, that the matter was to be numbered among the numerous stories of the fable-rich America; and indeed a fable it remained." (Page 165.)

Possibly Mr. Isherwood would be benefited by reading the whole essay.

G. M. P.

The New Testament.

The first and authorized edition of the revised translation of the New Testament was published simultaneously in all English speaking countries May 20. There were sent to this country from the Oxford and Cambridge presses, 400,000 copies.

The Ammonia Jelly Motor.

To the Editor of the Scientific American:

I have invented a new engine to which I desire to call your attention and the attention of Professors Gamgee, Keely, and other gentlemen who can elevate themselves by lifting at the band of their breeches.

From a bottle filled with anhydrous ammonia, of the thickness of good jelly, by a pipe there is communication to a cylinder. I set the bottle in a basin of rain water. The latent heat of the water liberates the latent heat of the ammonia, which is thereby expanded into vapor, and passes into the cylinder, forcing the piston forward. Its further expansion to fill the space behind the piston—being work done—occasions a loss of heat, and with the loss of heat the vapor is condensed again to cream or jelly, and runs out by an exit port into another bottle. The second bottle stands also in a basin of rain water, and the latent heat of which again vaporizes the anhydrous cream—ammonia, I mean—and it is carried thence to the further side of the piston, which is then forced back to its original position, the expansion (after cut off) again condensing the vapor and preparing it to flow back to the first bottle. By connecting rods and crank the piston actuates a belt wheel, and that the machinery of the shop.

But I find that a curious result obtains. For if the ammonia expands and condenses, and after filling a large space immediately puts itself into a very small portion of the same space, thereby leaving a *vacuum* which is *filled* with something (possibly a "vibratory force," similar to Keely's new trick), I find that it will run back and forth between the two bottles, without the intervention of the cylinder and piston. Hence I discard the machinery, and set two bottles of "anhydrous ammonia," or any other "condensed liquefiable gas of adequate tension," directly under the flywheel, with a bit of bent tube running from one bottle to the other.

The only difficulty about the invention is that it don't work any more usefully than any other form of perpetual motion, and yet the principle, divested of technics, is just as sound as the principle of Gamgee's zeromotor, while at the same time my invention has a more appropriate name—the nomoter.

A. F. HARVEY.

Kirkwood, Mo., May, 1881.

"Zeromotor."

In our younger days we were told "that if the heavens should fall we could all catch larks," as true now no doubt as then, but before disposing of the larks it may be well to consider the likelihood of having such an opportunity to catch them. Concerning the "zeromotor," about which, of late, there are so many visionary speculations, it would seem that a moment's consideration of the facts pertaining to the vaporization and liquefaction of the condensible gases would satisfy any one that the scheme was altogether chimerical. In the vaporization of condensible gases heat is absorbed which *must* be discharged before liquefaction can be effected.

Inasmuch as the specific heat of a given weight of gas does not vary with any change of volume, it follows that liquefaction is *not* caused by *expansion*, and to abstract the latent heat of vaporization without compression some condensing medium must be provided, having a temperature *below* that of the expanded gas. The boiling point of ammonia at atmospheric pressure being 30° below zero of the Fahrenheit scale, it is not at once discoverable where a condensing medium of lower temperature is to come from. Without it liquefaction does not take place, the cycle is incomplete, and this beautiful theory vanishes in thin air. Once prove that complete liquefaction follows expansion, and we not only have perpetual motion but a perfect *ice machine*, which once set in motion would produce ice and give off power to the end of time, and would require an act of Parliament *limiting* the hours of continuous working, otherwise we might confidently anticipate the commencement of another Glacial Period.—*J. K. Kilbourn, in Engineering.*

Perpetualmotion.

DEAR SIR: I have Invented a Machine that has been worked upon for the last Centuries and is called *Perpetualmotion.*

I am a young man, with out Money or Friends to lend me Money. Now how can I get money for a Patent and other expenses. I cant give Security as I have nothing. I wish to ask Several questions concerning a Patent. In the first place what can I get a Patent on the word Perpetualmotion. Now for instance I will say Electrisity now we have Electrisity and there is no Patent on it and there can not be gotten any on it. Now if Perpetualmotion was made with Electrisity could I get a Patent on the word Perpetualmotion and Manufacture 7 or 8 differant kinds stiles of Machines in the line of Perpetualmotion with the one Patent. Or can I get a Patent on it that it is the only machine that is Perpetual and Manufacture the different kinds with the one Patent I wish to ask if you would Publish an Article in your Paper that it would strike some Capitalists Eye who would forward me the money and I would give him a share in the buisoness. I have no money to Pay for this Insertion but I hope to do something for your Paper by Advertising and obtaining other Patents of which I have about 60, of which I keep account in a Book. As I say I have no Money and you know as well as I do that with out Money I can do nothing. One more and the last question. does not the Goverment offer a Reward to the Inventor of this Machine. If you would Please answer these questions through letter or your Paper. And Oblige A Subscriber. Address H. C. B. Will be called for at Post Office St. Louis Mo. For any Information or Enquiries Address the Above.

Gymnastics as a Cure of Disease.

Physical vigor is the basis of all moral and bodily welfare, and a chief condition of permanent health. Like manly strength and female purity, gymnastics and temperance should go hand in hand. An effeminate man is half sick; without the stimulus of physical exercise, the complex organism of the human body is liable to disorders which abstinence and chastity can only partly counteract. By increasing the action of the circulatory system, athletic sports promote the elimination of effete matter and quicken all the vital processes till languor and dyspepsia disappear like rust from a busy plowshare. "When I reflect on the immunity of hard-working people from the effects of wrong and overfeeding," says Dr. Boerhaave, "I cannot help thinking that most of our fashionable diseases might be cured *mechanically instead of chemically*, by climbing a bitterwood tree or chopping it down, if you like, rather than swallowing a decoction of its disgusting leaves."

The medical philosopher, Asclepiades, Pliny tells us, had found that health could be preserved, and if lost, restored, by physical exercise alone, and not only discarded the use of internal remedies, but made public declaration that he would forfeit all claim to the title of a physician if he should ever fall sick or die but by violence or extreme old age. Asclepiades kept his word, for he lived upward of a century and died from the effects of an accident. He used to prescribe a course of gymnastics for every form of bodily ailment, and the same physic might be successfully applied to certain moral disorders, incontinence, for instance, and the incipient stages of the alcohol habit. It would be a remedy *ad principium*, curing the symptoms by removing the cause, for some of the besetting vices of youth can with certainty be ascribed to an excess of that potential energy which finds no outlet in the functions of our sedentary mode of life. In large cities parents owe their children a provision for a frequent opportunity of active exercise, as they owe them antiseptic diet in a malarious climate.—*Dr. Felix L. Oswald, in Popular Science Monthly.*

Separation of Nickel Oxide and Cobalt Oxide.

The author proposes to give a process for the separation of the two metals, derived from two known methods, and permitting the exact determination of the two oxides, and the preparation of the two metals in a state of purity. The two fundamental processes are that of Pisani, who uses caustic potassa in presence of an ammoniacal liquid, in which are dissolved the two metals, with exclusion of air. The nickel oxide is precipitated alone in bulk, but always carries down with it more or less of cobalt oxide. The second method is that of Terreil, who precipitates cobalt in an acid solution in the state of roseo-cobaltic hydrochlorate. The cobalt oxide is peroxidized by means of permanganate. We suppose that the two bodies, cobalt and nickel, have been obtained by known methods, either as pure oxides or pure sulphides, free from all foreign matter. The mixed oxides or sulphides are dissolved in an aqua regia containing a large proportion of hydrochloric acid. The solution is largely diluted with water and saturated with ammonia in excess. Permanganate is then added until the solution remains rose colored for some time. Pure potassa is then added, when the nickel is precipitated as hydroxide, carrying with it manganese oxide, derived from the permanganate. The precipitate is washed by decantation and filtered, redissolved in hydrochloric acid, and treated again with ammonia, permanganate, and caustic potassa. The washing waters which contain the cobalt are collected, saturated with acetic acid, and precipitated by sulphureted hydrogen. The mixture of nickel and manganese oxides is redissolved in hydrochloric acid, and the solution saturated with ammonia. The solution is exposed to the air for some time, and the manganese oxide is by degrees entirely precipitated. It is filtered off, the filtrate is saturated with acetic acid, and the nickel thrown down by means of sulphureted hydrogen. The process may be employed on the large scale for obtaining nickel completely free from cobalt.—*G. Delcaux.*

The American Medical Association.

The thirty-second annual session of the American Medical Association was held in Richmond, Va., the first week in May. More than five hundred delegates were present from all parts of the country. Dr. J. T. Hoguen, of St. Louis, presided, and many valuable papers were read. The officers chosen for the ensuing year were:

President: J. J. Woodward, of the United States Army. First Vice-President: P. O. Hooper, of Arkansas. Second Vice-President: Laertes Conner, of Michigan. Third Vice-President: Eugene Chisolm, of North Carolina. Fourth Vice-President: Hunter McGuire, of Richmond. Secretary: William B. Atkinson, of Pennsylvania. Treasurer: L. J. Dunglison, of Washington, D. C. Chairman of the Committee on Arrangements: A. J. Stone, of Minnesota. Vacancies in the Judicial Council were filled by the appointment of Dr. S. N. Benham, of Pennsylvania; Dr. J. M. Jones, of the District of Columbia; D. A. Linthicum, of Nebraska; William Brodie, of Michigan; H. D. Holton, of Vermont; A. B. Sloan, of Missouri; and R. B. Cole, of California. St. Paul, Minn., was selected as the next place of meeting.

Interesting Discoveries in Yucatan.

In Yucatan some discoveries have been made, of a very interesting character, mainly by Dr. Le Plongeon, the agent of the American Archæological Institute, who has excavated the ruins of Mayapan, once the capital of the Mayas, a powerful tribe among the aboriginal inhabitants. The later history of this important town is well known; for less than a century before the arrival of the Spanish invaders, the king of the tribe had been murdered by his nobles, his followers dispersed, and the royal city destroyed, so that the objects brought to light by Dr. Le Plongeon's exertions find their place immediately as historical documents. Among other things, portrait sculptures of the unfortunate king have been discovered, which are at once recognized as similar in face and figure to bass-reliefs at Chichen-Itza, the metropolis of Yucatan, where the lords paramount of the country held their court, and where the king of the Mayas is represented as doing a sort of homage to his suzerain. This coincidence seems to point to a period of special artistic development throughout that region, when pictorial or sculptured representations of the affairs of daily life had become somewhat habitual. Further proofs of enlightenment are found in astronomical instruments, such as stone dials of accurate workmanship, which were found still standing on a smooth platform of stone, covered only with a few inches of vegetable mould. Various observations were made in regard to the religious emblems discovered, but beyond a strong resemblance of some of them to those of Eastern Asia, no extraordinary developments are made. Dr. Le Plongeon's accounts show a remarkable and interesting continuity of language, family names, and even of habits, between the ancient inhabitants of Yucatan and their modern descendants. It has been well said that all archæological discovery originates in the endeavor to investigate traditions, which survive after stone and brick have crumbled to dust; and it is very probable that further acquaintance with the friendly and civilized natives may furnish clews to discoveries of great importance.—*American Architect.*

How the Weather Indications are Determined.

At the Signal Service Bureau in Washington the weather indications are recorded at 5 A.M., 11 A.M., 4 P.M., and 11 P.M. daily. A reporter undertakes to tell how the work is done, and this is what he sees:

Take a seat in the indication room with me, and we will see how the weather is gotten up. It is now 4 o'clock, Washington time, and telegrams are pouring in from all parts of the United States, Canada, British America, West Indies, Nova Scotia, and falling into the lap of the sergeant in charge. The territory covered is from Olympia, in Victoria, on the northwest coast of British America, across to Sydney, above Newfoundland, thence down to Havana, across to San Diego, California, and thence back again. There's a girdle for Puck. At a certain hour of the day—3 o'clock Washington time—observations are taken at all the stations, and then they begin to come in, chasing each other over the wires pell-mell, like a crowd of unruly school boys. These dispatches are called off to six gentlemen, each of whom sits before a map, one noting the thermometer, another the barometer, a third the condition of the weather, and so on. These are transferred to one large map, and then Old Probabilities makes his appearance. He glances over all; sees where a storm was at 1 A.M., and notes where it was at 3 o'clock. He takes into consideration the wind currents, the humidity, and all the minor details which his experience and learning have taught him. Not a word is spoken in the room. Old Probs is in a deep study. In a moment he will speak to fifty millions of people, and a few more over in Canada. His stenographer appears, and the indications are dictated for New England, then the Middle States, the South, West, Mississippi Valley, then, perhaps, a storm bulletin twenty-four hours in advance to warn some special section of the country.

Among the innovations made by General Hazen is the furnishing to sections of the country special reports of floods, the condition of rivers, and their probable rise or fall within the twenty-four hours following at given points. Then again reports are made for the Southern States on the weather during cotton picking time, signals being displayed from the telegraph stations denoting clear or bad weather coming. It is in contemplation to furnish the agricultural sections with indications for harvest time, so that the farmers will know when to cut their grain and when to take it in. The idea was to have small cannon at telegraph stations, and if a storm should be discovered in the night, which promised great damage, to awaken the farmers so they might save what they could. But it has been found that most country telegraph offices close at such an early hour that this cannot be carried out.

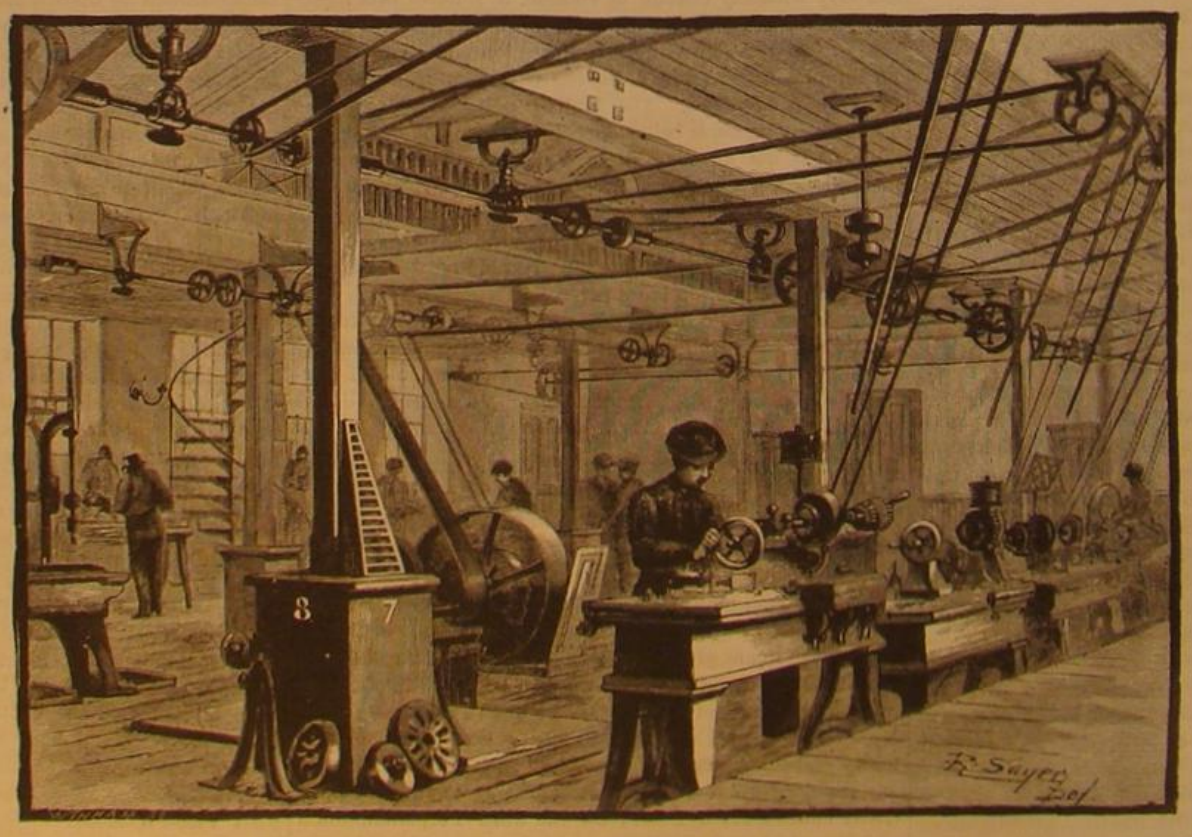
OPENING OF THE NEW WORKSHOP OF THE STEVENS INSTITUTE OF TECHNOLOGY.

