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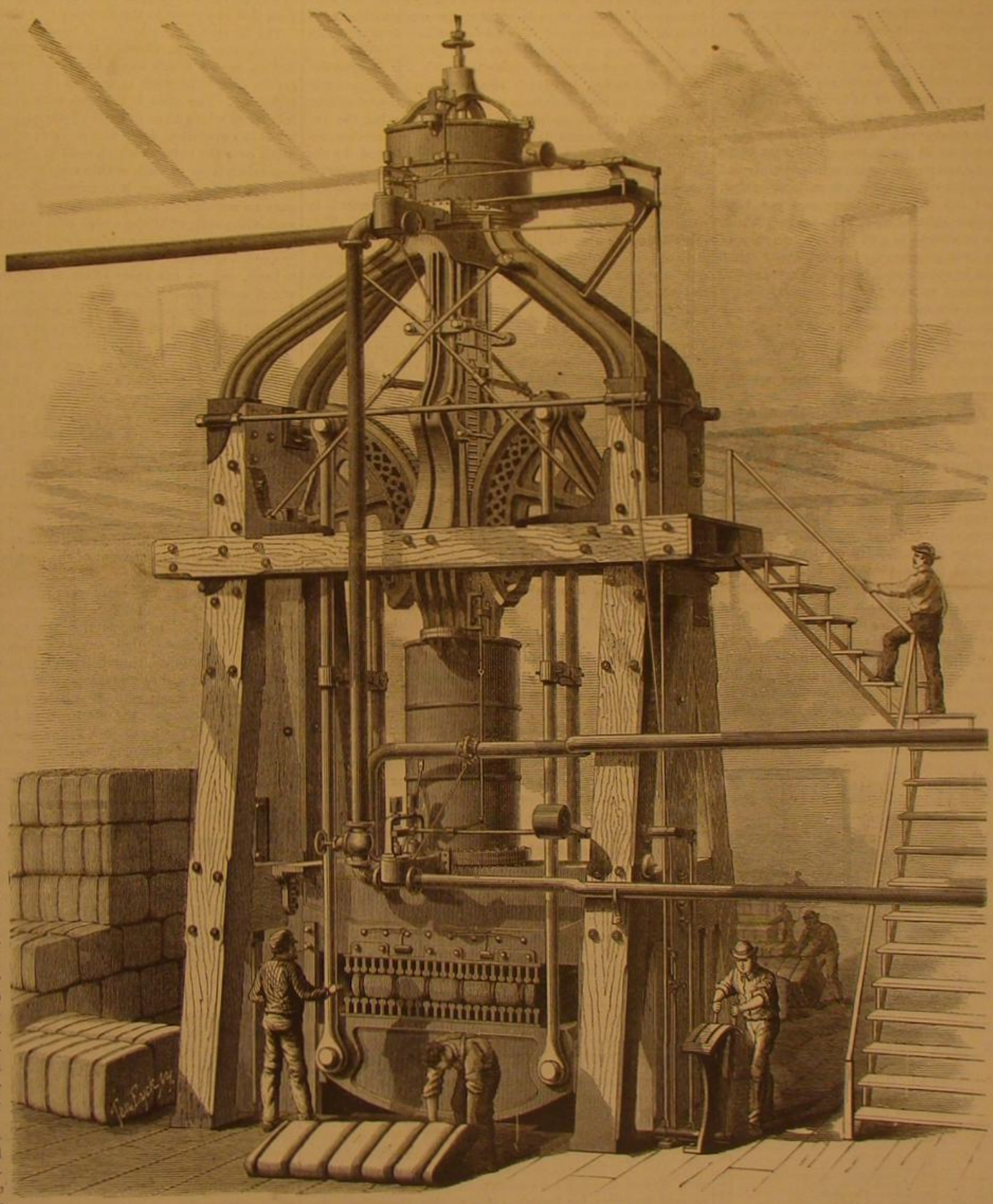
IMPROVED STANDARD COMPRESS.

It may be safely stated that the cardinal object, to be attained in the construction of mechanism designed for compressing bulky articles into a more readily manipulated form, is so to arrange the application of power that its effect be not diminished toward the end of the work; or perhaps, more accurately, so that the amount of force expended in performing the operation shall increase in direct ratio with the opposition it has to surmount.

Referring to the individual instance of that class of cotton or other presses, in which a steam piston is made to act upon a rack working between cog segments, connected by rods to the follower of the press in such a manner that the leverage will be increased as the follower is drawn up, it is hardly necessary to point out that, toward the end of the stroke, an immense force may be developed. But it has been found equally true, owing to the difference of sizes of articles of the same nature, to be compressed, bales of cotton, for example, that besides, from other causes, the power of the press is hardly sufficient to perform the work or to reach so near the end of its stroke as to render the gain by this increase of leverage available. It is, therefore, common, in order to attain the latter result, to employ a cylinder of larger size than is necessary at the beginning of the motion or with bales of comparatively small dimensions.

In the invention represented in our engraving, while the general plan above noted has been adhered to, two engines, instead of but one, are employed, and these are so arranged that a cylinder of comparatively small diameter applies the first and, consequently, the less powerful pressure. When this has reached the limit of its capability, the second engine comes into action and, by means of a large piston surface and short stroke, develops sufficient power to insure the completion of the pressure, and thus brings into effect the advantageous leverage already alluded to. By this means, it is claimed, steam is not only used in the most economical manner, but the construction affords four distinct gradations of the power, to be applied at will, as follows: First, by employing the smaller cylinder alone; second, by introducing steam into the larger cylinder in addition and causing it to work expansively therein; third, by cutting off steam in the smaller cylinder, so that it may there work expansively in connection with the steam in the large engine; and, fourth, by using steam direct from the boiler in both.

It is not considered necessary to enter into any detailed description of the mechanism, as a reference to the engraving will clearly indicate the quite simple construction of the invention. The points to be more especially noted are the mutual operation of the two engines and the results gained by actual practice. The machine from which our illustration was taken occupies a floor space of 14 by 18 feet, and an idea of its hight is readily obtained by comparison with the figures represented beside it. The lower single acting cylinder is 48 inches in diameter, and the upper one 60 inches; their strokes are, respectively, 9 and 4 feet. To afford a better notion of the operation, we need only describe the same exactly as we saw it a few days since. The material to be compressed was cotton, and a single bale, taken as a sample, weighed in the neighborhood of 500 pounds, and measured, before pressing, 52 inches. This was placed on the follower of the machine, and the engineer threw over one of the hand levers, shown at the right of the engraving. The effect of this was to vibrate a rock shaft, the lower one represented, and so open the steam valves of the lower cylinder. These valves, as well as those on the upper engine, are balanced as nearly as possible, and are claimed to possess all the advantages of both cylindrical and double puppet valves, as they work with little friction and are held on their seats with slight steam pressure. As steam entered the lower engine, the piston of course rose, and the rack upon it, engaging with the teeth of the segments and thus acting on the massive wrought iron rods, quickly raised the follower. This motion continued until very near the end of the lower engine's stroke, when the upper end of the piston rod entered a simple clutch formed by gibs, resting at their upper ends in bearings in a crosshead upon the lower end of the downwardly projecting rod of the upper cylinder. The gibs are hooked at their free lower portions, and are controlled by arms provided at their outer ends with rollers which work in grooves in the stationary frame. These grooves are so formed that, when the crosshead and clutch are in their lowest position, the hooks at the lower ends of the clutch jaws are drawn outward from the head of the rack; but, as they rise, are pressed inward and, by the shape of the frame, clearly shown in our engraving, kept in contact with the head of the lower piston rod.



GRADER'S STANDARD COMPRESS.

This clutch, acting automatically, coupled the ends of the two piston rods together, and at the same moment its gibs, as they expanded, actuated a bell wire and sounded a gong close beside the engineer, who, rapidly moving a second lever, admitted steam into the upper cylinder. At this point, the various gradations of power above noted may be employed in accordance with the nature of the work to be accomplished. The second and more powerful engine being now in operation, further compression of the bale followed. Six

inches of stroke, we noticed, corresponded to one inch of movement of platen; and with a steam pressure of 125 pounds, this would develope a pressure of two thousand tuns.

Finally the limit of stroke was reached, and the follower had risen to a distance of between 7 and 8 inches from the immovable portion above it. Here the bale was held until the straps were passed and the ends secured, and then steam was allowed to escape from the upper cylinder, allowing the follower to drop.

It will be noticed from the drawing that the piston rod of the upper and larger engine projects up through the cylinder and terminates in a flanged collar. Beneath the latter is a rubber buffer, so that, as the piston descended, the falling weight was met by this elastic support taking against the top of the cylinder, and all jar is thus avoided. When the widened portion of the guides was reached, the clutch of course uncoupled, leaving the piston of the smaller engine to continue its descent, cushioning slightly on the contained steam. The rack and segments necessarily resumed their position as at the beginning of the operation.

So quickly is the work performed that, probably during the time the reader has devoted to perusing the above description, a dozen bales of cotton would have been pressed, banded and removed. In the case of the bale referred to in the beginning as 52 inches through, we found that it occupied about 5 seconds to complete the pressure; and within 50 seconds, the bundle was reduced to 14 inches in thickness and securely tied. The economy of space in shipping thus gained need hardly be pointed out. Estimating cotton bales pressed by other means as of an average thickness of 33 inches at the beginning, and supposing them to be compressed to the uniform dimension of 18 inches, here is a saving, we are informed, of 175 tuns admeasurement per 1,000 bales, while it is further claimed that, thus packed, 24,000 pounds of cotton can be stowed in a 28 foot car. In case of hay, the economy is even greater; for two bales, standing 6 feet 2 inches high, can be compressed into a single bale of 20 inches. A fair statement of the average capacity of the machine (judging from our own examination, together with the claims of the inventor) seems to be about 60 bales of cotton per hour. There are other advantages incident to thus compressing cotton into such perfectly compact form, in addition to that of economy of space; among which may be mentioned its greater facility in handling, less danger of being permeated by fluid or moisture, and also greater immunity from the peril of fire.

As regards the construction of the machine, we may add that it appears exceedingly strong and durable. Its weight is about 100 tuns. The follower rods, as already noted, are of wrought iron, while the segments, rack, crosshead, etc., are of gun metal. The cogs are cast from templates and claimed to be more perfect even than cut gear, while their strength, we are assured, precludes all possibility of their stripping. There are also powerful braces placed so as to meet the strains in the most advantageous manner; and rubber buffers are applied at the various points which might be jarred by sudden or too heavy impact.

The invention was patented by Mr. G. W. Grader, and may be seen in operation at the works of the Standard Compress Cotton Company, Nos. 108 and 110 Morton street in this city. Further particulars may be obtained from Mr. C. H. Close, of the latter address, or from Mr. J. H. Edmundson, Memphis, Tenn.

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NEW YORK, SATURDAY, NOVEMBER 8, 1873.

Contents.

(Illustrated articles are marked with an asterisk.)

MR. R. A. PROCTOR, the distinguished British astronomer, has recently arrived in this country. He proposes, we believe, to give an extended series of popular lectures, for which purpose he has brought with him a series of paintings illustrative of astronomical problems and discoveries.

THE ELECTRICAL CONDENSER.

In the working of the steam engine, the office of the condenser is to assist the power and economy of the machine, by rapidly removing the back pressure of the exhaust steam and converting it into water for re-use in the boiler. In a somewhat analogous manner, the employment of the electrical condenser appears to facilitate and improve the working of certain kinds of telegraphs. When a battery current is sent through an insulated telegraph wire, there is produced another current, termed static induction, which interferes with the operation of the battery current.

On the ordinary pole telegraph with the ordinary instruments, the static induction gives little trouble; but in the case of subterranean and submarine cables, the induced currents prevent the rapid working of the instruments.

The electrical condenser consists of tin foil, separated by sheets of insulating material, such as paraffin paper; and when the metal of the condenser is connected with the telegraph wire, it absorbs the electricity of induction, and changes it so that it acts to assist instead of retard the transmission of telegraphic signals by the instruments.

The various submarine cables could hardly be worked with commercial success, were it not for the combination with them of the condenser. The condenser has been recently applied to some of the land lines with greatly improved results. It is employed in connection with the Stearns duplex instruments, by which messages are simultaneously transmitted in both directions over one wire; thus doubling the capacity of transmission without augmenting the expenses. The Stearns invention has been heretofore described in our paper. It has lately been adopted by the British government, in accordance with the recommendation made by us.

Another recent application of the electrical condenser is in connection with what is termed automatic telegraphy. This consists in operating the sending key by drawing under it a strip of perforated paper, each perforation, of given length, representing a given signal. At the opposite end of the line the message is received upon chemically colored paper, the color of which is instantly changed and the signals made visible by the passage through it of the electrical currents. The great trouble with the practical working of this system of telegraphy always has been that the static electricity operated to string out the electrical waves, producing tailings, making the signals to run into or overlap each other, and render them illegible, upon the receiving paper. This was especially the case if a certain limit of rapidity in the transmission was exceeded. This limit of transmission was 100 words per minute over a line of 250 miles extent; which is about the speed of the common Morse instrument.

Mr. George Little, who is well known for his indefatigable efforts and ingenuity in connection with automatic telegraphy, has applied the condenser to his instruments with marvelous results. He states that it enables him to transmit 5,000 words, or 30,000 signals per minute, over one wire, with perfect legibility, and that the instruments of the Automatic Telegraph Company are now working the system at this rate between New York, Philadelphia, Baltimore, Washington, Mobile, and other cities.

This discovery promises to be of much importance in the business of electrical transmission. It will enable people to do their correspondence in full by telegraph, instead of by brief sentences, as at present. It will assist to prevent blunders in transmission, for which at present there is no remedy, except by double payment. It is well known that the Western Union Company will not otherwise guarantee the correct delivery of any messages sent over their lines. The successful introduction of the automatic system will, however, put an end to this extortion. The facility of transmission is so great that the Automatic Telegraph Company is now enabled to send twice as many words, for the same money, as the other lines; and thus the sender may make sure of a correct delivery of his message, without loss of time or payment of extra charges.

Another striking advantage of the electrical condenser is its use in connection with subterranean wires. It permits the transmission of signals with as much facility when the wires are placed underground as on the pole lines, and will enable our city authorities to pass ordinances requiring the removal of the many poles which now disfigure and encumber our streets.

PROGRESS OF SCIENTIFIC EDUCATION.

Two more munificent gifts have been made in aid of scientific education: one in the shape of a bequest of the sum of $200,000, by Mr. William Wheelwright, of Newburyport, Mass., lately deceased in England, for the establishment of a scientific school in his native place, and the other by Mr. Mr. Ario Pardee, of Hazelton, Pa. The latter gentleman, finding through his own experience the necessity of increased facilities for technical instruction throughout the country, some time since selected Lafayette College, in Easton, as the object of his donations. Although the aggregate amount thus bestowed had, up to some sixteen months ago, already reached a large sum, Mr. Pardee determined to found a complete scientific department, and to this end began, within the college grounds, the erection of the edifice, which quite recently has been formally presented to the authorities of the institution. This magnificent gift, while forming a fitting culmination to the series of benefits already rendered by its donor in furtherance of scientific learning, brings the total pecuniary value of his endowments to the large sum of half a million dollars.

The building, which has been named Pardee Hall, is five stories high, 256 feet in length, and is constructed of brown stone. It contains chemical and metallurgical laboratories, geological and mineralogical cabinets, large and elegantly fitted up lecture rooms, besides a spacious hall. The laboratories are said to be the most complete in their appointments in the United States. Accommodations are provided for 250 students. Pipes throughout the building convey gas, oxygen, hydrogen, sulphuretted hydrogen, steam, and blast, to all points where the same may be required. There is an elaborate set of chemical apparatus, together with a valuable stock of chemicals, besides models of machinery for mining operations and various industrial purposes.

The formal ceremonies of donation consisted in an address by Mr. R. W. Raymond, lecturer on mining geology in the college, on the "Necessity for Scientific Education," together with speeches by Mr. Pardee, the Governor of Pennsylvania, and Dr. Cattell, President of the Faculty.

THE STATE OF THE IRON TRADE.

There exists at present a general feeling of depression in the iron trade, and this more especially among the smaller firms. We do not share in the gloomy apprehensions of its permanency, however, throughout the winter, and it seems to us that there is ground for a much more hopeful feeling than that expressed in the majority of cases.

The railroad supply firms and locomotive works have probably suffered most, through the countermanding of orders. But the money which would have been expended in payment for the completed work is not out of existence, but simply locked up. The same is the case with regard to all other industries which have felt the effects of the crisis. Funds, if not in circulation, must accumulate; and when they once break over the barriers which confine them, there will be a superabundance of cash within easy reach. How soon this reaction will take place, it is impossible to say. The panic gave no warning of its approach, and we believe that the anomalous state of affairs which now causes the people to so closely guard their purse strings will disappear in an equally sudden manner. The only counsel to be given is simply to hope, and to use every effort to tide over the interval which may elapse before the resumption of easier times. The country is unquestionably in a prosperous condition, and industries generally are doing excellently well. Hence, as to the temporary nature of the present difficulties there is not a shadow of a doubt; and that they cannot much longer continue, we consider almost a certainty. Those houses which, by careful management, succeed in bridging over the chasm without making serious sacrifice, will, we further believe, when the reaction comes, clear sufficient to wipe out the record of the losses they may have incurred, and, besides, show a fair profit for the year.