This useful institution, as most of our readers know, is situated on the west bank of the Hudson River, in Hoboken, N. J., opposite Eighteenth street, New York, and one mile distant from our city limits. The unqualified success which for several years past has attended the efforts of the faculty in giving to the students, in connection with scientific study,

TOOL ROOM.—STEVENS INSTITUTE.

the opportunities for practical instruction in the mechanic arts, has rendered it desirable to enlarge and extend this branch of the establishment. The workshop has, therefore, been removed from the basement into the former lecture room of the institution, a building 50 by 80 feet, with high open roof and double galleries. This beautiful apartment has been generously fitted up by President Henry Morton, at his own cost, as a workshop for the students. He has filled it with the finest specimens of steam engines, lathes, planers, drills, milling machines, grinding wheels, and other mechanical appliances, all of which were formally presented by him to the trustees on the evening of May 14, and the occasion was one of much interest. The shop, brilliantly illuminated with the electric light and the machinery all in full operation, presented a very animated scene when the visitors entered.

The proceedings were opened by President Morton, who made a very admirable presentation address, in which he gave an outline of what the institution had done and aimed to do in the future for its pupils. Mr. Dod, of the trustees, accepted the gift of the President. Mr. Coleman Sellers, the eminent mechanician, followed with an excellent address, in which he paid a glowing tribute to the character of President Morton and spoke of the requisites for the education of the young mechanic. Mr. Horatio Allen and others also made addresses. The proceedings closed with a reception at the residence of the president. We give the addresses of the various speakers in our SUPPLEMENT. One of our engravings is an interior view of the new workshop. The other shows the tool room.



THE NEW WORKSHOP OF THE STEVENS INSTITUTE OF TECHNOLOGY.

The Pauperizing of English Labor.

The Macmillans have lately published a volume of thoughtful sermons by the Vicar of Granborough, England. In the introduction to the volume, the author insists upon the duty of the church to take a more active part in trying to ameliorate the condition of the English poor. He says: "I am the vicar of a rural parish in which more than 70 per cent of the population are potential paupers—that is to say, that out of some 70 families in the village, more than 50 are either actual or prospective recipients of the bounty of the poor law. I have not a single laboring man past work in my parish who is not either in the workhouse or in receipt of outdoor relief. When I lived among Sheffield workmen I used sometimes to come across people who asserted that they would rather starve than receive parish pay. I have never even heard of such a case in Buckinghamshire. I fear I have hardly a laborer in my parish who, if he were sick or out of work, would not welcome the visit of the relieving officer. Failing the 'wages of work,' the Bucks laborer learns to think of 'wages of the parish' as his of right. . . . We have fifty cottages, but have not one laborer's home with three bedrooms. We have seventeen with only one. Our death rate, which is generally so accurate an index of social condition, sounds satisfactory; it is only 18 per 1,000; but then one third of our deaths are infants under the age of 1. I need not, however, multiply deplorable statistics of that kind."

How Japanese Fans are Made.

A British consul in Japan gives the following particulars touching the manufacture of folding fans at Osaka:

As in many other branches of industry, the principle of division of labor is carried out in the fan-making trade. The bamboo ribs are made in Osaka and Kioto by private individuals in their own houses, and combinations of the various notches cut in the lower part are left to one of the finishing workmen, who forms the various patterns of the handle according to plans prepared by the designer. In like manner the designer gives out to the engravers the patterns which his experience teaches him will be most likely to be salable during the ensuing season; and when the different blocks have been cut, it still rests with him to say what colors are to be used for the two sides of each fan. In fact, this official holds, if not the best paid, at any rate the most important, position on the staff in ordinary. When the printed sheets which are to form the two sides of the fans have been handed over to the workman, together with the sets of bamboo slips which are to form the ribs, his first business is to fold the two sheets of which the fan is to be composed, so that they will retain the crease, and this is done by putting them between two pieces of paper, well saturated with oil, and properly creased. The four are then folded together and placed under a heavy weight.

When sufficient time has elapsed the sheets are taken out and the moulds used again, the released sheets being packed up for at least twenty-four hours in their folds. The next process is to take the ribs, which are temporarily arranged in order on a wire, and "set" them into their places on one of the sheets, after it has been spread out on a block and pasted. A dish of paste then gives the woodwork adhesive powers and that part of the process, is finished by affixing the remaining sheet of paper. The fan has to be folded up and opened three or four times before the folds take the proper shape; and by the time the fan is put up to dry it has received far more handling than any foreign paper could stand; indeed, foreign paper has been tried, and had to be given up as unsuitable for the work; but with great care the Osaka fanmakers have been able to make some fans with printed pictures which have been sent over from America, though they were invariably obliged to use one face of Japanese paper The qualities of native paper now used are not nearly so good as those of which the old fans were made, and, in consequence, the style of manufacture has had to be changed. Instead of first pasting the two faces of the fan together and then running in pointed ribs, the ribs are square, and are pasted in their places in the manner described above. The outside lacquered pieces and the fancy work are all done in Osaka and Kioto, and some of the designs in lacquer on bone are really artistic; but the demand for the highly ornamented description of fans is not sufficient to encourage the production of large quantities of first-class work. When the insides are dry, the riveting of the pieces together, including the outer covering, is rapidly done, and a dash of varnish quickly finishes the fan.

NEW BELT CLASP.

The simple and ingenious device herewith illustrated seems to exactly meet a great want among users of small machinery for a perfect coupling for round leather belts.

The fastenings now in use are the hook and the screws neither of which is satisfactory, since under a variety of conditions they both give out and have other objections which are too well known to need mention. The manner of applying the Whiting belt clasp is clearly shown in the engravings.

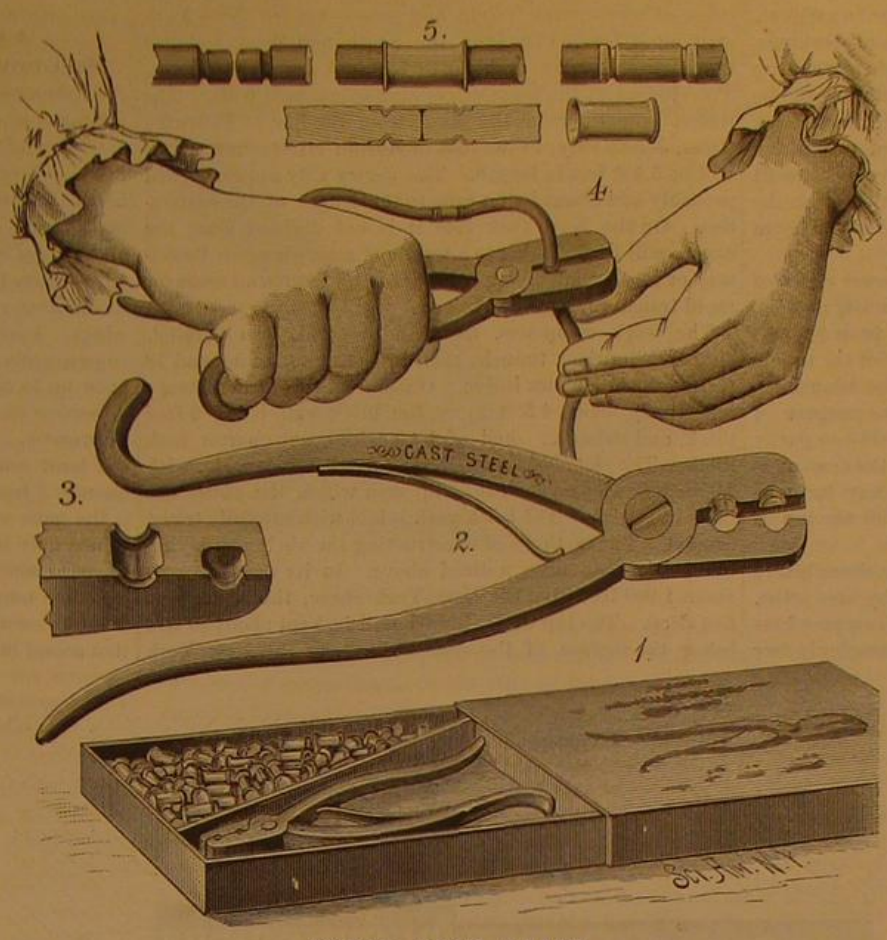
Fig. 1 shows the appliances necessary for coupling round belts; they consist of a quantity of thin brass ferrules and a steel pincer, (Fig. 2) of peculiar form for preparing the belt for the clasp, and afterward compressing it upon the belt.

In Fig. 5 the left hand view shows the belt compressed with a crease formed around it by the cavities in the ends of the pincer jaws (Fig. 3). The central view (Fig. 5) shows the ends of the belting inserted in the ferrule, and the right hand figure shows the ferrule after it has been creased by the transverse semicircular cavity in the pincer jaw. The ferrule, as will be noticed, is flanged on opposite ends to form a guide in applying the pincers.

When the metal of the ferrule is creased so that it sets down well into the crease in the leather of the belt it forms a fastening which is not only very secure, but it is perfectly smooth and does not wear the pulleys, and when belts are crossed they are not worn by the clasp. The joining is so perfect that pieces of belting of two inches in length may be used for a whole belt, and yet run as perfect as if there were but one joint. When the belt is broken or cracked the clasp can be applied without shortening the belt. When the belt is adjusted to proper length, and the clasp applied, no further attention is required, as it will last until the belt is worn out.

We are informed that the belt is now in use in hundreds of manufactories, giving the best of satisfaction.

Manufactured and for sale by the Whiting Stronghold Belt Clasp Company, 111 Liberty street, New York city.



NOVEL BELT CLASP.

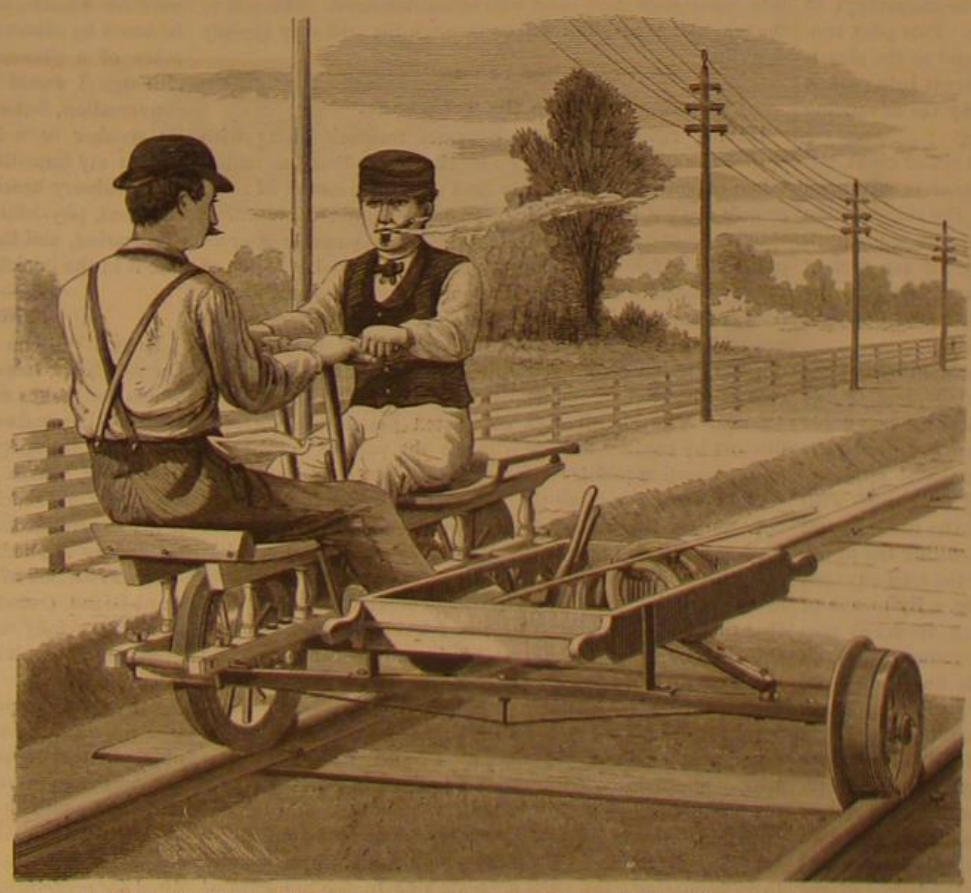
THE NEW NAVAL OBSERVATORY.—A tract of seventy-one acres of land on the outskirts of Georgetown, D. C., has lately been purchased for the site of the new Naval Observatory. It remains for Congress to pass the necessary appropriations for buildings and equipments.

TELEGRAPH HAND CAR.

In the SCIENTIFIC AMERICAN of April 16 we gave an illustration of a single velocipede hand car; we now give an engraving of a velocipede hand car adapted to two persons and provided with a receptacle for wire, tools, etc. It is very little heavier than the single machine, but with the power of two men applied the propulsion becomes easier for each man than it would be if their power were applied to two single machines. The speed may be greater than that of the single machines, and the carrying capacity is also increased. This machine is provided with two seats for the operators, who face each other and both work the same lever. The strength of this machine is adequate to the power applied and to the usage it is likely to receive, while at the same time it is so light as to be easily lifted from the track when occasion requires. And although it is made to accommodate two men, it may be easily operated by one person, or it can be readily run by two men, who may carry the third man in place of the tools, and if necessary a fourth man on the rear seat.

The value of this invention will be appreciated by those whose duty requires them to pass frequently over railway tracks, and who have heretofore used only the cumbersome and power-wasting hand car. It is invaluable to telegraph-line men, track repairers, bridge builders, and inspectors, and, in fact, to any class of men having to do with railways and telegraph lines. It is also well adapted to light section work, and has been adopted by several roads for this purpose, and so far with excellent success.

Further information may be obtained by addressing Messrs. George S. Sheffield & Co., Three Rivers, Mich.



SHEFFIELD'S TELEGRAPH AND LIGHT SECTION HAND CAR.

THE dome of the cathedral at Rome is illuminated inside and out by the Siemens electric light, and the effect is described as brilliant and charming.

Physiological Action of Salts of Gold and Other Metals.

A very remarkable series of observations has been made by Dr. James Blake, concerning the physiological action resulting from solutions of different salts when introduced into the blood of living animals. He finds that salts of the same isomorphous group produce an intensity of physiological action in proportion to their atomic weights. The salts of thorium, palladium, platinum, osmium, and gold showed great similarity in their physiological action, all of them having a decided and characteristic effect upon the heart. The action of gold compounds was surprising; in minute doses of 0·003 gramme per kilo, it kept up the action of the heart for several hours after death, though the temperature of the body had fallen 13° below the normal heat.

Tattoo Marks Made Useful.

"Why is it," asks Dr. Le Comte, who is physician to a regiment of dragoons, "Why is it that such quantities of soldiers die upon the battlefield?" And then he replies, confidently: "Simply because of the difficulty which arises in regard to arresting hemorrhages."

The compression of an artery being the best mode of stopping profuse bleeding, Dr. Le Comte proposes to teach each soldier first where these vessels are situated, so that he may assist himself while waiting for the surgeon. Therefore, he tattoos an image of some kind upon every portion of the soldier's body where there is an artery.

RECENT INVENTIONS.

An improvement in the manufacture of staples has been patented by Mr. Charles W. Dean, of South Wareham, Mass. This invention applies more especially to the manufacture of small staples or double-pointed tacks for fastening carpets, or for other purposes, but may be also applied to staples of any of the usual sizes for common uses. The staples are formed from bars of metal in lieu of wire. The staples being cut successively from bars of metal in a form approximating to their finished shape, with their legs diverging, and then bending these legs parallel, or nearly so, to complete the staple.

Mr. Archibald W. Reid, of Schenectady, N. Y., has patented an improved machine for fleshing and removing the hair from hides, in which machines the hides are placed upon a suitable support and the hair removed by tools carried by a revolving drum or wheels.

Mr. John Harger, of Toronto, Ontario, Canada, has patented a mode of preserving butter by incorporating with the milk or cream before churning, and with the butter after churning, boracic acid dissolved in hot glycerine, and sulphate of potassium dissolved in boiling water.

Mr. Gustav Rein, of Cincinnati, Ohio, has patented an improved annunciator for telegraph lines, which provides for raising the drop automatically by the devices used for connecting or breaking the lines, thus avoiding necessity of handling the drop and insuring its return to place. The further object is to prevent mistakes in connecting the lines.