Regarding the probable condition of the workmen, due to the reduction of force in many establishments, we notice with regret that the sentiments of one of our most prominent firms breathe a spirit of retaliation and a lack of sympathy for the men, on account of the part taken by the latter in the strikes of a year ago. Such expressions tend but to re-open old wounds, and employers will find that, instead of thus planting the seed for future feuds, they will serve their own interests best by considering the welfare of their employees. By assisting their men in a time of trouble, to the extent of their ability, they will engraft in them a feeling of gratitude which will serve materially to diminish the chances of future dissensions; while it will be but ordinary charity to endeavor to alleviate the condition of fellow beings who, from no fault of their own and for an indefinite period, are thus forced out of employment and compelled, as best they may, to face the hardships and miseries of the coming winter.

ELASTIC PROFANITY.

At a summer festive gathering on one of the Thousand Isles of the St. Lawrence, last summer, the Rev. Dr. Pullman, of Peoria, playfully gave, as a complimentary toast, "The health of the inventor of Elastic Profanity," in allusion to Dr. S. C. Barnum, of this city, who happened to be present, and who is well known in the dental profession as the author of the *rubber dam*. This is a device now in common use, for keeping fillings dry during the operation of tooth plugging, and is almost as indispensable for good success in dentistry as chloroform is in surgery.

The rubber dam is nothing more than a piece of sheet rubber, which is punctured and stretched over the necks of the teeth, serving to hold up the gums, and wholly prevent the access of saliva at the point where the filling is being introduced. It is not only a marvelous convenience for the dental operator, but affords great relief to the patient; for it in no way interferes with the natural functions of the tongue, muscles, and glands of the mouth. It enables the dentist to perform with ease and certainty a class of most necessary operations which were previously counted almost among the impossibilities by leading practitioners. In thousands of cases, teeth which before were condemned for extraction are now readily saved and filled.

The rubber dam was invented in 1865, by Dr. Barnum, and presented by him as a free gift to the profession, at the Dental Convention held in this city during that or the following year. Previous to the discovery of this device, dentists were obliged to resort to all sorts of curious contrivances in the attempt to keep their fillings dry. Among these was the duct valve, a round disk which was placed in the mouth of the patient, upon the orifice of the salivary gland, and there pressed by a clamp, to prevent the escape of the saliva. This was painful to the patient, as well as injurious, as it caused an unnatural engorgement of the gland.

Then there was the saliva pump. While the dentist was engaged in filling the tooth, an attendant stood by and worked a hand pump to draw off the saliva from the patient's mouth

Sometimes the dentist had to take plaster casts of the defective tooth and adjacent parts, and by their aid manufacture temporary bulworks of gum mastic, to fit the mouth, with a view to shut off the water from the designated tooth. This preliminary operation involved much more time and trouble than the filling of the tooth.

Then there were the tongue clamp, the gum clamp, the gag, the iron presser, and other special tormenting devices, which were brought into operation for the one purpose mentioned; to say nothing of sponges, blotting paper, and cloth napkins, with which it was deemed necessary to stuff and torture the patient's mouth. All of these relics of what may be termed the dark age of dentistry have been superseded by Dr. Barnum's rubber dam. The author occupies a high place in the estimation of the profession, by whom he is justly regarded as a benefactor; while every dental patient, who remembers the old instruments, gives honor to the inventor, and rejoices with elastic profanity.

THE LATE DR. NELATON.

To Nélaton, the greatest of modern French surgeons, recently deceased, it is said that the medical profession owes the perfection and simplification of an immense number of the most difficult chirurgical operations. Although he wrote but little, he manifested a wonderful genius for devising tools and apparatus, and for imparting clinical instruction to others. "Give him a piece of wood, some iron wire, and some chisels," says a biographer, "and he will invent and construct an instrument to suit any requirements."

He detested display, and particularly avoided spreading out cases of implements during the course of an operation. "Surgery *à grand orchestre*," he called such exhibitions; and it seemed as if he managed to do far more with his fingers than many other surgeons with the most elaborate of tools.

His coolness equaled his dexterity, and some of his sayings will doubtless pass into proverbs. "When you have made a correct diagnosis and know what you are about, you risk nothing," was a favorite remark. "If you have the bad luck, while operating, to cut a man's carotid artery, remember that it takes two minutes' time to cause syncope, and four minutes will elapse before he bleeds to death. Now four minutes is just four times as long as is necessary to place a ligature on the vessel, provided you do not hurry": and "You are working too quickly, my friend; remember that we have no time to lose," were other now famous observations made during the course of difficult operations.

Nélaton attained very general celebrity from the fact of his treating the Prince Imperial and the wounds of Garibaldi. He died of a lingering malady of the heart, continuing his teachings and practice to the last.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW GALVANIC BATTERY.

Abbe Fiehol, says *Les Mondes*, has recently constructed a new battery, using a Spanish mineral which is probably a kind of pyrites. Within a glass jar is placed a zinc cup, 7 inches long, 3 inches deep, and 2 inches broad, into which the mineral is packed. Above is a piece of copper, and the interstices are filled with pulverized coke, mixed with ten per cent of chloride of sodium (common salt) and moistened with water. Four elements, united with isolated copper wires, copper to copper and zinc to zinc, it is stated, gave a current of surprising energy, fully equal to that of five Bunsen couples. The battery is constant, and it has been found that, after eighteen months continuous use, it operates as well as when first employed. The only condition seems to be that it should be kept thoroughly moistened.

A NEW TEXTILE PLANT.

The jury at the recent Exposition, at Lyons, France, awarded a medal for the utilization of the fiber of a marsh plant, commonly known as the *massette*. It is of the typha family, and three varieties, namely, *typha latifolia*, *angustifolia* and *minima*, yield the fiber. The plant grows in a wild state in great profusion in streams of water, ponds, etc., and reaches a hight of some ten feet. Heretofore it has been employed for seating of chair bottoms and thatching of cottages, and occasionally in place of straw as bedding for animals.

The mode of extracting the fiber from the leaves after the latter are cut and dried consists simply in boiling them for several hours in an alkaline solution and afterwards dressing them in a mill or under rollers. Washing terminates the process. A yellowish paper is made, worth about $16 per 220 pounds. The fiber, it is believed, may be used for fabrics and for cordage, and is considered equal to hemp, flax or jute.

AMERICA NO LONGER A CUSTOMER FOR BRITISH STEEL.

The excitement produced in Sheffield by the rise in coal has been intensified by a rumor that one of the largest firms engaged in the manufacture of steel—mainly for American customers—is about to transfer its business to the United States. For a long time past these makers have been producing steel from Bilbao ores, but have at last found themselves (overweighted by the cost of freight and the high prices of fuel and labor) unable to compete with American makers, who import the ore direct, and manufacture upon the spot. If confirmed, says *Iron*, this report will only tend to prove more clearly than before that, although we need not —for awhile—dread the American as a rival, he is gone for ever as a customer.

THE MANUFACTURE OF MAGNESIA.

The Washington factory, near Newcastle, England, manufactures the greater part of the magnesia used in the world. The principle of the process employed consists in treating dolomite with gaseous carbonic acid, under a pressure of 5 or 6 atmospheres. The dolomite is first dried, then finely pulverized, and afterwards placed with cold water in a cylinder which constantly revolves on its horizontal axis. The carbonic acid gas formed by the action of hydrochloric acid upon carbonate of lime is, by a powerful pump, driven into the vessel at the pressure above noted. The solution of bicarbonate of magnesia thus produced is carried into a vertical cylinder and submitted to steam (the consequent elevation of temperature regenerating the neutral carbonate,) and then led into canals beside the last mentioned receptacle. Lastly, the substance is gathered into masses, from which are cut the parallelopipeds which, after desiccation, are supplied to commerce. Caustic magnesia is obtained by heating the carbonate in red hot muffle furnaces.

ANALYSIS OF TEA.

Zöllers analysis is as follows:

Potash	39·22
Soda	0·65
Magnesia	6·47
Lime	4·24
Oxide of iron	4·38
Protoxide of manganese	1·03
Phosphoric acid	14·55
Sulphuric acid	trace
Chlorine	0·81
Silica	4·35
Carbonic acid	24·30
	100·00

THE BRITISH ASSOCIATION.