An improved washing machine, patented by Mr. George Jackson, of Boscobel, Wis., consists of a semi-cylindrical tub having a semi-cylindrical cover and disks mounted upon gudgeons provided with inwardly projecting stops connected by rods and carrying oscillating paddles.

An improved trace clip and hook has been patented by Messrs. Joseph T. Haines and Horatio M. Stratton, of Swedesborough, N. J. This invention relates to that class of harness in which half chains are used for the traces, the object being the production of a cheap and durable loop or clip and hook which can be easily fastened without the employment of a spring or similar device, the loop or clip serving at the same time as a ring by which the trace is held up by the hip strap of the harness.

Ann E. Isham, of West Troy, N. Y., has patented an improved candy package which consists of a cone provided with an aperture in its bottom closed by a swinging or sliding gate, and with an opening in front having flaps and closed by gauze or netting, the whole designed to represent an army tent with flying colors.

An improved trace carrier, patented by Mr. Charles H. Fox, of Winnebago City, Minn., consists of a frame and a pivoted hook arranged and operating in connection therewith, by which provision is made for the attachment of the trace and for holding it securely in place.

In telephone-exchange systems, where it is necessary to have six or eight stations connected with one line wire, it is desirable that the telephone switches be placed correctly after using for speaking purposes, for if left in a wrong position there is much trouble and delay in finding and remedying the fault. To overcome this Mr. John D. Richardson, Jr., of Newport, R. I., has invented a telephone switch signal that reminds the person using the telephone, either by visible signals or by vibrations of the call bell, to place his switch in the right position, or that his switch is wrongly placed, thus preventing the switch from being left in a wrong position, and saving time and trouble in finding and locating the misplaced switch.

An extension magazine for coal stoves has been patented by Mr. Dewitt Van Evera, of Maquoketa, Iowa. The invention consists in constructing an extension magazine of a stationary or movable upper part having exterior ribs, and a movable lower part made in two or more sections, and having corresponding interior grooves, whereby the magazine can be lengthened and shortened.

Messrs. Peter D. Fischer and Charles Nonnenmacher, of New York city, have patented an improvement in extension folding lounges; and it consists in constructing them so that the links which connect the two parts will be inclosed with the frame out of sight when the lounge is closed; and the shell is so contrived that it is supported independently of the body when opened or extended.

PROGRESS OF THE HUDSON RIVER TUNNEL.

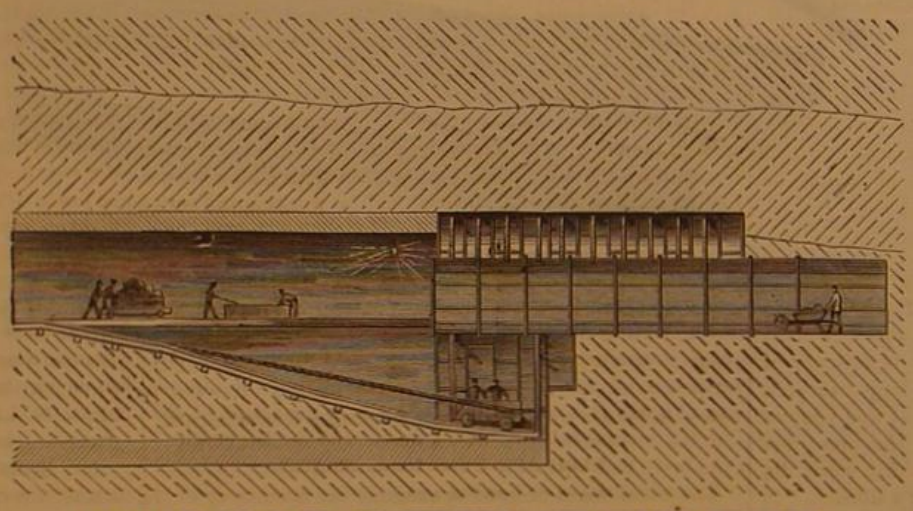
[*Continued from first page.*]

son near the foot of the ladder leading to the upper air lock. In the middle, between the tunnel openings, is shown the lower curved end of the chute for passing in bricks and other small materials, and which, in emergency, might serve as an additional way out for workmen. Fig. 4 represents the opposite side of the working chamber, with the telephone closet, compressed air pipes, electric lamp, windlass for operating the cable roads to the breast of the tunnel, etc. The tram cars laden with clay from the forward workings, are hauled to the shore end of the tunnel, where they are automatically dumped (as shown in Fig. 3) into the puddle underneath the floor of the working chamber. Here the clay is worked up with water to the consistency of cream and forced, by the air pressure in the tunnel (from 19 to 21 pounds according to the state of the tide) up through the blow-out pipe to the surface, where it is used for filling in low ground.

From the working chamber the visitor may enter either of the tunnels and follow the tramway to the breast, now between 450 and 500 feet distant, and advancing from 3½ to 4 feet a day. As he approaches the working end of the tunnel the roadway suddenly dips downward and the tunnel becomes a full cylinder. The guide explains the purpose of keeping the tunnel half full of clay to be two-fold—to partly relieve the strain upon the brickwork while the cement is hardening, and to furnish a broader passageway for men and materials. By this plan the full diameter of the tunnel is available for roadway.

The method of advancing the work can be described in few words when so much has been shown by the artist. The material to be removed is an extremely compact blue clay, which thus far has proved to be encouragingly free from softer streaks, seams, or other breaks, by which water can enter or compressed air escape in serious quantity. The advance is made cautiously, though, as already noted, with considerable rapidity.

First the quality and consistency of the material ahead are approximately determined by driving in slender rods of iron from the forward end of the pilot tunnel, which is 6½ feet in diameter. The breast of the pilot tunnel is kept from 15 to 20 feet in advance of the forward working of the tunnel proper. In this way any possible change in the character of the ground must be discovered before it can be a source of imminent peril to the main work. Besides, the pilot tunnel furnishes a substantial support for the braces which hold in place the advancing iron plates of the main tunnel until the successive rings are completed and the brickwork built up. The pilot tunnel is composed of ten segments or rings of stout iron plates, each 4 feet long, the whole securely bolted together and braced within by beams of wood (not shown in the engraving), to counteract the thrust of the exterior braces. This pilot tunnel is continually built up at the forward end as the clay is removed, the plates for the advancing segments being taken from the rear end, which has been passed by the advancing brickwork.



SECTION OF END OF TUNNEL AND PILOT TUNNEL.

The main excavation follows the pilot in six or eight terraces or steps, and the iron shell of the tunnel is advanced section by section as the clay is removed, the construction of the rings going on from the top around the sides until each ring is completed. When four rings (or ten feet of the shell) have been completed and securely joined, the circle is bricked up and finished with a coating of Portland cement.

The visitor cannot but be favorably impressed by the excellent character of the work now being done, and by the increased care taken to reduce to the smallest the inevitable hazards of a work of this nature. Two new features in the prosecution of the work will command especial approbation. These are the introduction of solid bulkheads with double air locks near the working ends of the tunnels, and the construction of an air-tight diaphragm filling the upper half of each tunnel, at a point still closer to the men engaged in excavating, plate laying, and brick laying. By means of these precautions the danger to the workmen from any possible inrush of water will be materially reduced. Work upon the bulkhead for the south tunnel is now going on, and at the time of our visit (May 17) the air locks were being put together for testing. The bulkhead will be placed at a point near where Fig. 2 begins; and the intention is to have one of the air locks always open as a refuge for the workmen. The diaphragm will be placed near the rear end of the pilot tunnel. Its office will be to prevent the outflow of air from the upper half of the tunnel between the diaphragm and the bulkhead, should a break occur at the breast of the working, thus insuring the safe retreat of the workmen to the air lock in case of such an accident. The doors of the air locks are made uncommonly large and strong, both for the safety of the workmen and their convenience in passing through materials. By the use of these bulkheads, as will be readily perceived, the workmen in the other tunnel and at the shore ends of both tunnels are relieved of risk in case an accident occurs at the working end of either tunnel. These bulkheads and diaphragms will be carried forward from time to time as the work proceeds.

The direction and immediate supervision of this important enterprise has lately been undertaken by the favorably known engineers, Wm. Sooy Smith & Son. An early beginning on the New York end of the tunnel is anticipated.

Full particulars as to the location, purpose, magnitude, and history of this great work will be found in the volumes of the SCIENTIFIC AMERICAN for 1880. For the convenience of reader, who have not the back numbers at hand, the following facts may be recapitulated:

The tunnel is intended for railway use, to obviate the expense of transferring freight and passengers for New York arriving at Jersey City from the South and West, and also to escape the delays incident to fog and ice on the river. The Hudson at the point of crossing is one mile wide. The tunnel proper (under the river) from the foot of Fifteenth street, Jersey City, to the foot of Morton street, New York, will be 5,550 feet in length. The Jersey City approach will probably add about half a mile to the length of the excavation. On the New York side it is not decided what the course will be—whether to a terminus somewhere on Broadway or into a contemplated system of underground roads for rapid transit throughout the city.

The work comprises, as already stated, two parallel, almost cylindrical, tunnels, each 16 feet in horizontal and 18 feet vertical diameter inside. Outside the measurements are respectively about 4 feet more, the brick wall being 2 feet thick, and the outer shell of boiler iron, one-quarter inch thick. The plates of the shell are 2 feet 6 inches wide, with 2½ inch flanges on each side, through which the plates are bolted together. The brickwork is laid with carefully tested cement. The methods of constructing the shell and laying the brick have been noticed above. In its deepest part, about 1,000 feet from the New York shore, the river is 60 feet deep. The top of the tunnel will be kept about 30 feet below the surface of the river bed. Near the New York side some rock and sand will be encountered. The rest of the way the excavation will be through the stiff clay already described.

Noises in the Telephone.

Having remarked that telephones transmit along with speech sounds of an unknown origin, the author has undertaken experiments in order to find out if the causes of these sounds are not those which oppose telephonic communication at great distances. To eliminate all possible sources of error, the following arrangement was adopted. A line of twenty meters was laid on the floor of several rooms, all the doors of communication being closed. It was connected at one end to a pair of telephones by means of flexible conductors, designed to arrest sounds which might communicate themselves mechanically along the metal to the telephones. The circuit was completed between these conductors by another flexible wire, on the path of which was an interruption pedal, rendering it possible to cut the circuit without changing at all the nature of the communications between the line and the telephones, and to prove that the sounds heard had an electric origin. The operator acted at the other end of the line which was not connected, directly or by induction, with any electric generator. He observed that the current produced by the friction of two wires of the same kind or of different kinds and that produced by closing a pressure screw were heard in the telephones. It is easily understood that when suspended, telegraph wires serve for telephonic transmission; this cause may occasion much trouble, since these lines are formed of pieces of iron wire connected to each other and to the stretchers by ligatures, more or less perfect, which are in a state of constant agitation. But this cause of failure may be removed by soldering the wires instead of tying them. Unfortunately there is another cause: the currents due to the influence of the vibrations themselves. To verify this hypothesis, the author placed in the circuit, at the end opposite the telephones, a rod of iron 1·50 meters in length, and connected to the system by supple conductors. This rod was struck sometimes transversely and sometimes longitudinally with a hammer. The sounds occasioned by the blows were distinctly reproduced by the telephones with their peculiar characters. This experiment if repeated with copper or brass rods, gave merely negative results. It seems that the phenomenon is only produced as an effect of the vibrations occasioned in the wire. Future experiments must decide whether it is due to a molecular change which the metal undergoes or to a peculiar action. If, as it is probable, the vibrations caused by the wind act upon the lines of iron wires like the blows upon a rod, it appears difficult to correspond at great distances with the existing means of transmission, till a method has been found of causing the telephones to speak by the aid of electric action so powerful that the currents arising in the line itself cease to be an appreciable cause of disturbance.—*M. A. Gaiffe.*

A Curious Case of Partial Deafness.

Mr. Edwin Cowles, of the Cleveland (Ohio) *Leader*, gives the following account of an infirmity which curiously limits the range of his sense of hearing:

"My deafness is somewhat of the nature of color blindness. There are certain sounds I never hear. I have never heard the sound of the bird since I came into this world, and until I grew up to manhood I had always supposed the music of the bird was poetical fiction. You may fill this room with canary birds, and they may all sing at once, and I never would hear a note, but I would hear the fluttering of their wings. I never hear the hissing sound in the human voice, consequently, not knowing of the existence of that sound, I grew up to manhood without ever making it in my speech. A portion of the consonants I never hear, yet I can hear all the vowels. I never could distinguish the difference between the hard sound of the letter 's' and the soft sound, consequently I frequently mix these sounds in a sad manner. It is the same with the soft and hard sound of the letter 'g.' It was only by accident, after my marriage, that I discovered the existence of the hissing sound in the human voice. I was then taught arbitrarily how to make it, but I never hear it in my own voice, consequently I frequently miss making that sound in my speech without knowing it. Owing to its having become second nature to me to omit the sound of the letter 's,' when I do make it I labor in doing so, which in a great measure gives my pronunciation the peculiarity it has. There are words which I pronounce literally according to the spelling, which gives an additional peculiarity to my speech. For instance, I used to pronounce the word 'parochial' just as it was spelled until I was corrected, when I now pronounce it 'parokial.' I cannot hear the difference between the sounds 'ch' and 'k' when embodied in a word. All these examples will give an idea how it is that my peculiar deafness affects my speech. Before I was taught to make the hissing sound my pronunciation sounded the same to everybody as theirs did to me. About a quarter of the sounds in the human voice I never hear, and I have to watch the motion of the lips and be governed by the sense of the remarks in order to understand what is said to me. I have walked by the side of a policeman, going home at night, and seen him blow his whistle, and I never could hear it, although it could be heard by others half a mile away. I never hear the upper notes of a piano, violin, and other musical instruments, although I would hear all the lower notes. I can hear low conversation, but cannot as a general rule understand a public speaker in a hall. Now you will understand how it is that my impediment of speech is owing entirely to my extraordinary hearing. I have consulted the most eminent surgeons, physicians, and aurists in the country in regard to my hearing, and they all tell me there is not another case like it in the books."

ENGINEERING INVENTIONS.

Messrs. William H. Bomgardner and Henry Kerns, of Omaha, Neb., have patented a system of car braking by which the brakes are set instantaneously by diminishing the speed of the engine, and by which they can be released by increasing the speed of the engine, the object being further to set the brakes automatically whenever the moving or standing train receives a shock from either end, the system being so arranged as not to interfere with hand braking as commonly applied.

Mr. Frederick W. Hales, of Charlotte Town, Prince Edward Island, Canada, has patented a ditching machine designed especially for opening ditches through wet or swampy grounds, and which may also be used with advantage for other ditching.

An improved speed recorder and indicator has been patented by Mr. Marmont B. Edson, of Brooklyn, N. Y. The object of this invention is to obtain a constant indication and permanent record of the speed of machinery. For this purpose I combine with indicating and recording mechanism of usual character devices fitted for rotary motion by connections to the machinery, and provided with weights fitted for centrifugal motion, that are in connection with the actuating rod of the indicating mechanism, whereby the indicating hand and recording pencil are moved in unison with the centrifugal motion of the weights.

An improvement in time signals for railroads has been patented by Mr. Alma P. Burroughs, of Seneca Falls, N. Y. This invention is an improvement upon the time signal for which Letters Patent No. 230,738 were granted to the same inventor on the 3d day of August, 1880, and it consists in the application of compressed air, and in the mechanism therefor, whereby the clock hands are ungeared by passing trains.

RECENT DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

PECK, ADMINISTRATOR, *vs.* COLLINS.—PATENT DRIVE WELL. —REISSUE.

Mr. Justice Bradley delivered the opinion of the court.

1. Upon a surrender of a patent for reissue, an interference declared thereon, a decision against the patentee, and subsequent refusal of a reissue, the patent becomes destitute of validity and absolutely void.

2. Under the law as it stood in 1866 a patent surrendered for reissue was canceled in law as well when the application was rejected as when it was granted. The patentee was in the same circumstances as he would have been if his original application for a patent had been rejected.

3. Under the law as it then stood surrender of a patent was an abandonment of it, and an applicant for reissue took upon himself the risk of getting a reissue or of losing all. The question of his right to any patent at all was opened anew the same as upon an original application for a patent.