We continue, from our last, abstracts from papers read at the late meeting at Bradford:

HEAT-CONDUCTING POWER OF ROCKS.

Professor Herschel and Mr. Lebour have been experimenting in this subject. Twenty-eight specimens of rocks were reduced to uniform circles of 5 inches diameter and ½ inch thickness, carefully gaged. Out of six specimens that had been tried, slate plates, cut parallel to the plane of cleavage, transmitted the heat faster than any of the others. Where the flow of heat had become uniform, the water was raised 1° Fah. in thirty-two seconds. With marble, sandstone, granite, and serpentine, about thirty-nine seconds were required to raise it by the same amount. The greatest resistance to the passage of heat was offered by two specimens of shale, gray and black, from the coal measures in the neighborhood of Newcastle, which occupied forty-eight or fifty seconds in raising the water one degree, or half as long again as the time taken by the plate of slate.

PHOTOGRAPHS OF INVISIBLE SUBSTANCES.

Dr. J. H. Gladstone, F. R. S., called attention to some photographs of fluorescent substances. Fluorescent substances, such as bisulphate of quinine or uranium glass, have the power of altering the refrangibility of the violet or chemical rays of light; hence, although paper painted over with bisulphate of quinine will look nearly white, it will appear in a photograph as if it were nearly black. Dr. Gladstone exhibited some photographs of ornamental design traced on white paper with bisulphate of quinine; although the designs were nearly invisible to the eye, in the photographs they were boldly visible. A colorless solution of bisulphate of quinine was placed in one glass, and some ink in another glass; when both glasses were photographed, they came out equally black. Dr. Gladstone said that once, at the seaside, he painted a pattern with bisulphate of quinine upon paper, and took the paper to a photographer to be photographed; he objected, because there was nothing on the paper, but on trying the experiment he found out his error. It was stated that some kinds of varnish possess a similar power of affecting the refrangibility of light.

SHOOTING STARS.

It appears, from the report of the Luminous Meteor Committee of the British Association, that shooting stars and large fire balls have appeared during the past year in more than usual varieties. Large meteors have presented themselves in considerable numbers, and ordinary shooting stars in a more striking manner, as regards the explanation of their origin, than has often been the case in former years. Of all these kinds of shooting stars, both large meteors and meteoric showers, much accurate information has reached the committee. Two of the largest fire balls seen in Great Britain were aërolitic, or burst with the sound of a violent explosion on November 3 and February 3 last. Aërolitic meteors and aërolites have also been noticed in the scientific journals of other countries, which have given rise to experiments on the composition of aërolitic substances, both chemical and microscopical, the conclusions of which continue to extend the range of our speculations regarding the origin of these bodies. Thus the existence of carbon and hydrogen, in the atmosphere from which the largest iron meteorite yet found (a few years since upon the shores of Greenland) was expelled, confirms the discoveries of Grahame and Professor Mallet, in America, of the existence of the same gases in other meteoric irons. Dr. Wöhler has thus detected the oxides of carbon as gases in the vast meteoric iron of Ovifak, found in Greenland and brought to Stockholm during the last few years by Professor Nordenskiöld; and the same gas was found by Professor Laurence Smith in the siderite which fell recently in the United States. A connection between comets and meteorites appears to be indicated by these discoveries, in the spectra of some of which gases containing carbon appear to have been certainly recognized by Dr. Huggins.

The past year was distinguished by the occurrence of a most remarkable star shower on the night of November 27 last, to the expected appearance of which astronomers were looking forward with especial attention, from the unexplained absence of the double comet of Biela (to which it belongs), from its accustomed returns in the last three of its periodical revolutions.

The cloudy state of the sky unfortunately deprived observers in the South of England from witnessing the sight; but in Scotland, and north of the Midland counties of England, many uninterrupted views of it were obtained. On the European continent and in the United States of America, as well as in the East Indies, at the Mauritius, and in Brazil, observers were equally fortunate in recording its appearance, and few great star showers have hitherto been more satisfactorily observed, or indeed more abundantly described. In an astronomical point of view, the agreement of the time and other circumstances of its appearance with the supposed path of the lost comet is so exact as to prove that the calculations made by astronomers of that comet's orbit cannot be affected by any errors of a large sensible amount, and a proof almost certain is thus obtained, that the disappearance of the comet is owing to no unexplained disturbances of its path; but that like some former comets of variable brightness, it has not improbably faded for a time out of view, and that at a future time a reasonable expectation may be entertained of re-discovering it pursuing its original path in repeated visits to the earth's neighborhood, and to the field of telescopic observation.

IMPROVED PROCESS FOR PURIFYING COAL GAS.

Mr. Vernon Harcourt said that the usual method of freeing coal gas from sulphuretted hydrogen was by passing it through lime. But oxide of iron was also employed in place of the lime, the advantage possessed by the oxide being that while the lime, after it had served its purpose, was useless and difficult to get rid of, the oxide of iron could be used repeatedly for the same purpose. The chemical changes involved were that, when the gas had passed through the oxide the latter was changed into sulphide of iron; when the sulphide was exposed to the air, the sulphur separated and the oxide was re-formed, thus enabling the oxide to be again used. This was called a continuous process, because the oxide could be continuously used. But the process was not quite continuous, for, after the oxide had been used some thirty times, it became so clogged with sulphur as to be useless. The new process was applicable wherever oxide of iron could be used in the purifying process. The difference from the old process was that the oxide during revivification was moistened with a solution of ferric sulphate (persulphate of iron), and a portion of the oxide was removed from time to time, and treated as follows: It was first extracted with water by the use of a well known arrangement. The soluble salts were sulphate of ammonia—formed in the purification by the reaction of ammonia upon ferric sulphate—and, in smaller quantities, sulpho-cyanide, hypo-sulphite, and probably sulphate of ammonia. This extract was mixed with a small excess of sulphuric acid; and yielded, when concentrated by evaporation, crystals of ammonium sulphate. The remainder of the substance was then boiled with dilute sulphuric acid, which dissolved the oxide and left a residue of sulphur. The actual process of extraction by acid consisted in treating the substance successively with (1) a solution of ferric sulphate containing some free sulphuric acid; (2) with a more dilute solution of ferric sulphate to which sulphuric acid had been added; (3 and 4) with more dilute solutions of ferric sulphate—all these liquids being the product of a former extraction—and (5) with water. The liquid resulting from the first of the treatments enumerated above was a strong solution of ferric sulphate, which was used as already mentioned, by being mixed with the charge of oxide before it was replaced in the purifier. The residue of the final washing consisted almost entirely of sulphur, and required only to be dried. It would be evident that all the oxide which had been freed from sulphate of ammonia and sulphur by this treatment passed into the condition of ferric sulphate, and in this condition it was replaced in the purifier. There it again became oxide by the action upon it of the ammonia in the gas, which it completely removed, fixing it as sulphate. This system had been brought into use as a manufacturing process, and had been found to be, as far as could be judged, a complete success.