4. Whatever may have been the effect of the new clause introduced in the law by the act of July 8, 1870, that "the surrender shall take effect upon the issue of the amended patent" in cases where a reissue is refused for other reasons, it would still seem that if the patentee's title to the invention is disputed and adjudged against him, the effect of such a decision should be as fatal to his original patent as to his right to a reissue.

In error to the Court of Appeals of the State of New York.

United States Circuit Court.—District of Maryland.

BOOTH *et al. vs.* SEEVERS *et al.*

Bond and Morris, Judges:

The recovery of profits and damages from the manufacturers of an infringing machine debars the patentee from recovering from a user for the use of the same machine.

STATEMENT OF THE CASE.

[This suit was brought under reissue patent No. 1,826, granted to complainant on November 29, 1864, for improvement in grain separators, for the use of a machine, which was one of a number, for the manufacture of which the complainant had recovered from the makers.]

The Railway Tell-tale.

An ingenious machine, called the "tell-tale," has been introduced recently on the Erie Railroad. It registers the speed of trains, when and where they stop, and how long. It is used especially for freight trains, and is fastened at either end of small cabooses or at the side of large cabooses, about four and a half feet from the floor. It was adopted because freight trains frequently exceeded the prescribed rate of speed. They would run very fast for some distances, and then take things comfortably for a time.

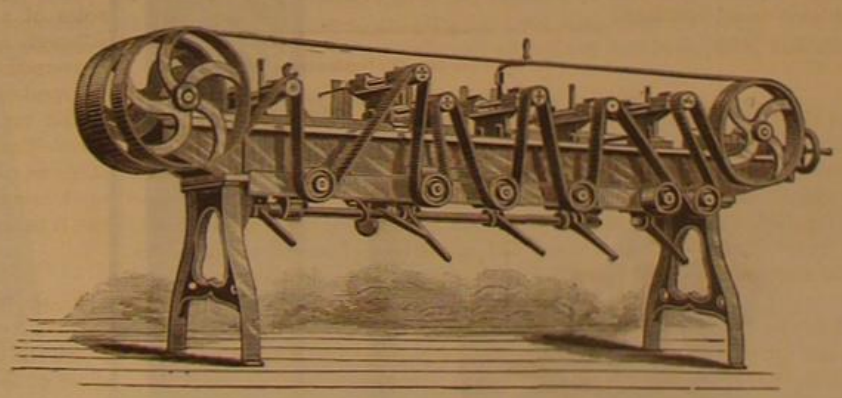
NEW GANG BORING MACHINE.

The gang boring machine shown in the annexed engraving is made by William White & Co., Moline, Ill. It will bore six or less holes in wood in any position on an area six feet long by four inches wide.

The piece to be bored is laid on a table or rest attached to the side of the machine opposite that shown in the engraving, and is moved up to the gang of bits by a suitable lever. This table is abundantly provided with gauges and clamps for handling the work.

The pulley on the right hand of the machine is carried in sliding boxes moved by the hand wheel and screw to take up and let out the belt as the location of the boring spindle is changed.

The boring spindles can be adjusted independently of each other by a screw, and can be moved along the bed to within three inches of each other. They are carried on V-ways, and are consequently parallel.



GANG BORING MACHINE.

All practical woodworkers know it frequently takes longer to "lay out" a stick in which a number of holes are to be bored than to do the boring. As the "laying out" is unnecessary with this machine it is easy to see why one man can do more than six men with a single bit machine, where there is six holes to be bored in each stick.

This machine can be furnished to order to bore over a greater area and a larger number of holes. The spindles are of steel, and the various parts are arranged for the greatest convenience and durability. Many of our extensive manufacturers are using these machines with great satisfaction.

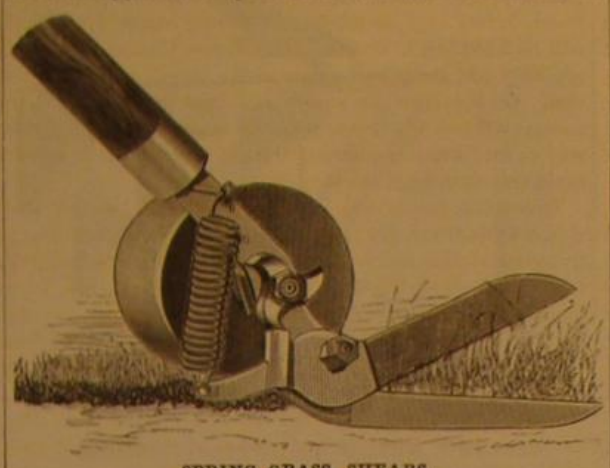
Incandescent Electric Lamps on Shipboard.

What has been wrongly described as the first attempt to light the saloons of an ocean steamer by incandescent electricity has been carried out with alleged success on the Inman steamer City of Richmond, which arrived in this port May 9. Our readers will recall the successful use of the Edison lamps on the steamship Columbia, on her trip from this port around Cape Horn to Oregon, a year ago. This later attempt, however, appears to be the first use of incandescent electricity in lighting an Atlantic steamer.

The system adopted on the City of Richmond is similar to Mr. Edison's, and was set up experimentally at the risk and cost of the inventor, Mr. Swan, an English electrician, whose lamps have been fully described in this paper. The main saloon of the City of Richmond was lighted by six lamps, and eleven others were placed in other parts of the ship. The light furnished was described as mellow and pleasant. The power for the generator was supplied by the ship's engines, and no estimate was made of the amount of energy consumed.

NEW SPRING GRASS SHEARS.

The trimming of the edges of lawns or grass borders is not always effected in the best manner, even with a pair of long-handled grass shears on wheels. Automatic action in such a tool is, therefore, an evident gain, and the patent recently obtained by Mr. Adie, of Pall Mall, will, we believe, be appreciated by all those who have ever attempted



SPRING GRASS SHEARS.

the work to which we have alluded. On reference to the accompanying engraving it will be seen that the tool consists of a pair of grass shears, on the tang of the lower blade of which is fitted a cam arrangement with three arms or teeth, and working on an axle communicating with a small roller on the opposite side. The upper blade is so formed that a shoulder is thrown forward to intercept the teeth of the cam, and a projecting arm is attached to one end of a spiral spring, the other of which is fixed to the tang of the lower blade above the cam. The tool is fitted with a long handle, having a cross piece at the top, and in working the action may be thus explained: The roller being set in motion communicates its revolutions to the cam arm, which, in turning, comes in contact with the shoulder before mentioned, and raises the blade with a downward pressure. As the shoulder escapes from the cam arm the spring quickly closes the shears. It will thus be seen that while the power of the roller is slowly stored in the spring the latter gives out its power suddenly when the shoulder escapes from the cam.

Trial of a Petroleum Engine.

The naval board ordered to examine the machinery of the Brayton Petroleum Engine Company, have reported to Chief Engineer Shock, giving in detail the results of their experiment with the Mystery, on the Potomac. They say: "As to the adaptability of this type of machinery to steam launching and its fitness for naval purposes, we would state that the principal advantage to be derived from the use of motive power of this description is the celerity with which machinery can be put in operation, only a few seconds being required for that purpose. The use of this motor is unattended with danger, and it is well adapted for special naval purposes, such as launches used at navy yards, for attachment to cranes and stationary engines; but on account of the danger from fire in carrying large quantities of crude petroleum on board our cruising vessels, and as our vessels often visit ports where petroleum cannot be obtained, which would render this type of machinery powerless, we can only recommend its use as above mentioned. The liability to derangement is about the same as in the ordinary steam engine." The report is signed by Chief Engineers Philip Inch and William S. Smith and Passed Assistant Engineer John Lowe. The board also report that they consider the Brayton motor as economical as steam under certain conditions.

Length of Jupiter's Day.

The Emperor of Brazil has transmitted to the French Academy a note of M. Crul's upon the time of Jupiter's rotation. The sharpness of outline and the bright color of the brown spot which has been so long visible enabled him to deduce from nearly 1,100 rotations a period of 9h. 55m. 36s.—*Comptes Rendus.*

NEW INVENTIONS.

Mr. Edward K. Morse, of Fall River, Mass., has patented a sharp-calked supplementary shoe to fit the lower side of an ordinary shoe between its toe and heel calks, the supplementary shoe being provided with lips at its toe and heel to overlap the upper side of the inner edge of the ordinary shoe, and having a locking plate connected with its rear end by cam-headed pivots, so that the supplementary shoe can be attached to and detached from an ordinary shoe while upon a horse's foot by swinging the locking plate in and out upon its pivots.

An improved device for tightening belts without removing or shortening them, has been patented by Mr. Horace D. Hicks, of Whitefield, N. H. The invention consists of a fixed eccentric on a lever controlled shaft, and of a lever-controlled eccentric sleeve fitted loosely on the same shaft, each eccentric forming the central bearing of a pulley, which pulleys are clutched together so that they may be revolved together, though they may be independently moved eccentrically for tightening their respective belts.

Mr. William Coupe, of South Attleborough, Mass., has patented an improvement in leather-stretching machines. This invention is an improvement upon the machine for which Letters Patent No. 178,361 were granted to the same inventor June 6, 1876. The invention consists of improved devices for adjusting and holding the leather in the machine, so that the work may be performed more quickly and the leather be stretched more evenly.

Mr. David Flanders, of Sing Sing, N. Y., has patented a process of changing the bearing years of fruit trees. It is well known that fruit trees, especially apple and pear trees, bear heavy crops of fruit on alternate years, and but very light crops on the intermediate years, so that in the bearing years apples are a drug on the market, and in many localities will not pay for the cost of gathering them; consequently the apple grower realizes little or no money from a most abundant crop, while in the intermediate years the trees that have nearly exhausted their vitality the year before by such abundant fruiting produce but little or no fruit, so that, though the prices rule high, the apple grower can obtain but small returns from his crop, because of its poverty. Could the so-called "bearing years" be changed—could the trees be made fruitful by any means or process in the intermediate or barren years—those applying the process to their trees would have the heaviest fruit crop when the prices were highest. The object of this invention is to accomplish this result; and it consists in applying to the blossoms of the trees in the spring of the bearing year, by sprinkling or otherwise, acid or alkaline solutions of sufficient strength to check the development and destroy the vitality of the blossoms, and to cause them to gradually fall off, the solution being sufficiently diluted so as not to injure the tree.

Mr. Ernest W. Noyes, of Bay City, Mich., has patented a head for clipping machines, so constructed that it can be applied to any part of the animal, and will avoid the necessity of an attendant to hold up the feet or legs of the animal being operated upon.

An improved lamp extinguisher, patented by Mr. George A. Greene, of Cool Spring, N. C., consists of telescoping tubes attached to a bellows, and provided with a loose curved tube and a tip capable of being inserted in the lamp burner.

An improvement in call-bells or alarms placed upon a single electric circuit, and so operated that any particular office or person upon such circuit may be called without disturbing or calling any of the other offices or persons upon the same circuit, has been patented by Messrs. George A. Cardwell and Nelson L. North, of Brooklyn, N. Y.

Mr. James M. Dennis, of Cambridge City, Ind., has patented a process for preparing the fibers of wood for the manufacture of brushes, which consists in first soaking the wood in heated alkaline water, then separating the fibers by pressing and pounding, or otherwise, then cleaning the fibers, then boiling them in agglutinated water, and finally oiling the fibers.

A simple and convenient device for containing shot and powder, and for weighing and delivering them without handling them, has been patented by Mr. Christopher I. Miller, of Richmond, Ky. The invention consists of a series of boxes, or a box subdivided into several compartments, whose bottoms incline to a common center. In the bottom of each box is an opening controlled by a slide, and beneath the boxes are inclined troughs or conductors, at the lowest point of which is fixed a receiver dependent from a spring balance, the bottom opening of the receiver being controlled by a slide, the intention being to devote some of the boxes to powder and the others to shot of different grades, so that by opening the slide on a box the contents of that particular box, or as much of the contents as may be desired, will run out into the conductor and thence into the receiver, to be weighed, whence they may be delivered into any suitable bag, box, or other receptacle by opening the slide of the receiver.

An improvement in carriage tops has been patented by Mr. Henry J. Miller, of Goshen, N. Y. The improvements relate to standing tops for carriages, the object being to produce more handsome, durable, and convenient tops than can be obtained by the usual methods of construction.

A Strange Accident.

A very peculiar accident occurred on the Philadelphia and Reading Railroad, near Tumbling Run crossing, on Monday afternoon. No. 62, one of the large engines lately turned out from the Baldwin Locomotive Works, was running down the road at a good rate of speed, w_en a number of persons who were watching her heard a loud report and saw the tank and caboose almost disappear in a cloud of smoke. Almost simultaneously with the report two figures which occupied the tank were seen to jump and turn half a dozen somersaults before they became motionless alongside the roadbed.

The engine continued on her way, the engineer being apparently unaware that anything of an extraordinary character had happened. Noticing, however, that his engine was the center of attraction to a large number of people who had been halted by the report of the explosion, the engineer, Andrew Quinn, left his cab and made an examination of the fire-box. The door was open and the tank contained a deposit of burning coal, but everything else was seemingly in proper order. The engine continued on her way and nothing of an unusual character has since been heard regarding her. The men who jumped from the tank were train men on their way down the line. Both of them were scorched by the explosion and bruised in their attempt to reach terra firma, but neither was seriously injured. Just previous to the explosion the fireman had put on a lot of fresh coal. It contained, it is supposed, a large quantity of gaseous matter, and this caused the explosion. The engineer was prevented from hearing the latter by the noise generally accompanying a moving engine, and as he was traveling at good rate of speed, and stood in the cab (on top of the boiler), while the force of the explosion was spent in the direction of the tank.—*Pottsville (Pa.) Miners' Journal.*

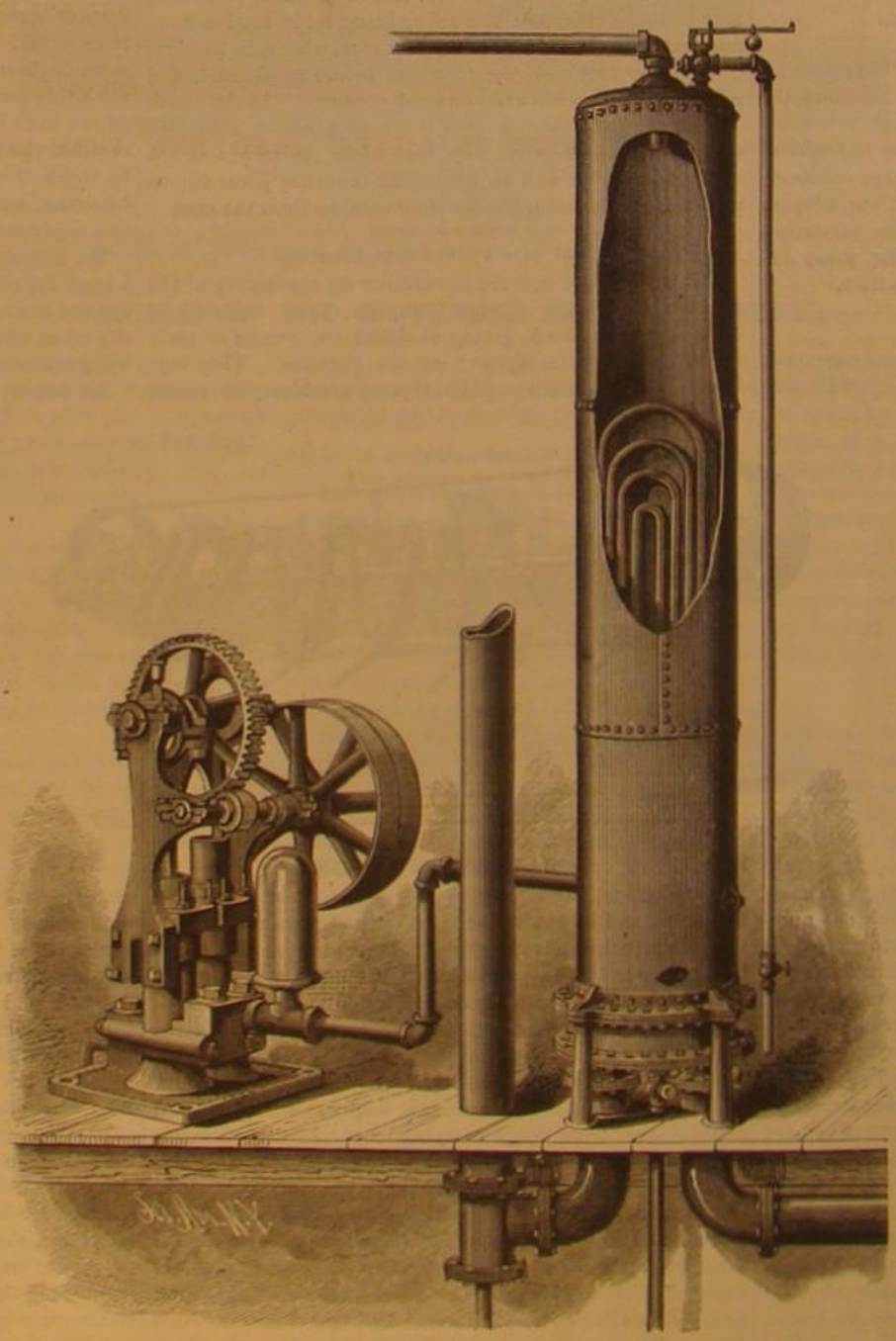
FEED WATER HEATER AND FEED PUMP.

The engraving shows the latest form of the now well known Berryman feed-water heater and purifier and feed pump. These appliances are in use in the principal manufactories in the country, and have established their claim to superiority by long continued and successful use. It is a well established fact that the most economical way of feeding a boiler is by means of a good pump in connection with an efficient and economical heater. Our engraving represents the Berryman, showing the point in the center of the heater, near the top, from which the feed water is forced into boilers; the water, being under a pressure constantly maintained by the feed pump, is in a quiescent condition, and on reference to the engraving, it will be seen that the supply pipe extends far enough into the heater to draw the feed water from the quiet or dead water space, below all surface impurities, and where it is practically pure. This point has been brought out by a long experience in the manufacture of this heater.

The engraving shows a surface blow-off pipe, the use of which requires no loss of time; it will expel all sedimentary or surface deposits. The ∩-shaped tubes are not injured by any strain by contraction and expansion; hence the heater never leaks. The tubes are of brass, seamless drawn, and tested beyond any strain they can possibly be subjected to in actual use.

The double pump shown in connection with the heater is well made in all its parts, and is self-contained and complete. The four valves, the only parts that can get out of order, are so constructed that they can be got at by simply unscrewing a brass cap. The gears are made from cut iron patterns, rendering them noiseless in action, and the pump, being double-acting, is easy on the driving belt, and its action very smooth.

Mr. I. B. Davis, of Hartford, Conn., is sole manufacturer of these appliances, and has made a specialty of this heater and feed pump for over ten years.



THE BERRYMAN FEED WATER HEATER AND PURIFIER AND FEED PUMP.

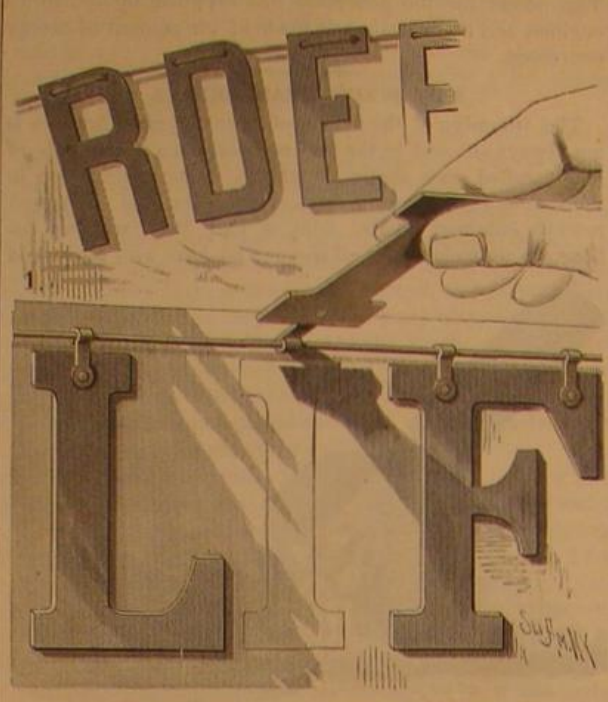
Remedy for Acid Burns.

Since vitriol throwing has become a common offense, it may be well to point out that in a case which occurred during a chemical lecture, described in the *Bulletin de Thérapeutique*, in which two students were seriously injured in the face by the explosion of a flask containing boiling sulphuric acid, the intense suffering at first experienced ceased entirely about a quarter of an hour after the application of a soft paste of calcined magnesia and water in a layer about two millimeters in thickness. M. Alande states that the magnesia requires to be renewed in twenty-four hours, but that patients, after recovery, retain no marks of the accident.

SMILAX and Japanese ferns are now made to twine around the same cord while growing, and thus become doubly valuable for decorative purposes.

NEW METHOD OF SPACING AND LETTERING SIGNS.

The engraving represents a new method of spacing and outlining the lettering for signs lately patented by Mr. John



CALLOW'S METHOD OF LETTERING SIGNS.

C. Callow, of 56 Beech St., Cleveland, O. With this device the spacing of letters in sign work can be easily and rapidly executed by unskilled persons with all the facility of practical sign painters, and letters and other forms can be readily traced around the edges preparatory to filling in with paint, and accuracy in spacing is secured.

This improved method consists in stretching a cord or wire at the proper point, and attaching thereto the appropriate pattern letters either by means of hooks or by passing the wire or cord through eyelet holes formed in the letters. In laying out a sign where several letters of the same kind occur more than once, it is only necessary to substitute any other letter of the same width temporarily, replacing it afterward with the outline of the proper letter.

The alphabets are cut from tough, heavy boxboard, and the letters are of modern shape and style, such as are used by the best sign painters. The letters themselves when painted, grained, gilded, flocked, or otherwise ornamented, and tacked upon a suitable backing, form a handsome and durable sign. The lettering outfit furnished by Mr. Callow enables any one, without previous practice, to proceed and produce a good sign.

The Manufacture of Plate Glass.

To cast, roll, polish, and burnish plate glass requires machinery of peculiar construction, and a "plant" that is costly by reason of its complex nature. The pouring of liquid glass from the furnace upon the cast iron plates, and the subsequent rolling, are processes comparatively simple. Any housekeeper who has used a rolling-pin on a batch of pie-crust dough, performs an operation very similar to this stage of plate-glass-making. It is the succeeding processes of grinding and polishing and final burnishing that require time and costly mechanism. After leaving the rolls and bed plate the glass is rippled and rough, and only fit for gratings or skylights. Each plate must be transferred to machines that resemble the turn-tables of a railway. On the revolving platform the glass is cemented into a bed of plaster of Paris, and the machine started. Bearing heavily on the surface of the glass are blocks of metal, and while in motion the surfaces are kept supplied with sharp sand and a constant stream of water. The next stage of the glass-grinding process is the same as to machinery, but instead of sand coarse emery is used. Then finer emery is used in another revolving table, and so on for half a dozen times. The final polishing is done by heavy reciprocating devices, fed with rouge, and maintaining a constant back and forward motion, and also a lateral movement over the surface of the crystal. All this requires the assistance of a large force of men, many of them skilled laborers. After going through these different grindings and polishings the plate that measured an inch in thickness is only three-quarters of an inch thick, has lost all its roughness, and is ready for the show-window of the purchaser.—*Pittsburg Telegraph.*

MECHANICAL INVENTIONS.

Mr. John H. Eddy, of Sidney, Ohio, has patented a cutter head so constructed that the knives can be adjusted to cut any desired bevel without pitching or tilting the spindle.

Mr. Albert A. Bennett, of Harveysburg, O., has patented a hand circular saw for cutting thin lumber, and it consists in a plate having near its middle and its lower edge a small circular saw loosely revolving in a bearing, and having in front and rear, and slightly projecting below the lower edge of the blade, a gear wheel which, as the plate is steadily pushed over the surface of the board, bites the latter, and through a train of gear wheels imparts a rotary motion to the saw, which, as the plate advances, cuts a kerf through the board with a circular sweep.

An improvement in pipe tongs has been patented by Mr. Deloss Worden, of Oil City, Pa. The invention consists in forming one of the tongs with a bit chamber or seat adapted to receive and hold a square, parallelopiped, or any many-sided removable bite-block in such manner as to present one edge of the bite block in position to take hold of the pipe, the block being retained in place in the chamber by a recessed button.

An improved button-polishing machine has been patented by Mr Homer W. Terry, of Springfield, Mass. This is a machine for applying buttons of horn or other material to the buff or polishing wheels in a more expeditious manner than by hand, as in now usually practiced. The invention consists in a movable and flexible or jointed band or apron distended between pulleys or drums, and provided with gripes arranged in a plane parallel with the plane of the belt, and arranged to seize the button by a movement in the plane, and hold them while passing under the buffs.

An improvement in breasts for cotton gins has been patented by Mr. Charles C. Tate, of Brown's Station, Ala. The invention consists in combining, with the breast heads, horizontal rolls arranged on arms thereof.

An improvement in middlings purifiers has been patented by Mr. John A. Kister, of Mill Brook, Ohio. This invention relates to the arrangement of parts whereby the bran and coarser particles are separated from the middlings. The nature of the invention is such that it cannot be described without engravings.

Mr. Benjamin F. McCarty, of Rolling Prairie, Ind., has patented an implement for cutting the wire bands of bundles or sheaves of grain before feeding them to a thrashing machine. The invention consists of a hollow handle or casing having its upper end reduced in size, the casing being adapted to slide a suitable distance on a central spindle which carries a spring and the cutting blades, the blades being so constructed and pivoted that their ends or shanks will be brought together by the downward thrust of the handle.

JOHN FITCH'S STEAMBOAT EXPERIMENT ON COLLECT POND.*

The population of New York city had nearly doubled in the ten years since 1786. Streets had been laid out, and habitations erected above the swampy fields in the region of Canal street. But although surveys had been made of the several streets about the Collect, or Fresh Water Pond, they were not graded, nor had building lots been found (for obvious reasons) marketable in that locality. The water of the pond was sixty feet deep, and the marshy ground to the northwest, as well as toward the East River, gave little signs of promise as to future value.

This beautiful pond, occupying the site of the present great gloomy pile of prison buildings known as the Tombs, was the scene, in the summer of 1796, of the trial of a boat propelled by steam. It was the invention of John Fitch. The boat was 18 feet in length and 6 feet beam, with square stern, round bows, and seats. The boiler was a ten or twelve gallon iron pot.

The little craft passed round the pond several times, and was believed capable of making six miles an hour.

The spectacle was watched with critical interest by Chancellor Livingston, Nicholas Roosevelt, John Stevens, and others, who had in common with philosophers and inventors in England and Europe been for some time engaged in the speculative study of the steam engine and its prospective uses.† Fitch belonged to the prominent Connecticut family of that name, was born in the famous old town of Windsor, adjoining Hartford, and had been inventing and experimenting for a dozen or more years, hoping to succeed in the application of steam power to navigation. His genius, idiosyncrasies, and impecuniosity were in perpetual conflict; otherwise he might have achieved the triumph to which he aspired. He was a man of striking figure, six feet two inches in height, erect and full, his head slightly bald but not gray, although fifty-three years of age, and dignified and distant in his general behavior.

JOHN FITCH'S STEAMBOAT EXPERIMENT ON COLLECT POND NEW YORK CITY 1796.

LEECH FARMING.

BY A. W. ROBERTS.

All leeches are not aquatic. In Ceylon there exists a small variety of leech that attaches itself to the brush and stones which it resembles in color. Here they hang on, in wait for any passing traveler, constantly reaching forth with their distended bodies in all directions, so great is their anxiety to attach themselves to any living animal. Hoffmeister, when collecting on the Island of Ceylon, discovered that his legs were covered with streaks of blood which flowed from hundreds of minute wounds produced by the bites of a terrestrial leech, *Hirudo ceylonica*. This same leech is found on the Himalaya Mountains, eleven thousand feet above the level of the sea. Several varieties of land leeches also exist in Japan, Chili, and Brazil.

Leeches drink the blood of their victims, and when gorged to the very lips fall off, and do not partake of food again for many weeks.

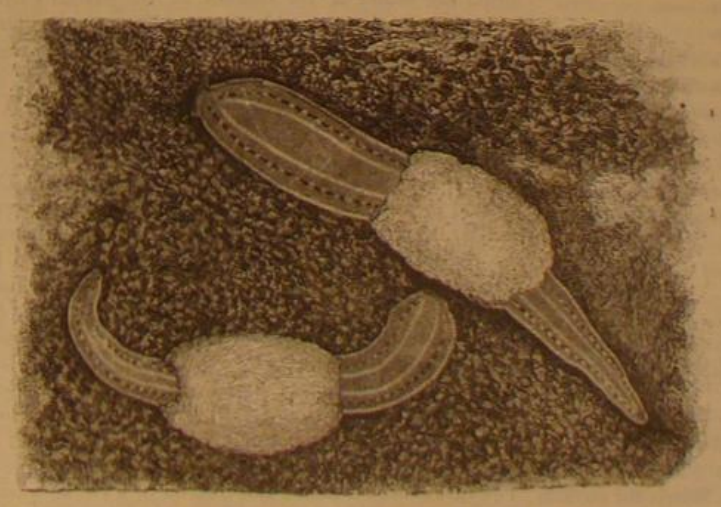
Leeches do not undergo any transformations of form, but are developed directly from the egg as perfect leeches. The perfection of the organization of the leech is always in proportion to that of the natural "host" or victim on which they prey, as, for instance, our mollusks afford safe harbor and food to various marine leeches which are much lower in development than those found on fishes, reptiles, and mammals.

Some time ago, being anxious to obtain specimens of a leech common in our hard clams, I applied to the "opener" of one of the most fashionable oyster and clam saloons of Fulton Market to save me some, leaving a bottle of alcohol with him. Calling, after the expiration of two weeks, I was surprised to find not a single leech saved, but was smilingly referred to the proprietor, who, I found, had given instructions not to save any for me, as he feared I was one of those newspaper "sketchists," working up a sensational article on hard clam trichinæ. These clam leeches are flat, an inch in length, and a quarter of an inch in breadth, and are attached to the outer wall of the stomach of the clam, which they resemble in color. Having great friendship for the hard clam, I must have swallowed alive many hundreds of these *Malacobdellæ* alive, and being of an inquiring mind I determined to have a mess of them cooked, and am forced to admit that they were very nice, very palatable, and of the most desirable Little Neck clam flavor, from which highly prized brand of clams they were taken.

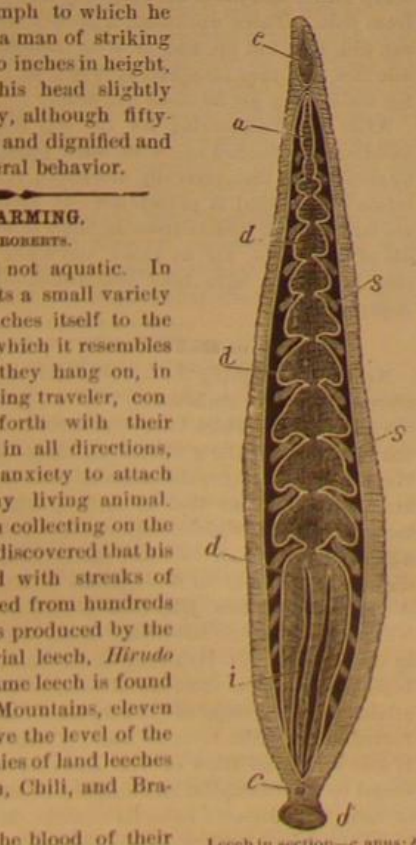
The Chinese eat both marine and fresh-water leeches.