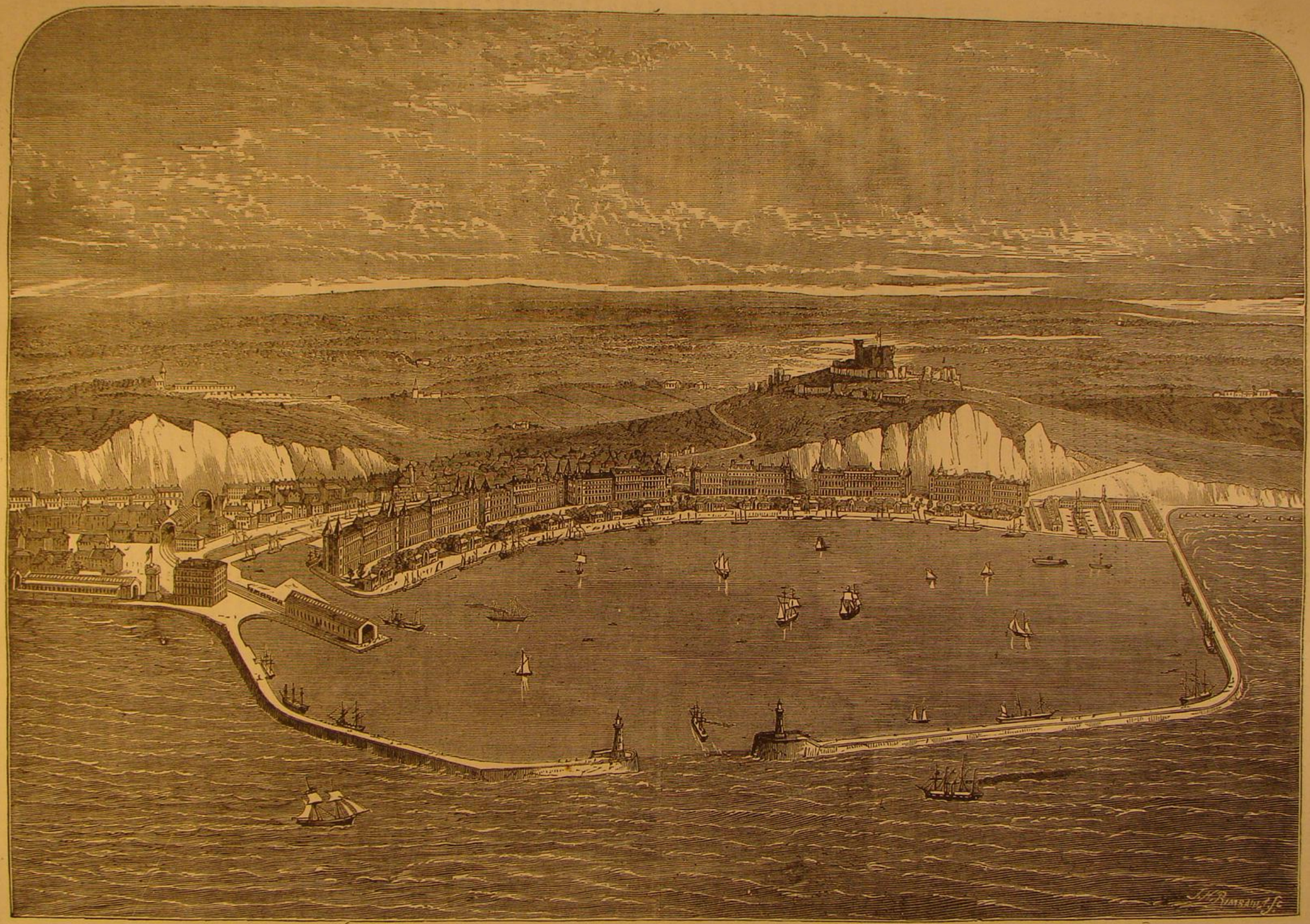
NEXT YEAR'S MEETING.

The next meeting of the British Association is to take place at Belfast, Ireland, on August 9, 1874. Professor Tyndall has been elected to preside.

A Gigantic Cotton Press.

We devote our initial page this week to the illustration and description of a new machine for the compressing of cotton, hay, or similar material. The apparatus is a gigantic affair, occupying two stories of a moderate sized building, and is a model of admirable workmanship. The parts, though weighing tuns, move with the ease and regularity of a well balanced engine, and the tremendous pressure which they develope produces results which it is difficult to imagine could be otherwise so well and readily effected.

The application of the invention to the re-pressing of cotton bales, previous to their shipment abroad, will tend to increase materially our present facilities for exportation, as a vessel is thus enabled to carry fully three times more of the staple than heretofore. There are many advantages gained, notable immunity from danger of fire or injury by moisture, increased facility in handling, besides others which will be easily apprehended on perusal of the description of the device. Apart from its capabilities, the machine is intrinsically well worthy of the examination of engineers and mechanics.



THE TOWN AND HARBOR OF DOVER, ENGLAND, WITH THE PROPOSED NEW WORKS.

PROPOSED ADDITION TO THE HARBOR WORKS AT DOVER, ENGLAND.

The Admiralty Pier at Dover, well known for its immensely solid construction, has been found to be so convenient a landing and embarking place for continental traffic that another work, leaving the shore from the other end of the town and, with the work already constructed, inclosing a harbor of refuge of 350 acres extent at low water line, has been proposed by Colonel Sir Andrew Clark. We publish herewith a bird's eye view of the town, with the suggested improvement.

The trains of the two railroads, whose depots are seen on the left in the engraving, at present run on the top of the solid masonry of the pier, allowing passengers to pass immediately from the cars to the steamboats; but the new plan suggests the construction of an inside landing place, with covered platform for loading and unloading trains, also shown in the view (for which we are indebted to *Engineering*). This would improve the accommodations considerably, as the place of arrival and departure would be protected from the very strong tide of the Straits and from the sea, which runs at times at great hight. But the more important proposition is the other arm of the work, quitting the eastern part of Dover and proceeding seawards in a south-southwesterly direction for a distance of 3,800 feet. It then turns westward and continues further for 2,200 feet, stopping at a point 600 feet from the end of the Admiralty Pier. This 600 feet width is the entrance to the harbor.

The pier already in progress has been twenty five years in hand, the work being executed in stone facing, the inner filling being of concrete. The new work is to be entirely of the latter material, and it is proposed to use convict labor in the construction. By modifying the design of the structure now being erected, which is another feature of Colonel Clarke's design, it is believed that the whole can be completed in five years.

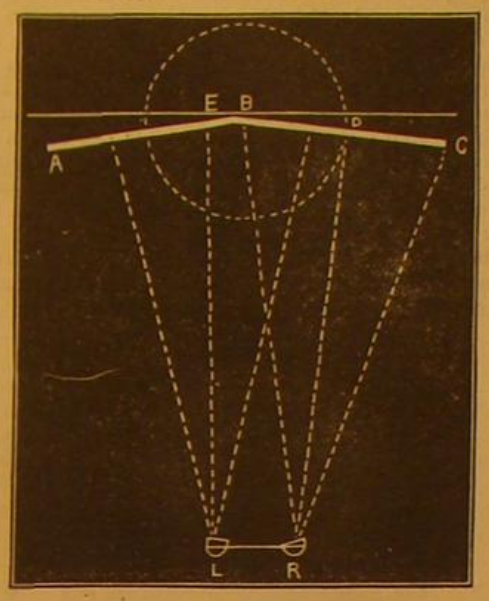
The value of a harbor of refuge at Dover will be understood when it is known that the South Foreland is but five miles east from the town. This promontory is frequently the scene of most tempestuous weather; and when the wind is northeasterly, whole fleets of vessels lay there unable to round it, suffering very considerable damage. The work would also add to the attractions of Dover as a marine resort, its beautiful surroundings and bracing air having long made it renowned in Europe. It has a very handsome façade of residences, and the commercial part of the town lies well protected by the South Downs, which almost surround it and through which the two railroads enter by long tunnels. Immediately to the left of our picture is the cliff whose appalling hight is so well described in "King Lear," from which it obtained the name of "Shakespeare's Cliff." A prominent point in the view is Dover Castle, which was built by Julius Cæsar after his landing in Great Britain, 1,930 years ago. Thirty-five acres of ground are covered by this work, which is still a redoubtable fortress,now armed with the best modern artillery. The hights on the west side of the town are surmounted by a very large fortification, with barracks, bombproof magazines, etc. But the harbor of refuge, open to all nations, will be a more beautiful and probably more useful example of the powers of modern science than either ancient or modern strongholds.

THE Chemical Society of Berlin have decided to erect a statue of Liebig, either at Darmstadt, Giessen, or Munich. Subscription lists have been opened throughout Germany in order to secure the necessary funds.

New Stereoscope for Large Pictures.

In the accompanying diagram I have attempted to indicate the construction of an instrument, available for pictures of large size. The two halves of each stereogram are to be mounted on pieces of cardboard, joined together by leather, cloth, or other flexible material, so that the whole may be shut up like a book, with the pictures face to face.

Let L and R indicate respectively the positions of the left and right eyes of the observer, and the lines, A B and B C, the boards or frames upon which the folio pictures rest. The perpendicular pencils of light from the center of each picture now reach the eye pieces in converging lines, which, by



transmission through the prisms, may be rendered parallel or divergent to suit the particular theory of binocular vision approved of by the constructor of the instrument. I may observe that parallelism is the idea which accords best with my own apprehension of the subject. After transmission through the prisms, the rays are finally passed through suitable magnifying lenses, whose centers, I apprehend, may be employed for the purposes of vision. The eye pieces themselves may be constructed of single pieces of glass ground to a spherical curve on one side (the outside), and to the refracting angle on the other.

To determine the angular inclination of the pictures to each other, find, first of all, the point, B, at which their juncture shall be placed. Then, with a radius equal to one half the width of the pictures to be shown, describe the circle seen in the figure. From each eye piece draw a line touching the outside of the circle, and from the center of the circle draw other lines through the points of juncture. The result is the angle for the pictures. In the right hand portion of the figure I have drawn lines showing the actual direction taken by the rays in passing from the picture to the prism, and in the left the virtual or seeming direction of those rays.

The advantages I claim for this form of lenticular stereoscope are:

1. That it admits the use of pictures of any size.

2. That those pictures are not mounted on separate sheets of card.

3. That they are, as heretofore, right handed, and therefore capable of production by any perfected process.—*D. Winstanley, in British Journal of Photography.*

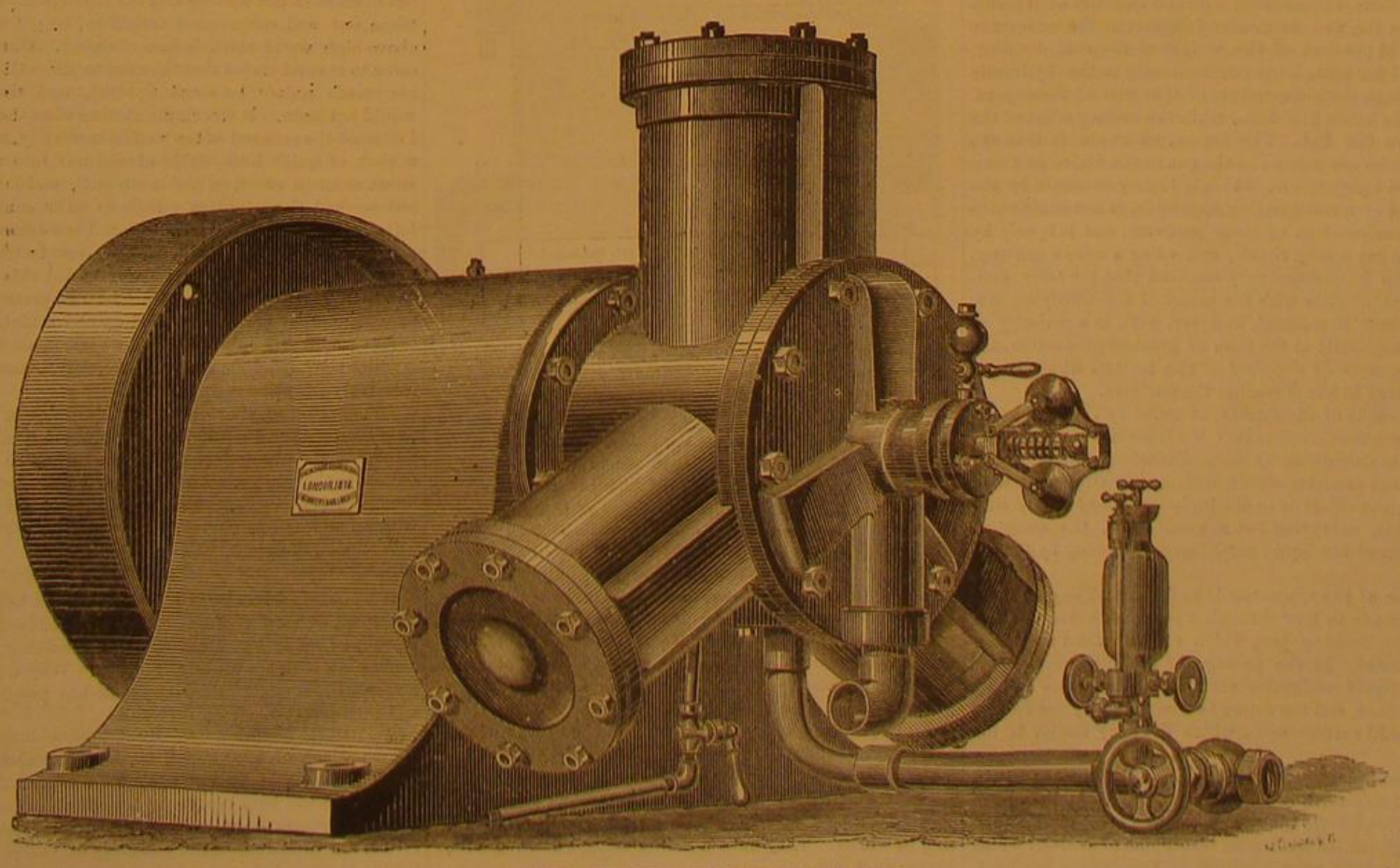
THE THREE CYLINDER ENGINE.

We published sometime ago a sectional view of an engine constructed with three cylinders, placed at angles of 120°, and three pistons operating one crank. We give herewith a view of the complete machine, from which it will be seen that the dead centers are overcome and the fly wheel is dispensed with; and a very high piston speed, to the attainment of which engine builders are now specially directing their attention, is at once made possible. Two thousand revolutions per minute, without jar or disturbance, are said to have been reached by this engine,which is the invention of Messrs. Brotherhood and Hardingham, London, England. The cylinders are arranged, says *Engineering*, to which we are indebted for our illustration, around a central chamber with which they communicate, the whole being cast in one piece. The crank pin, after passing through the connecting rod eyes, is prolonged, and fits into a hole in a rotary slide valve, which it thus actuates. The valve has a steam and exhaust port, which are alternately placed in communication with the passage belonging to each cylinder. In working this engine, steam is admitted to the central chamber, and exerts an equal pressure on the inner sides of the three pistons. Thus far the machine would be *in equilibrio*. But steam now passes through the slide valve to the outer side of one piston,thus throwing that piston into equilibrium but the three pistons collectively out of equilibrium. In other words, it renders the pressure on the inner sides of the other two pistons effective. A rotary motion of the crank and slide valve ensues, and the other pistons are alternately operated upon in a similar manner, the constant effective area for pressure being that of a piston and a half. If steam be not admitted during the whole of the inward stroke of a piston, it follows that the piston is not entirely thrown into equilibrium, and the crank has to assist it in the return stroke. The effect is of course equivalent to working steam expansively in an ordinary engine.

It will now be seen, and this is the most important feature of the engine, that a piston, when moving in one direction, pulls the crank, and when moving in the other, is pulled by the crank. Hence, the strain on the connecting rod is always a tensile one. No knock can therefore take place in the connecting rod eyes on the alteration in the direction of the piston's movement; so the fit may everywhere be quite loose, and, instead of constantly adjusting brasses, it is only necessary to renew a few bushes when excessive wear has taken place. Similarly the slide valve is free to slide on the crank pin, and adjust itself to its face as wear takes place; and the back of the crank disk always maintains a steam-tight joint in the same manner. The lubrication at first proved a source of difficulty, but it is now amply secured by the simple addition of an impermeator to the steam pipe, the oil being carried by the steam as a medium to all the working parts.

In the course of experiments it was found that few metals would stand heavy work in high pressure steam under such conditions. Ultimately hard phosphor-bronze bushes for the connecting rod eyes, working on a hardened steel crank pin, were adopted, and these are found to last a long time without any oil whatever, the steam affording of itself sufficient lubrication for these two metals.

An average speed of only 300 feet per minute for the pistons is said to give a very high indicated horse power in pro-



THE THREE-CYLINDER ENGINE

portion to the size and cost; besides which, there are the advantages due to the saving in weight. It will be seen that great protection is afforded to the moving parts, and that cleanliness of working is insured. The economy arising from the friction being so much reduced is very considerable, while the ready applicability of the engine to a great variety of uses is one of its chief merits.

The Effect of the Panic on the Iron Works.

It appears that the late financial crisis is producing after results of a rather serious nature as affecting the iron manufacture in the neighborhood of this city. A *Tribune* reporter has lately visited officials of several prominent establishments, and, with the exception of the statements of representatives of the Quintard and Architectural works, the inference to be drawn from the opinions selected is that the prospect for the autumn and winter is far from encouraging.

The agent of the West Point Foundery says that, previous to the panic, there was every expectation of a brisk demand for machinery. Now, however, prices have fallen, and people are putting off enlarging or repairing their shops until more favorable times. The West Point works, which usually employ from 600 to 700 men, are working barely two thirds of that number, and it is probable that even further reductions will be made. Little hope is held out of a revival of business before spring. The President of the Atlantic Dock Iron Works confirms the latter statement, and adds that the workmen have but a gloomy outlook. Out of 250 men employed at the last mentioned establishment, 100 will be shortly discharged. To the panic, the entire difficulty is ascribed, notably through the stringency of money, the fact of a general retrenchment taking place, and buyers are holding back in apprehension. Few contracts are now being made because contractors hesitate to involve themselves in engagements in the present unsettled state of affairs, while manufacturers shrink from accepting offers, unless they are certain they can get ready money on their completion.

The J. L. Mott Iron Works will continue carrying on a large stock and running on full time with a strong force of hands, in expectation of better times in the spring. If matters become worse, the company will have to follow the general example and make reductions. About 400 men are employed.