That the leech is very sensitive to all atmospheric changes is proven beyond doubt, and the idea of utilizing this little creature as a sort of barometer is not new. The best leech storm-glass consists of a tall candy jar with tin top, in which perforations are made; at the bottom of the jar a flooring of peat with two or three smooth stones is placed; the jar is then filled with soft water, into which, after it has settled and become quite clear, two or three of the medicinal leeches are placed; great care must be taken in summer time to keep the temperature of the water down by placing the jar in a cool and shady situation, as heat is fatal to leeches. When the weather continues serene and beautiful, the leeches remain motionless at the bottom. On the approach of a rain or snow storm the leeches will be found at the top of the water, where they will remain till the weather becomes settled. When a wind storm is approaching the leeches will gallop about with great liveliness, seldom resting until the wind becomes violent. When a thunderstorm is approaching the leeches will seek a lodgment above water, displaying great uneasiness, and moving in convulsive-like threads. In clear frosts, as in dry weather, the leeches remain constantly at the bottom. The water must be changed every two weeks. The leeches are fed twice a year on blood tied in a thin linen bag, or on a living frog. The best leeches in the market are Russian and Swedish, and are of a dark brown color. The Hungarian leech is green in color, with yellow stripes, closely resembling our horse leech. In Pennsylvania a native leech has been used to some extent among the Germans, but it is found to be very unreliable when taken out of water and applied, dropping off the patient when only half gorged, but when covered with water will gorge to its full extent. I believe that this is the only instance known of utilizing our native leeches. The German and French governments were the first to offer large premiums for the encouragement of leech culture, but many years elapsed until a French fisherman, named Berchade, met with entire success, and at the same time accumulated quite a fortune, as leeches were at that time in great demand and brought high prices.

In 1841 a Mr. H. Witte established a small leech farm in Kent avenue, Williamsburg, L. I. In course of time this small establishment was abandoned, and one of thirteen acres was established near Newtown, L. I., and to him I am indebted for the following information and description of the only leech farm in America. The breeding ponds consist of oblong squares of one and a half acres each. The bottoms of these ponds are of clay, the margins of peat. In June the leeches begin forming their cocoons in the peat margins of the pond. These so called cocoons are very curious objects, consisting of a frothy mass of gelatin material of the size shown in the illustration. Through this mass the leech introduces his body and deposits the eggs. After the eggs are deposited the open ends of the

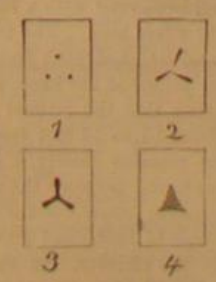


Leeches depositing eggs in cocoons, in section of peat.



Leech in section—*c*, anus; *b*, posterior sucker; *s s*, glands of the skin; *i*, intestine; *a*, œsophagus; *d d d*, stomach; *e*, anterior sucker.

1. Jaw of a leech.—2. Jaw magnified.



Different forms of the bite of a leech.

Cocoon of leech closed.

* By permission from the "History of New York," by Mrs. Martha J. Lamb. A. S. Barnes & Co., publishers: New York and Chicago.

† The statement that Robert Fulton was present at this trial of Fitch's steamboat on the Collect, in 1796, is an error, he being in England at that date, thoroughly absorbed in the study of Watt's steam engine and canals; he that year published in London a treatise on the improvement of canal navigation, with numerous well executed plates from designs of his own. He also about the same time, in England, patented a mill for sawing marble, for which he received the thanks of the British Society for the Promotion of Arts and Commerce and an honorary medal. In 1797 he passed over to Paris, with the intention of bringing to the notice of the French Government a submarine torpedo and torpedo boat.

cocoon close, and the gelatinous material becomes more dense and glue like. From each cocoon from thirteen to twenty-seven young leeches are developed. The young are hatched out by the heat of the sun, and begin to issue from the cocoons early in September. At first they are no thicker than a pin, but at that early age are capable of cutting through the skin of a horse. At the end of three years these leeches are ready for the market.

The greatest enemies to young leeches are musk-rats, water-rats, and water shrews, who dig the cocoons out of the soft peat breeding margins. Next to rats and shrews is overheating of the peat or the water of the pond. In fact, nothing is so fatal to leeches as a too high temperature. Mr. Witte says he has had leeches frozen in solid ice, but by slowly dissolving the ice and gradually increasing the temperature of the water the leeches sustained no injury. The depth of the water in the ponds during summer is three feet, in winter time the depth of the water is increased to avoid freezing.

The leeches are fed every six months on *fresh* blood placed in thin linen bags, which are suspended in the water. The leeches, as soon as they smell the blood, assemble from all parts of the pond, and attaching themselves to the outside of the bag suck the dissolving coagulated blood through the linen. Digestion proceeds very slowly in the leech, and more than a year will elapse before all the blood is digested in a fully gorged leech, during which time the blood remaining undigested in the stomach of the leech is in a fluid state, as if just taken in. The excremental deposits are of a grass-green color. The best substance for packing leeches in is the peat of their natural ponds made into a stiff mud. Water containing tannin, tannic acid, lime, salt, or brackish water must be guarded against always; iron is not objectionable, but is an advantage in small quantities.

The demand for leeches in the last few years has somewhat fallen off in the Eastern and Southern States. The Western States and California are now the heaviest buyers. Mr. Witte's sales alone average a thousand a day. The number of leeches imported to this country amounts to about thirty thousand yearly.

The custom of stripping and salting leeches, to cause them to disgorge after having been applied, has passed away, as many well established cases have occurred of infectious diseases having been communicated on the application of the same leech to a second party. A very popular error exists that a leech when applied takes only the bad blood (whatever that may be) and rejects the good; this is a mistake. With a leech blood is blood, be it the cold blood of a fish or the warm blood of a human being, no matter how diseased that human being may be. So long as blood is fresh and not tainted or putrid the leech will thrive on it. A friend of mine, who was the proprietor of a large leech-breeding establishment at the foot of the Harz Mountains, when wishing to feed his leeches was in the habit of hiring poor laborers, at six cents per day, to stand in the water for half an hour nearly up to their thighs that the leeches might obtain a full gorging of human blood.

In the marshy lands of Roumania the wild leeches are captured by means of men entering the water and allowing the wild leeches to fasten on to their naked bodies. The leech fishers then strip them off after reaching the shore.

How to Keep Leeches.

Take any wide mouth bottle that will admit the hands and fill it about two-thirds full of what is known as "Excelsior" (such as is sometimes used in upholstering and making cheap mattresses), wash the "Excelsior" with warm water and pour it off; then pour in cold, soft water enough to cover, and put in the leeches, tie a piece of thin cloth over the top, change the water once a month, and occasionally set the bottle and contents in the sun.

I have used this method for a number of years, and I do not remember ever finding a dead leech. It has certainly proved better than any jar, sponge, rusty nails, earth, or anything else I ever tried, and has the recommendation of being cheap and easily attended to.—*James S. Talbot, in New Remedies.*

Return of an Orchid Hunter.

On several occasions during the past year or two our readers have been indebted to Mr. Ernest Morris for curious and interesting information touching the natural history of the Amazonian forest regions communicated in his letters to the *World*. Mr. Morris lately returned to this city, bringing a large number of rare and valuable orchids, which he has collected for Mr. Erastus Corning, of Albany, N. Y., whose collection is valued at more than $100,000, and is considered the finest in the United States. Mr. Morris expects to return to his orchid hunting in South America, probably in Columbia and Equador. With the genuine explorer's feeling he says: "The valley of the Amazon is too civilized for me, and I want to get off the beaten track. When I come across an empty beer bottle hung up as an ornament in an Indian hut it makes me feel as though I was too near home."

Although the Amazon has been well explored, people have no idea of the richness in gums, herbs, and rubber of the country through which its tributaries flow. In trading along these rivers the Americans are far behind the English and French, although goods of American manufacture are considered the best and are most expensive.

Besides the orchids Mr. Morris brought a great quantity of herbs used in making the poison Wourali, with which experiments are to be made, as it is thought to be valuable as a cure for hydrophobia. Among other medicinal roots, he has some Macapa, which was once given to him by an Indian woman when he was very sick with fever and inflammation of the liver.

The business of orchid hunting may fairly rank among the most adventurous of the occupations of men, and the number of enthusiastic naturalists engaged in it is larger than is commonly suspected. As a contemporary points out, the owners of great floral establishments in Europe and America keep a regular staff of hardy botanists, who are to them what special correspondents are to a great newspaper. If the truth were known, it would probably be found that professional orchid hunters have explored more remote parts of the world than the foreign representatives of journals have ever done, but the world at large knows it not, because the orchid hunters are contented with the discovery of new specimens or filling their wallets and cases with rare specimens, and then returning quietly to their employers, while the special correspondent is bound to write and let everybody know where he is and what he is doing. A few years ago an orchid, *Cypripedium stonei*, variety *platinæum*, was sold in London for over £150, or $750. This is undoubtedly a tremendous sum to pay for a single plant, but the probability is that it had been brought from some distant part of the world at great risk and expense—perhaps from the Yunan borders of China, the fever-stricken and chimpanzee-inhabited jungles of Borneo, the mysterious lands lying north of the head-waters of the Amazon, the forests of Madagascar, or the northern extremity of the Transvaal. Great orchid merchants pay enormous sums annually to support their emissaries abroad, and in their estimation the discovery of a new specimen is so invaluable that, if merely told of its whereabouts, they will send out expeditions in search of it. Fifteen years ago an eminent West End (London) firm of florists heard of a strange orchid in the interior of Jamaica, and, thanks to their expenditure of a large sum of money, and the patience and energy of their emissaries, they were in possession of the coveted specimen within a year's time. At present the lovely wax-like flowers of the orchid are luxuries only for rich men and the possessors of conservatories, and this must remain the case so long as orchid hunting is such a costly and dangerous employment.

The Mastodon in Recent Times.

Prof. John Collett, Ph.D., State Geologist of Indiana, gives some statistics in relation to the mastodon, that dispels the notion that these animals did not live in recent times. Archæologists who argue the great antiquity of man upon this planet, based upon the fact that his remains have been found with those of the mastodon, will be compelled to seek other lines of proof for their theory. We quote from page 385, Geological Report for 1880. Professor Collett says:

Of the thirty individual specimens of the remains of the mastodon (*Mastodon giganteus*) found in this State, in almost every case a very considerable part of the skeleton of each animal proved to be in a greater or less condition of decay. The remains have always been discovered in marshes, ponds, or other miry places, indicating, at once, the cause of the death of the animal and the reason of the preservation of the bones from decay. Spots of ground in this condition are found at the summit of the glacial drift or in "old beds" of rivers which have adopted a shorter route and lower level, consequently their date does not reach beyond the most recent changes of the earth's surface; in fact, their existence was so late that the only query is, Why did they become extinct?

A skeleton was discovered in excavating the bed of the canal a few miles north of Covington, Fountain County, bedded in wet peat. The teeth were in good preservation, and Mr. Perrin Kent states that when the larger bones were cut open the marrow, still preserved, was utilized by the bog cutters to "grease" their boots, and that chunks of sperm-like substance, 2½ to 3 inches in diameter (adipocere), occupied the place of the kidney fat of the monster. During the past summer of 1880, an almost complete skeleton of a mastodon was found six miles northwest from Hoopston, Iroquois County, Ill., which goes far to settle definitely that it was not only a recent animal, but that it survived until the life and vegetation of to day prevailed. The tusks formed each a full quarter of a circle, were 9 feet long, 22 inches in circumference at the base, and in their water-soaked condition weighed 175 pounds. The lower jaw was well preserved with a full set of magnificent teeth, and is nearly 3 feet long. The teeth, as usual, were thickly enameled, and weighed each from 4 to 5 pounds. The leg bones, when joined at the knee, made a total length of 5½ feet, indicating that the animal was no less than 11 feet high, and from 15 to 16 feet from brow to rump. On inspecting the remains closely, a mass of fibrous, bark-like material was found between the ribs, filling the place of the animal's stomach; when carefully separated, it proved to be a crushed mass of herbs and grasses, similar to those which still grow in the vicinity. In the same bed of miry clay a multitude of small fresh water and land shells were observed and collected, which were kindly determined by Dr. F. Stein, as follows:

1. *Pisidium*, closely resembling *P. abditum*, Halderman. 2. *Valvata tricarinata*, Say. 3. *Valvata*, resembling *V. striata*. 4. *Planorbis parvus*, Say.

The shell bearing animals prevail all over the States of Illinois, Indiana, and parts of Michigan, and show conclusively that, however other conditions may differ, the animal and vegetable *life*, and consequently climate, are the same now as when this mastodon sank in his grave of mire and clay.—*Clinton (Wis.) Herald.*

How Cattle are Killed for New York Market.

In the city of New York there are two large abattoirs or slaughter houses. On the east side of the city there is a collection of several of these establishments, which occupy the blocks bounded by East Forty-third street, First avenue, East Forty-sixth street, and the river front. The total number of beef cattle slaughtered here last year amounted to about 100,000 head.

At the foot of West Fortieth street is what is called the West Side Abattoir, which is the largest establishment of the kind in the city. Its dimensions are 425 feet in length on Fortieth street, and 300 feet on Thirty-ninth street, with a uniform depth of 200 feet. The annual kill of beef cattle here is 2,200 head per week, or about 115,000 a year.

At Jersey City, across the river from New York, is situated another large establishment of this kind. It is not only a slaughter house, but the receiving point for the greater portion of the cattle coming into New York. It is very favorably situated, being not more than a mile by water from any of the European steamship wharves, and cattle for export can be shipped by boat from the abattoir direct to the side of the vessel. For this reason it is the principal place from which the live stock export traffic is done. The stock yard covers several acres, and is divided into large pens, partly roofed over, with water troughs and hay racks running along the sides. They afford accommodation for about 3,000 cattle, and the charge per head for each animal entering the yard, no matter how long or short may be the period of its stay, is 40 cents. During the time they are kept in the yard they are fed at the owner's expense. The slaughter house proper is a building 250 feet front by 300 deep, but with the offices and other additions the buildings cover an area of 270 by 390 feet.

When the company which controls this abattoir first started in business, in October, 1866, their establishment was at Communipaw, and in 1867 their receipts were 79,829 cattle, 456,939 hogs, 160,247 sheep, of which 16,791 cattle, 423,512 hogs, and 143,639 sheep were killed on the premises. The export trade in live stock brought a large increase in the receipts, and in 1875, the year after they took up their present location at Harsimus Cove, Jersey City, they received 258,550 cattle, 640,149 hogs, and 685,724 sheep; of these, 78,894 cattle, 543,919 hogs, and 431,241 sheep were slaughtered on the premises. From this time on the arrivals have continued to increase, until last year they reached 368,298 cattle, 952,371 hogs, and 634,191 sheep. The slaughter of beef cattle, however, had fallen to 43,758, while that of hogs was 940,200, and of sheep 630,700.

The cattle coming into New York average from 700 pounds to 800 pounds in weight, and at 10 cents per pound, about the usual figure, bring $70 to $80 each on the hoof. The method of killing is essentially the same in all the New York slaughter houses. A rope is fastened around the animal's hind legs, and he is lifted off his feet by means of a block and tackle, so that he hangs with his head downward, and just touching the floor. His throat is then cut with a large, sharp knife, and his death is speedy and comparatively free from pain. Three workmen, a dresser and two assistants, can kill, flay, cut up, and dress an animal in about twenty minutes, and they slaughter eighteen to twenty head daily, for which they get 59 cents per head.

After the slaughtering for the day is at an end all the buildings are flushed out with water pumped from the river by steam, and then carefully mopped over, so that no sign of refuse of any kind is perceptible—in fact, the floors, which are laid with an incline from the sides to a gutter in the middle of the houses, are as clean and white as the decks of a ship after they have been holystoned.—*Shoe and Leather Reporter.*

Source of Bad Taste in Croton Water.

Nearly every spring the users of our city Croton water are alarmed by an unpleasant "fishy" or "cucumbery" or "woody" taste, which lasts sometimes for weeks. This season it was particularly offensive. At a late meeting of the New York Microscopical Society, Mr. J. D. Hyatt called attention to the fact that in early spring the beds of all the mountain brooks which feed the lakes become covered with a gelatinous layer of minute vegetable organisms known as diatoms, sometimes to a thickness of a quarter of an inch. A very little of this jelly mass placed in a vessel of water will soon impart the same odor to the water as is observed in the Croton. Mr. Hyatt concludes that as soon as the jelly begins to disappear from the streams, which occurs when it attains a certain stage of growth, the same odor will be imparted to the entire body of water which flows to this city. If this is true no trace of the cause of the odor would be found by microscopical examination of the water in the city at such long distance from its source. Mr. Van Brunt said his observations confirmed this view.

The Ancient Cypress near Sparta.

The celebrated cypress tree that had stood near the city of Sparta, Greece, for over 2,800 years, and was described by Pausanias 400 years before the coming of Christ, has been destroyed by a band of strolling gypsies, who camped beneath it and left their fire burning. It was 75 feet high and 10 feet in diameter near the ground. The people of Sparta greatly mourn its loss.

The Mississippi River and the Grain Trade.