The Ætna Iron Works employs but 300 hands, instead of 700, and proposes to reduce the former number by half. Substantially the same views as already given, as regards an amendment of business in the spring, are held.

The Architectural Iron Works have work ahead for two or three months. Their customers are of the wealthiest class, and the government is also a patron: consequently collections are exceptionally ready with this company, but even in their case some difficulty has been found during the early part of the difficulty. No trouble is experienced in obtaining currency to pay off. The Quintard Works have not been interfered with seriously, on account of their business being mainly repairing. The proprietors consider that the complications will be merely transient and that money will be plentiful during the winter, while an unusually active trade will spring up during the spring. The full force at the establishment is 500 hands, and no material reductions will be made.

A New Mode of Condensing the Liquefiable Matters held in Suspension in Gases.

BY MM. E. PELOUZE AND P. AUDOUIN.

It is well known to all gas engineers that gas, as it passes from the retorts, carries along with it a quantity of liquefiable matters (tar and ammoniacal liquor) to the amount in general of 12 per cent of the weight of the coal distilled. Only 4 or 4½ per cent, however, condenses in the hydraulic main, although the temperature of that part of the apparatus is always below 212° Fah., while the boiling point of the tar is above 600° Fah. The reason, no doubt, is that the liquid particles are present in the gas in the vesicular form. The reduced temperature, which it is easy to obtain by the employment of a refrigerating apparatus, is not sufficient to cause the condensation of these particles; and it is only by carrying the gas a long circuit, and using a coke condenser, that they can be so completely removed that the tarry matters may not interfere with the action of the purifying materials. It may be asserted, however, that, in a majority of works and especially at the time of greatest production, the gas is not completely deprived of the matters which ought to be removed before it reaches the purifiers.

The new mode of condensing, invented by the authors, is founded upon the principle that the liquefaction of the globules held in suspension by the gas, is brought about by the contact of the particles either with solid surfaces or with each other; the object is to obtain, by the aid of a very simple apparatus, occupying but a small space, the complete condensation of the liquid particles carried along by the gas or vapor.

The action of the apparatus is as follows: The gas to be purified is made to flow through a series of holes of small diameter, so forming jets, which strike against a surface placed opposite. In the passage of the gas through the holes, the liquid molecules are brought into close contact with each other, and the action is completed by the contact with the solid surface upon which the tarry matter is deposited.

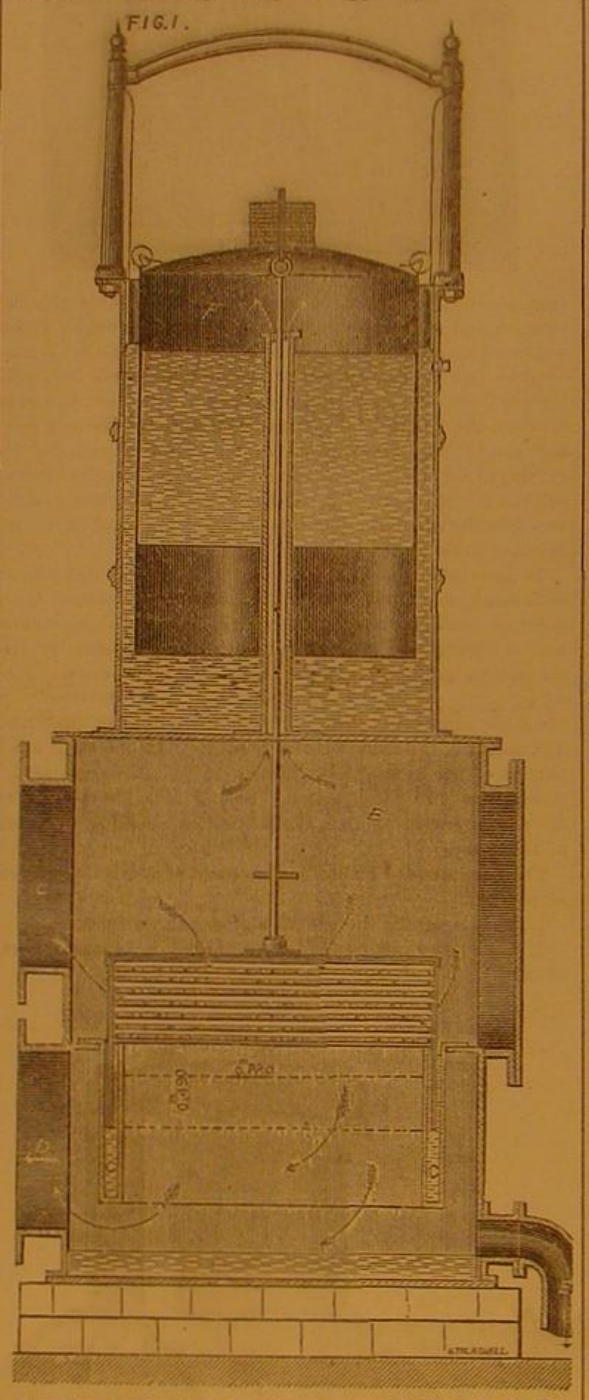
The intimate contact between the liquid globules and the gas which holds them in suspension, obtained by the use of this apparatus, effects the condensation of some matters (ammonia, sulphuretted hydrogen, bisulphide of carbon) which hitherto have only been removed by complicated methods, sometimes injurious to the illuminating power of the gas (washing with liquor, etc.). It must be added that, by passing the gas, properly cooled, through the apparatus, any naphthaline is completely eliminated and retained along with the tarry matters.

A high pressure is not necessary to the use of the apparatus, eight tenths of an inch of water being sufficient in ordinary cases. It may be placed either before or after the exhauster; if before, a weak vacuum must be maintained.

The most striking result of the use of the apparatus is the almost complete removal of sulphuretted hydrogen from the gas, and it follows that a very important economy in purifying materials must be effected wherever it is employed. An apparatus (of which we append an engraving) has been in operation in one of the Paris works, at which the daily make exceeds 350,000 cubic feet, for several months with perfect success; and others are now to be installed in all the works of the Paris company. The gas, after passing through this apparatus, the capacity of which is less than a cubic yard, is found to be completely deprived of tarry matters; while the tar deposited is rich in oils, and the ammoniacal liquor collected is larger in quantity and more than twice the strength of the ordinary condensed liquor.

In conclusion, it is said that numerous photometric experiments have proved that the gas loses none of its illuminating power in passing through the apparatus.

FIG. 1.



A is the condensing apparatus, properly so called; B is the chamber in which the apparatus moves; C is the inlet for gas; D is the outlet for gas after passing the condensing apparatus; E is the outlet pipe for condensed products, terminated by a siphon; F is the regulator, by means of which the number of perforated plates in use is varied according to the quantity of gas to be purified; and G is the water space into which the apparatus dips.—*Journal of Gas Lighting.*

Statistics of Vassar College.

There are over 21 miles of gas pipe in the building, which, including the various stories, covers a floor space of over five acres. There are 410 young lady students, 50 professors, teachers, and assistants, and 100 servants and helpers, making between five and six hundred persons, all of whom board upon the premises. A special telegraph wire and a horse railway extend from the College to Poughkeepsie, N. Y., distant 2½ miles. The young ladies drink 150 quarts of milk every day, swallow 150 pounds of butter, and 40 pounds of sugar for pudding sauce for one dinner. The students are required to spend one hour daily in the open air for exercise; they have a lake, and boats for rowing in summer, and skating in winter. They have a riding school, bowling alley, gymnasium, etc.

Correspondence.

(Correspondence of the Scientific American.)

Middletown, N. Y.—Its Manufactures and Institutions.

To the Editor of the Scientific American:

If anybody wishes to find a really enterprising, thrifty and beautiful place, let him come up here to Middletown. It is 67 miles from New York on the Erie railway, in Orange county, the garden of New York State.

I suppose your readers know that the finding of so many fossil animal remains hereabouts, including bones of gigantic mastodons, is attributed to the ancient attractive fertility of the soil and its superior natural endowment with the phosphates of lime: a substance that contributes luxuriance of growth and vigor not only to grains and grasses, but to all living things that derive nourishment therefrom. Hence the inhabitants of Orange county are notable as an enterprising and long-lived people. The county chickens lay the finest eggs, the cows yield the richest milk, the cattle and sheep furnish superior meat, the oxen are large and brawny, the horses muscular and spirited.

Middletown is one of the homes of inventors. Here new inventions and manufactures flourish. I have been much interested during a tour of the shops. The Orange County Butter Pail Company are making here large numbers of the improved tub, patented not long ago by your house. In the various mechanical establishments, which include large founderies, rolling mills, hat works, horse shoe nail mills, file works, saw factories, etc, I find that the SCIENTIFIC AMERICAN is read and studied with satisfaction by the more intelligent operators.