At the last meeting of the New York Board of Trade and Transportation some significant figures were given as to the relative cost of transporting grain from the West to Liverpool by rail to the Atlantic seaboard or by river to New Orleans. It was stated that grain can be shipped from St. Louis to Liverpool, by way of the river, for 17 cents a bushel; the rate by way of New York is 29½ cents. The rates from St. Paul, Minn., show a difference in favor of New Orleans of 15½ cents a bushel.

Under these conditions the increasing tendency of shippers of grain in the Mississippi valley to choose the southern route is not surprising. During the year ending August 31, 1879, the exports from New Orleans were 4,617,825 bushels of corn and 1,868,084 bushels of wheat. For the year ending August 31, 1880, the exports were 9,863,790 bushels of corn and 5,344,510 bushels of wheat. The total increase for the year was nearly nine million bushels. The increase for the coming year is likely to be still greater, as several barge lines and many new barges have been added to the grain fleet of the Mississippi River for this season's trade. By this plan one towing steamer is able to guide down the river a raft of barges carrying from eight to twelve hundred car loads of grain. The cheapness of the river route much more than compensates, as we have seen, for the increased length of the ocean trip. The passage from St. Louis to New Orleans is made in little over a week. The amount of the barge traffic already in progress may be estimated from the following figures given in the St. Louis *Republican* of April 8, with reference to the carrying capacity of barges then about to start for New Orleans:

"Steamer Iron Mountain and five barges with 220,000 bushels wheat and 50,000 bushels corn; Oakland and six barges, with 50,000 bushels wheat, 200,000 bushels corn, and 25,000 bushels oats; and the Bigley and four barges, with 40,000 bushels wheat and 100,000 bushels corn, making a total shipment for the week of 680,000 bushels grain, which by railway transportation, at 500 bushels to the car, would require 1,370 cars, and estimating 20 cars to the train, would make up 69 freight trains and employ about 400 train men. The amount of wheat carried will be 310,000 bushels, corn 350,000 bushels, and 25,000 bushels oats, to say nothing of the package freight, which will be large."

The reduction of the cost of transportation to Western Europe of ten or fifteen cents a bushel must have the effect of vastly increasing the power of our Western wheat growers to compete successfully with those of Hungary and Russia, and thereby largely increase the European demand for American grain. In this way the development of the river route (thanks to the successful working of the jetty improvements at the mouth of the Mississippi) cannot but prove advantageous to the farmers of the Mississippi Valley as well as to the merchants of New Orleans.

The effect upon the commerce of the Atlantic States is not at first so promising, unless by the improvement of railway, canal, and lake carriage the cost of transporting grain from the interior to the seaboard may be so reduced that the primary advantage of the river route can be overcome.

If it should prove that the East and West water and rail routes are unable to compete with the Mississippi in the transport of bulky and cheap agricultural products, it by no means follows that their profitableness will be seriously impaired in the long run. The prosperity which must come to the interior through the establishment of a cheaper way to market for its surplus products must tend to increase rapidly the purchasing power of its people and their disposition to purchase largely those commodities which compress more value into a little space and inevitably demand direct and rapid carriage. And the merchants and transporters of the seaboard may possibly find the farmers of the interior, owing to an increased though diverted grain trade, much more profitable as customers than they ever have been. Part of a great traffic may be worth more than the whole of a lesser traffic.

The Commerce of New York.

The twenty-third annual report of the New York Chamber of Commerce, just presented, covers the trade of the year 1880. In reviewing the imports of the year, the sugar trade is first considered, the course of this staple being regarded as a sure indication of the general condition of the country. The consumption of sugar was 819,000 tons, as against 743,000 tons in 1879. Of this quantity Louisiana furnished 89,000 tons, the remainder being drawn from foreign sources. If to this consumption be added that of sugars from beet root and maple groves the total is swollen to 900,000 tons. New York continues to be the chief port of receipt and distribution for this large trade, taking 570,000 tons against 506,000 tons the previous year.

The consumption of foreign molasses, owing to the falling off in the yield of the West India sugar crop, decreased from 34,500,000 gallons in 1879 to 33,100,000 gallons in 1880. The crops of Louisiana and Texas yielded 12,000,000 gallons, making the total consumption for the year about 45,000,000 gallons. The trade, like that of sugar, has been profitable. The history of the coffee trade for 1880 will be ever memorable for the lesson it has taught of the danger of attempting to force up the price of a great staple by monopolizing the supplies. Consumption, however, was not seriously disturbed by the speculation, the total amount being 176,000 tons, against 184,000 tons in 1879, a decrease of about 4½ per cent. The share of New York was 123,000 tons. The decrease in the receipts was from Brazil, the West Indies Mexico, and Holland, while the importations from Java and Sumatra show a large increase. The tea trade of the year was especially unprofitable to those directly engaged in the importation of China teas. The unprecedented figures of 3,000,000 pieces were reached in the importation of foreign hides, exclusive of Calcutta hides, or an excess of 900,000 over the figures of 1879. The wine and liquor trade was remarkable for its prosperity and the few disasters reported.

Concerning the exports of this country, the report says that cotton continues to be the most important in value. The crop for the year ending September 1 reached the enormous figure of 5,757,397 bales, an increase of nearly 700,000 bales over that of 1879. Of this quantity, 3,865,621 bales were exported and 1,624,805 were taken by American spinners. New York and Baltimore are the only two seaboard cities which notably increased their exports of this staple. The export of American cotton manufactures has slightly decreased. The entire value of grains exported was $288,000,000, against $308,000,000 the year previous. The fresh beef shipments from New York have increased from 44,000,000 pounds to nearly 61,000,000 pounds in 1880. The entire value of the provision exports from all ports of the United States was $61,000,000, against a value last year of $58,000,000. Of live animals nearly 500,000 were exported, valued at nearly $16,000,000. Of this trade New York had over $7,000,000. The value of the entire export of lard was nearly $28,000,000, an increase of $5,000,000 over the previous year. Noticeable also is the export from New York of oysters to the value of $400,000, out of a total exportation valued at $550,000. Of the entire provision trade, exclusive of animals, of $128,000,000 value exported, New York sent $91,000,000. The shipments of crude and refined petroleum were 8,000,000 barrels, against 10,000,000 barrels in 1879. The production seems to be in excess of the demand about 20,000 barrels per diem. The tide of immigration brought to this country during the year 457,257 persons, of whom 327,371 were landed at this port. Of the latter, 104,000 were from Germany, 66,000 from Ireland, 35,000 from Sweden, and 34,000 from England.

The Shingle Product.

In recent issues the *Northwestern Lumberman* has given elaborate statistics of the shingle product of the Northwest, the amount of which is something stupendous, as will be seen in the following recapitulation of the output of the past eight years, allowing 5,000 shingles to each 1,000 feet of logs:

1873	2,277,433,550
1874	2,473,216,555
1875	2,515,838,240
1876	2,900,530,725
1877	2,668,856,735
1878	2,561,490,750
1879	2,859,112,750
1880	2,972,912,160
Total	21,229,391,485

It is estimated that something between 800,000,000 and 1,000,000,000 feet of logs are yearly made into shingles in this country.

Previous to 1845 the manufacture of shingles in the United States was almost, if not wholly, confined to the article of "rived" or "breasted," terms applied to shingles made by hand with a drawing knife, involving a waste of fully three-quarters of all the timber which it was intended to convert to this use. The shingles were 18 inches long, one-half inch at the butt, and one-eighth inch at the point, and were made only from the finest pine, cedar, or cypress, the latter being wholly manufactured in the swamps of Virginia and other Southern States. About that date steamed cut shingles had been introduced, but never attained a wide spread reputation or market, because of imperfections in the manufacture. Not far from 1845 sawed shingles were introduced, and their claim upon public favor was based upon the fact that coarser timber could be utilized in their manufacture and the cost of the product cheapened. They were not at first received with favor, but have rapidly grown in public estimation until they have almost wholly superseded all others. With the cheapening of the manufacture and in the use of coarser timber, hemlock was utilized for some time in the East, but has in late years been but little used.

The shingle cut of eastern Michigan and Huron shore is almost wholly confined to an 18-inch shingle, the product being shipped to the East and Southeast, where no smaller size is salable. A thousand feet of logs is calculated to yield from 4,000 to 5,000 marketable shingles, besides the coarser grades which have no market value to warrant their shipment. The cut of western Michigan, Wisconsin, and the Mississippi district is wholly of 16 inch, for the demands of the Western market and the less stringent inspection as to quality enable the manufacture of from 7,000 to 8,000 shingles from 1,000 feet of logs.

American Awards, International Fishery Exhibition.

The medals from the International Fishery Exhibition, Berlin, just received, are of gold, silver, and bronze, three inches in diameter and quarter of an inch thick. The gold medals are 20 carets fine, and weigh 7½ ounces. The diplomas accompanying the medals are handsomely lithographed. The list of American awards includes, in addition to the great prize of $2,000, taken by the U. S. Commission of Fish and Fisheries, eight gold medals, sixteen silver medals, and twelve bronze medals; and fourteen other exhibitors received honorable mention.

The Water Power of the Atlantic Coast.

In his annual report, just submitted, Chief Engineer McFadden, of the Philadelphia Water Department, asserts that the available water power of the Schuylkill and of all the streams along the Atlantic coast has been highly over rated. Eminent engineers have estimated the working force of the Schuylkill to be equal to the pumping of a daily average of 100 000,000 gallons. Mr. McFadden undertakes to show that the real power is not half as great, all the water being used all the time.

The amount pumped by the machinery at Fairmount, running 54 per cent of the time, was a daily average of 21,551,630 gallons. "Had there been power enough to drive the machinery 100 per cent, or all the time," he continues, "it could not possibly have pumped more than 40,000,000 gallons per day. With these facts as a basis we may safely state that the machinery at Fairmount would use and exhaust the power of the river if it was subjected to a steady and equable flow by impounding the storm waters. Of course duplicate water-power works at Roxborough, by using the power twice, first at Roxborough and a second time at Fairmount, could be made to double this amount."

The pumpage for last year amounted to 21,120,792,386 gallons, an increase of 6 per cent over that of the previous year.

The Utilization of Blood, Bones, etc.

In our city abattoirs very little of a slaughtered animal is allowed to go to waste. The hoofs are sold for glue stock, and bring about 40 cents a set. Pates, for the same purpose, bring 1 cent to 1½ cents per pound. The tallow is generally rendered at the abattoirs, and brings from 6¼ to 6½ cents per pound. What is called "hot fat," that is, fat taken from the breast and kidneys of the animal while it is yet warm, is sold to oleomargarine manufacturers at 4½ cents per pound. The bladder, wizen, reed, and bung gut are sold for about 8 cents a set, and made into skins for wrapping sausages in. The head brings 30 cents, and the meat is taken off it and canned, while the bones are used as fertilizers. The flesh tail, worth 5 cents, is made into soup, and the hair tail, which is used for making mattresses, or mixed with lime and sand for building purposes, is sold at 4 cents. Horns, which bring 10 cents per pair, are converted into bone buttons, handles for cutlery, etc. The blood is dried by steam, which separates the water from it, and then baked in a drying machine and sold for sugar refining and fertilizing purposes. Of late years it has also been manufactured into buttons by means of a chemical process. A number of consumptives come to the slaughter houses daily, and drink the warm blood from the freshly-killed animal with very beneficial results in many cases. The stomachs are used for tripe, and bring 12½ cents to 15 cents each. The tongue is worth 50 cents to 60 cents, and is usually smoked. The heart and liver together bring 30 cents, and although sometimes used for human food, are generally sold for cats' and dogs' meat.

Artesian Wells in New York.

The number of artesian wells in this city steadily and rapidly increases, something like forty having been sunk during the past year. Their depths range from 200 to 2,000 feet, and the flow ranges from 1,000 to 2,000 barrels a day. These wells are used mainly by brewers and other large manufacturers who require a large amount of water, and who find the artesian well water economical both from its cheapness and its coolness, which enables them to dispense with much ice. Usually the wells are vertical. In one instance seven holes were drilled in different directions and at different angles, only one being vertical. The boring was carried to a depth of about 260 feet on the average, the longest at an angle being 457 feet deep. Water was struck in all the borings, and an abundant supply has been obtained continuously.

Improving American Tea.

Recently on receiving a number of packages of American tea from the experimental tea farm in South Carolina, Commissioner Le Duc invited a number of tea dealers in Baltimore and Washington to test the quality of the crop. They pronounced it very good tea, and said it compared favorably with East Indian teas. Last year's receipts from the same place had a weedy flavor. This year the same defect is only barely perceptible, the result being due to cultivation. By next year it is thought it will have disappeared entirely. It is even now only perceptible to the taste of experts. Letters from Mr. Jackson, the gentleman in charge of the tea farm, comment in very favorable terms upon the healthy appearance of the plants and the prospect for excellent results.

The Value of Good Brakes.

Recently, while the steamer State of New York, from this city to Hartford, Conn., with about two hundred passengers, was passing the drawbridge across the Connecticut River, near Saybrook, a heavy freight train ran upon the bridge at considerable speed. The engineer had been misled, perhaps, by a confusion of lights, and very nearly ran his train into the draw to the destruction of the steamer. The engine when the train stopped was within 30 feet of the draw.

A HEAVY WOMAN.—Mrs. Charles Ballou, known as the Mammoth Queen, died April 8. Her weight had been given as high as 575 pounds. Just before her death it was 400 pounds. The coffin was 6½ feet long, 3 feet wide, and 20 inches deep.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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) W. S. P. writes: I wish to print names on thin leather for the back of books. What is the best process to get it in gilt letters that will not rub off? I never saw anything of the kind done, and find that to simply print the name in type and then bronze them will not hold. A. Thoroughly beat the white of an egg, rub it thin over the place to be lettered, put on the gold leaf, and with type heated sufficiently to coagulate the albumen press upon the leaf. Remove the surplus leaf with a tuft of cotton.

(2) C. & H. ask: Which is the most profitable and best variety of fish to cultivate in an artificial pond of forty acres, and sixteen feet deep in the deepest part? How shall we proceed to stock it? A. Clear the pond of sun fish, eels, cat-fish, pickerel, pike, yellow and white perch—they being enemies to all young fish. For natural food leave the pygmy silver and striped dace and minnows; stock the pond with German carp and fresh water bass.

(3) W. A. F. asks: Will a 30 horse power engine run with the same number of pounds of steam, and do the work of 10 horse power engine with the same number of pounds of steam, as a 10 horse power engine will? A. The difference will be small; there will be a little more loss in the thirty horse power engine from friction, radiation, and condensation.

(4) J. H. G. asks how to transfer ordinary printed pictures to a sheet of glass, and to remove the surplus paper especially as in book illustrations, where the back of the picture is covered with printed matter. What preparation should be applied to the picture as transferred to render it transparent, or nearly so? A. Coat the paper thinly with a clear mucilage of gum-arabic, spread it out evenly on the glass plate, and let it dry. The paper may then be pared down with the greatest facility by means of a glove maker's knife, a piece of thin flexible steel, 3 inches wide by 5 inches in length. At one end a handle is usually affixed, the other end being ground to a very fine edge. It is used somewhat after the manner of a plane, the plate being pressed down nearly level with the paper, and the edge of the blade presented somewhat obliquely to the stroke so as to cut smoothly. To make the paper translucent saturate it with good castor oil and cover the back with a second glass plate.

(5) G. C. asks: What will remove hair from a person's face without pain or injury to the appearance of the skin? A. To remove the hair so that it will not grow again it is necessary to destroy the hair bulbs. We know of no chemical or depilatory that will do this effectively and is not liable to injure the skin or prove painful in its application.

(6) J. A. B. asks at what degree of heat, or what is the lowest degree, at which steam can be made. A. Exposed to the atmosphere at sea level water boils at about 212° Fah. As the pressure diminishes the boiling point becomes lower. In a vacuum pure water can be boiled at 45° Fah. 2. To what temperature may water be heated? A. Under adequate pressure water may be heated hot enough to melt lead. Under a pressure of 50 atmospheres water boils at about 500° Fah. 3. Is there any way of sharpening cast plow points? A. Grinding is the only method.

(7) J. S. B. asks: What is the best explosive agent to use, efficiency and economy combined, in getting rid of pitch pine stumps? The stumps are full of pitch and the top root prevents pulling out. The stumps are in Florida. A. Dynamite and giant powder are most effective in this connection. A pound cartridge when forced into a hole beneath the stump, loosely tamped and exploded, is usually sufficient to remove it completely.

(8) C. D. R. asks how to remove the sulphur odor of rubber goods. A. Caustic potash, ½ oz.; water, 1½ pints; dissolve and heat to boiling. Put the goods into this for a few minutes, rinse thoroughly and dry.

(9) W. W. C. writes: I inclose a sample of mica taken from a mine near here in pieces varying in size 6 to 12 inches and sometimes larger. What is its value and to what extent is it used? A. The mica is of very fair quality. It is used extensively for stove doors, lanterns, etc. See "The Uses of Mica," page 326, and answer to W. L. T., page 330 (8), current volume.

(10) N. J. A. asks: 1. What is the best method of preserving fence posts from decay, and is saturation in crude petroleum of any use)? A. See "The Preservation of Wood," SUPPLEMENT, No. 119. 2. The best paint to preserve fence boards]? A. Mix linseed oil thoroughly with dry sifted ocher, and thin with benzine for use. 3. How can fine shingles be made durable and at the same time less liable to ignite from sparks, if not fireproof? A. Water, 1 gallon; chloride of zinc, ½ lb.; digest in this the wood for forty-eight hours, drain, and put into a solution of crude tungstate of soda 1 lb., water 1 gallon (hot), for three hours; then dry. 4. The most desirable metallic roof (aside from copper) as regards cheapness and durability? A. Tin plate, with a good coat of asphaltum or similar varnish.

(11) W. P. H. writes: I have some copper coins which have been cleaned and finished with sweet oil for about two years; they now show signs of corrosion, and to save them I must remove the oil and verdigris. I am told that cyanide of potassium properly applied removes it readily, but that it has to be used very carefully. Will it poison the air we breathe in using it, or must our flesh or skin not come in contact with it? How can it be rinsed off or the coins cleansed after application? Will it do what I want? A. Dip the coins into a hot solution of ½ oz. caustic potash in 3 oz. water, to remove the oil; rinse in plenty of clean water, and rub them gently with fine tripoli moistened with solution of ½ oz. potassium cyanide in 5 oz. cold water. If the hands are free from open cuts or sores (through which the poison may enter the system), and are not allowed to remain long in contact with the liquid, there is little danger of poisoning. It is not safe to keep such a liquid about the house, however, as a few drops taken internally by mistake or carelessness of handling might prove fatal. Rinse the bright coins in water and dip for a few moments in boiling water; on removal from which they will dry spontaneously.

(12) J. D. C. writes: In reference to the new system of chemical nomenclature (yet new and disagreeable to many), I beg information on some points which seem to overthrow the propriety of the new style, at least as regards the use of the termination, "ic." When we say "ferric sulphide," "mercuric cyanide," "argentic oxide," etc., will those terms bear analysis, will they bear application of the searching process peculiar to the magnificent system on which it is sought to engraft them, resolution into constituent principles or elements? For instance, what is the meaning of "ferric sulphide?" The new school will reply "A combination of iron and sulphur." But what is the guarantee that these two principles are *all* that are in combination. The very term "sulphide" implies and completely expresses, *a comp und*; and when we hear one say, "It is a sulphide," we immediately inquire, "sulphide" of what? "oxide" of what? The "ic" does not do more than add a *third* principle to the already existing "oxide," "sulphide," etc., and at best, simply indicates a *trace* of the *third* principle. "Ferric alumina," is quite appropriate; because it expresses "oxide of aluminum with a trace of iron;" but "ferric sulphide" is unfinished, unsatisfactory, because it may be a sulphide of well defined character, with trace of iron. It will not do to say that "ferric sulphide" means "sulphide of iron;" for that would be foolishly tautological, if stated in full. If we say the "Germanic Confederation," we are not to be understood as meaning that the principle or element composing the "Confederation" are wholly German in character, custom, inclination, etc.; in other words, German, and Germanic, convey different characteristic ideas. A nation may be Germanic without being German. A "ferric sulphide" may be a "ferric sulphide of barium," or some such combination, unless my comprehension be wholly at fault. I have never seen nor heard any argument pro or con on this subject, and ask the favor of your views. A. Your comprehension is wholly at fault. Molecules contain at least two atoms, one of which is positive to the other, which is negative. In the case of binary molecules the rule is: Place the name of the positive first, then that of the negative, changing the termination of this into *ide*. If the positive atom varies in equivalence this fact is indicated by giving it for the higher of two stages the termination *ic*, and for the lower the termination *ous*. Thus ferric sulphide means bisulphide of iron (FeS_2), while ferrous sulphide means the sulphide, or monosulphide of iron (FeS)—definite compounds. Should a third stage be developed below the *ous*-compound the prefix *hypo* is given, as hyposulphurous oxide; or if above the *ic*-body the prefix *per*. Ternary molecules are similarly named, except the negative terminations are *ate* and *ite*, instead of *ide*. Potassium and chlorine united directly form potassium chloride, a binary, but if united by oxygen they form potassium chlorate. Consult Cooke's "The New Chemistry."

(13) F. G. asks for preparation that will stop rubber hose from leaking. A. The rubber companies sell a cement suitable for this pupose. It is prepared by dissolving gum caoutchouc in naphtha. See article on cements, page 2510, SUPPLEMENT, No. 158.

(14) A. C. B. asks: Is there any preparation with which I can bleach pressed botanical specimens (flowers) which have become brown in drying? I have a specimen of "magnolia grandiflora," which is brown, and I wish to bleach it, then color it white and pink again. A. Try exposing it to the vapor of burning sulphur, under a tight box. It should be moistened before exposing it.

(15) L. A. T. asks: Can you recommend any good work on volumetric analysis? I desire an easy test of that character to determine the amount of calcium sulphate in water. I can use barium chloride to precipitate the sulphate, but on account of its slow deposition, it is very difficult to determine when exactly enough has been added. Can I add anything to the water which by change of color or otherwise will show when enough barium chloride has been used? A. You will find Thorp's "Quantitative Chemical Analysis" a handy book. We know of no good volumetric method of determining calcium sulphate. Evaporate the water to dryness in a capsule over the water bath, redissolve the residue with a little pure hydrochloric acid, add to this solution a slight excess of a filtered aqueous solution of barium chloride, gently warm the mixture, let it stand half an hour, then wash into a weighed filter. Wash the precipitate on the filter, dry it at 212 until it ceases to lose weight, weigh and deduct the weight of the filter, or, what is better, having determined the weight of the ash of such a filter, ignite the filter with the dried precipitate in a platinum crucible, weigh, and deduct weight of ash and crucible.

(16) E. M. E. asks how to preserve natural flowers so that they will look natural, either single or in bouquets. I have seen them—it is something new. A. Dissolve by agitation and digestion in a closely stoppered bottle, ¾ oz. clear, pale, gum copal, coarsely powdered and mixed with equal weight of broken glass, in 1 pint of pure sulphuric ether (ethylic ether). Dip the flowers in this liquid, remove quickly, expose to the air ten minutes, then dip again, and expose as before. Repeat this dipping and drying four or five times. Most flowers thus treated will remain unaltered for some time if not handled.

(17) D. D. asks: 1. What would be a good recipe for red ink to use with a rubber faced stamp? A. Pour over two ounces of fine aniline red or violet about half a pint of boiling water, stir and shake together, then let stand to cool and settle, and pour off the liquid portion. A sufficient quantity of this stirred up with pure concentrated glycerine makes a good stamp ink. 2. Give also a formula for black ink for the same use. A. Use good soluble nigrosine as directed above, or triturate the powdered dye with the boiling water in a large mortar with the water until a smooth paste is obtained. 3. Would gum arabic in the ink be likely to injure such a stamp? A. Gum should not be used in this connection.

(18) U. D. M. asks how is the silica prepared, how is it mixed, and with what to give it the consistency and quality of paint? What mixtures give it the different shades, what is the manner of applying it, and for what is it adapted? A. The name is usually applied to paints wherein a sirupy aqueous solution of waterglass or silicate of soda is employed as the vehicle. Waterglass is prepared by fusing together in a crucible at a bright red heat pure white silicious sand or powdered quartz and carbonate of soda (three of quartz or sand to about five of anhydrous carbonate of soda). It dissolves in boiling water to form a sirupy liquid. Almost any of the ordinary mineral pigments—zinc oxide, white lead, barytes, ochers, chalk, etc.—may be mixed with it to form a paint. It may be used advantageously on common inside woodwork and walls which it is desired to render fireproof. Such paints when they become dry are quite hard, but not waterproof.

(19) G. A. W. asks: How much higher is one of our oceans than the other? A. The latest surveys discover no difference of mean level of the two oceans. The tides on the Gulf side are very much higher than on the Pacific side.

(20) C. L. P. writes: 1. In SUPPLEMENT, No. 83, your correspondent, "D," in giving instructions for making rubber stamps, says: "Vulcanized rubber is used." Can you inform me where it can be purchased—of what company? A. The rubber referred to is gum rubber mixed intimately with about 6 per cent of sulphur and rolled out into sheets. It may be obtained from almost any large rubber manufacturing establishment. See our advertising columns. 2. He also says: "Both together (mould and rubber) are placed in a screw press, and heat sufficient to thoroughly soften the rubber is applied." Can you say how this heat is applied? A. By placing the mould and rubber in an oven or steam chamber heated to the proper temperature, about 330° Fah.

(21) H. W. asks: 1. What will prevent new made flannel underwear from shrinking? A. Good flannel will not shrink much if properly washed. Very little soap should be used, the water should be barely hot, and all the waters used should have about the same temperature. The goods should be wrung as dry as possible and well shaken out before hanging up to dry. We know of nothing that can be put into the goods to prevent shrinking. 2. How can cotton or linen cloth or cord or twine be treated to make it rotproof or proof against rot? A. The deterioration of the fibers may be in a measure retarded by saturating them with a hot aqueous solution of soap, and after wringing out digesting them in a strong solution of alum, then rinsing out and drying. In regard to your other queries you had better consult some reputable physician.

(22) P. W. M. asks how to prepare self-raising flour. A. Reduce separately, by grinding, to impalpable powders, 1 lb. bicarbonate of soda, 2½ lb. cream of tartar, 1¼ lb. salt. These should be intimately mixed together and then with 100 lb. fine flour. All of the substances employed should be thoroughly dry.

(23) J. W. asks: Is there any preparation or cement, or any way that thin sheet lead can be fastened to cast iron, so that it will adhere firmly and resist the action of the weather, that is, will not be loosened by ordinary use and exposure? A. The new sulphur sulphide composition, called Spence metal, is said to answer very well for this purpose. In a capacious iron vessel with a loose cover melt by heat, 2 lb. sulphur. Heat to bright redness in a sand crucible 3 lb. of coarsely powdered sulphide of iron (FeS_2). Remove the crucible and melted sulphur out of doors, quickly, but cautiously, transfer the contents of the former to the latter, cover, and smother the flames by covering the pot with moist earth or sand. When cold remelt the contents of the pot at a gentle heat, and having packed the base of the joint, lead outside, with oakum, pour in the melted composition.

(24) E. A. R. asks for a formula for making the liquid for a barometer or storm glass. A. Dissolve 1 oz. each of potassium nitrate and ammonium chloride in 5 oz. of hot water and let it cool, dissolve in 3 oz. of spirit of wine, ½ oz. of good camphor. Filter the solutions, and gradually pour the solution of salts into the camphor solution with constant stirring until a slight permanent precipitate is produced. Pour this liquid into the tube and draw out the latter so that only a pin hole remains open.

(25) E. J. C. asks: What can be used in paste for wall paper to hinder its destruction by the silver moth? A. A small quantity of corrosive sublimate or zinc chloride—70 or 80 grains (dissolved in a little water) to the bucketful is usually employed and proves effectual.

(26) S. R. B. writes: I am a painter for a large iron foundry, and have much trouble to get a filler (that will harden quick) for rough castings. Some of our large castings are quite rough, and look bad when painted. Can you tell me of anything that will answer this purpose? A. The following would probably answer your purpose: Put 28 lb. each of common pitch and coal tar asphaltum into an iron pot and heat to boiling over a fire. Continue the boiling eight hours, or until all volatile matters and moisture are driven off. Let it stand all night, and next morning heat to boiling again and add 8 gallons of boiled oil, then gradually 10 lb red lead and 10 lb. litharge, and continue the boiling three hours longer or until a small sample of it when cooked on a glass plate will roll up very hard between the fingers. Then remove the pot out of doors (away from fire), let it cool down somewhat, and add 20 gallons of turpentine. This black will dry in less than half an hour if it has been properly boiled.

(27) J. R. asks: How can I render paper pulp or papier mache non-porous, impervious to water, and to the action of potash? Can I treat ordinary pressed paper to accomplish the above results? I want to turn out a sheet of paper with a glazed, marblized surface, about the thickness of an ordinary business card, rolled from the pulp, or of pressed sheets, that will be unharmed by weak potash in solution, somewhat stiff and tenacious, but not brittle. Can I do it? A. If not too expensive you might use a solution of gutta percha in purified benzole as a sizing. We can think of nothing cheaper that will fully answer your requirements.

(28) R. J. B. asks for a good mixture for covering steam boilers and steam pipes. I happen to have some finely ground soapstone, with a little plumbago and mica in it. Is there anything with which it could be mixed so as to use it for the above purpose? A. Mix the powdered stone into a paste with an equal weight of plaster of Paris and the proper quantity of water, and cast in flat bricks or semi-cylindrical well oiled moulds, to fit the pipes, etc.

(29) J. A. S. asks: What chemicals are used in the Babcock fire extinguisher, and what are the directions for using the extinguisher? A. Bicarbonate of soda, water, and sulphuric acid. The soda is dissolved in water, the acid being contained in a leaden cup or bottle so arranged at the top that, when the handle at the top is pulled up the acid vessel is inverted and the contents thrown into the solution of bicarbonate of soda, 1 part of strong acid will completely decompose nearly 3¼ lb. of bicarbonate of soda, resulting in the formation of sulphate of soda and carbonic acid (gas).

(30) J. C. K. writes: I am making brands out of pure copper, and very often have trouble in casting, as it does not run well and leave holes in the edges of the letters of the brands. Can you tell me how to prevent this? Can I mix anything with the copper, that it will make as good a brand as pure copper? If so, please name it. A. The addition of a small quantity of zinc and about one-tenth of one per cent of phosphorus will sharpen the casting and in a great measure prevent the formation of blow holes.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

M. G. M.—The rock is hornblendic. It contains much sulphide of iron, some copper and zinc, but no appreciable quantity of free gold. The sulphurets may be richly auriferous, but an assay would be required to settle this point.—H. L. E.—Quartz rock containing crystallized sulphide of iron—pyrites—no value.—J. L. R.—The fine brassy piece is chiefly iron sulphide—pyrites; the other is manganiferous iron oxide and augite.—J. E. C.—It is a good ferruginous clay—almost too "fat" for brick-making alone, but good for pottery of some varieties.

COMMUNICATIONS RECEIVED.

Is Steam Explosive? By S. G.
On Tornadoes. By B. W. D.
On Gravitation and Motion. By W. R. B.

[OFFICIAL.]

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FOR WHICH

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May 3, 1881,

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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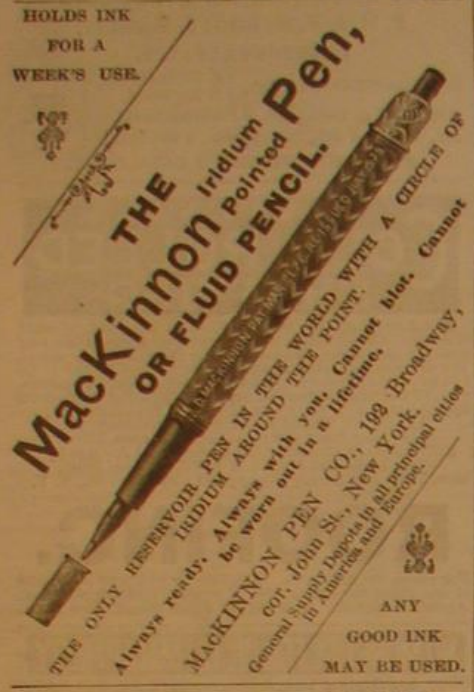

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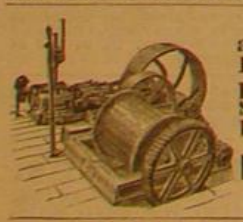

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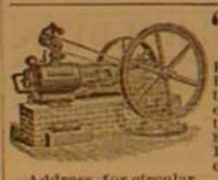

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