Among the specially interesting places that I visited were the Madden rolling mills, and the saw factory of Wheeler & Co. Both of these concerns were built up and are guided by a man who, from what some might regard as a humble condition of life, has elevated himself to a high place in the regard of his fellow citizens. E. M. Madden was, only a few years ago, a poor factory boy, but now he is a distinguished man, has occupied many important public positions, is now State Senator, to which place he is soon to be re-elected. I see that some of your city papers speak disparagingly of him, doubtless from political bias. But they evidently know little of his real character. A natural orator, honest to a fault, incorruptible, progressive, the advocate of all useful enterprises and improvements, he is greatly esteemed by the people; and the masses have in him a faithful and able representative. The six noble public schools which exist here are examples of his personal efforts to promote the public good; while among the later works of which he is godfather is the new and splendid State Asylum for the Insane, at this place, now nearly finished. But I must defer a description of this model institution until my next; after which I may give you a few words upon the remarkable mineral deposits of this region, and perhaps say something of certain interesting geological curiosities found near Goshen, seven miles hence. TRAVELLER.

Middletown, N. Y., Oct., 1873.

Carbonic Acid in Wells.

To the Editor of the Scientific American:

Last year I read your articles on carbonic acid gas in wells I remember that I was once engaged in putting up a bathing house, to be supplied with water from a well. After getting, as I supposed, everything done, the pumps soon exhausted the water from the well, and there was no remedy but to take out the walling and dig it deeper. I had the wall taken out and commenced rewalling, to get the new wall above high water mark before stopping. One of the hands came to me and stated that the man in the well could not get his breath unless he stood upright, and that his candle would not burn. It struck me at once what the matter was. I ordered the man out of the well immediately, and put about a peck of quick lime (oxide of calcium) into the tub, with about as much water, stirred it up well, and lowered the tub and worked the windlass a little so as to cause the gas to fall on the surface of the lime water. Then I drew it up, stirred up the lime and water again, so as to present a fresh surface of lime water, and lowered again. I did this three times, and then let down a candle, which burned perfectly well. My man then went back and walled up above high water mark before stopping for the night. I was astonished last year, in reading your articles on this subject, that no one struck upon this truly scientific remedy.

The burning of charcoal or anything else in wells would only increase the quantity of carbonic acid gas, unless such a current could be gotten up by the fire as to carry the gas out with the smoke, which I think hardly possible. The lime plan is easily done, absolutely certain, and in accordance with scientific principles. F. A. HOKE.

Walhalla, S. C.

WE published last week a portrait of the late Joseph Gillott, Esq., of steel pen fame. A correspondent is reminded thereby of an amusing conundrum, circulated long ago in connection with his name, as follows: Why was Mr. Gillott a very wicked man? Because he makes people steel pens and then tells them they do write.

Two prizes, of $350 and $150, have been offered by the English Society of Arts, on the motion of Sir Joseph Whitworth, for the best essays on the establishment, in large industrial concerns, of savings' banks for workmen. Manuscripts are to be sent to the Secretary of the above association at London, before the 1st of December next.

LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 17.

LIVERPOOL, ENGLAND, September, 1873.

We have at last reached the end of our European tour of observation, and are ready to re-embark for America. The "doings and observations," of which we are directed to make reports to the President, have been fruitful of interest and of instruction, and we look forward to our arrival at home with almost unalloyed pleasure. We have enjoyed good health, have made many pleasant and some eminently distinguished acquaintances, have enjoyed most exceptional opportunities of acquiring information, have added largely to our stock of general knowledge, and have filled our note-books with the technical and engineering statistics and memoranda which we came specially to seek.

Since leaving France, we have been even more fortunate in gathering professional information than during our continental journeyings. The fact is not at all surprising, however, for, as was remarked at Vienna, by far the greater part of all that is admirable as well as novel, in European practice, has its origin in British workshops. We have found time to make an excursion to some of the more interesting of the working districts of this country, and have also been fortunate enough to see some of the larger and best known workshops.

On the whole, there does not seem to have been an important advance in the standard practice in either of these important fields of labor since our last visit to Great Britain, three years ago. This is the case in the machine shops quite as much as elsewhere. Visiting the establishment of

SHARP, STEWART & CO.

a firm noted for the accuracy of their work, and particularly for the excellence of the tools of which a large proportion of their product consists, we found the verdict of the Vienna jury, which ranked them with our own best builders, fully sustained. Their shops have been erected in that patchwork manner which is oftener observed in Great Britain than in the United States, and are by no means as well built, or as well arranged as could be desired; and a large proportion of their tools would be considered antiquated, and would have been long ago replaced by more effective machines had they been the property of an American firm of first class tool builders.

The fact that the saving of the labor of a single man pays the interest on capital amounting to twelve or fifteen times his annual wages seems less generally recognized in Europe than on our side of the Atlantic, and the possibility of the principle finding application in the substitution of modern designs for older tools seems unsuspected. All tools here are made self-feeding, however, and considerable ingenuity is exhibited in devising new feed motions. We noticed here, as in some other shops, the adoption of the Whitworth tool holder for planing machines. This contrivance is a simple and effective one for rotating the tool and then taking a cut when the table runs backward as well as when moving forward. A round nosed tool is used, and a large saving of expense is effected by the efficiency of the device. A slotter was used for dressing up the cranks of a cranked axle. The axle was secured in a vertical position, and two cutting tools were employed, thus trimming both cranks simultaneously. Systematic endeavors to effect the greatest possible saving of labor, a direction in which our manufacturers excel all others, are more noticeable here than in any place visited in Europe. The rapidly increasing cost of labor in Great Britain is compelling rapid changes in this direction. A large amount of locomotive work is done here, and little more need be remarked than that the designs were in greater variety, and more in accordance with American ideas and practice, than is usual in this country. The work was unusually excellent. Steam riveting seems to be practiced wherever possible. In setting up seven eighths rivets, two blows were invariably given, and thus, although the machine was rather a light one, the work was thoroughly performed. The edges of all plates were planed, instead of being left, as is too generally the case with us, to be chipped by hand previously to caulking, a not infrequent cause of furrowing and of consequent explosion. Fireboxes were of copper, and the tube plates, at that end, which were an inch or more thick where the tubes entered them, were thinned down, below, to the same thickness with the other firebox sheets. Shells were made with butt joints and covering strips. Wheel tyres were of Vickers' steel, and were always flanged, whatever the position of the wheel. We were received most cordially by a member of the firm, and were introduced to a son of a director of the company, who kindly took us through the works. The young gentleman was serving an apprenticeship, and learning the business in the most thorough manner. We accepted this fact as an evidence of a better appreciation of the dignity of labor than has generally been observed in England, as well as of an understanding of the fact that scholastic attainments must be supplemented by a knowledge of shop practice, gained by actual contact, to secure ultimate success in any branch of mechanical engineering.

The most remarkable and in every way interesting locomotive building establishment in Great Britain, or in Europe, is that of the

LONDON AND NORTH WESTERN RAILWAY COMPANY,

at Crewe, and we spent a day there, seeing more that was novel and a greater display of ingenuity than we had ever seen outside the United States in a single manufactory. The superintendent at Crewe was, for a long time, Mr. Ramsbottom, one of the ablest locomotive engineers living, and to him is due the credit of planning this great establishment, and for the majority of the many ingenious departures from and improvements upon standard practice, as seen elsewhere. Six thousand men are employed here, and a town of 22,000 inhabitants has been built up about the works.

One hundred and fifty locomotives are built per year, and nearly two thousand are kept in repair. Immense quantities of steel are made at these works, and converted into rails, tyres, boilers and running parts of locomotives. Even the bricks for the new building in course of erection are made by an excellent machine built at Rugby, and are baked on the grounds in the annular Hoffman kiln. The steel works contain four converters of ten tuns capacity each. The large and well planned, finely lighted foundery, fitted with hydraulic cranes and steam travelers, is a model of its kind. The iron from a number of puddling furnaces, and the steel from the Bessemer works, are worked in a rolling mill in which the large plate rolls are driven by the now well known Ramsbottom reversing engine, or are forged in the smith shop, adjoining, by the curious but effective Ramsbottom steam hammer. In this machine, the work lies upon an anvil which simply supports it, while powerful steam pistons drive against it, simultaneously from both sides and horizontally, great masses of iron which run upon tracks supported at the proper hight above the floor. The heating furnaces are Siemens' regenerative gas furnaces, the most economical known; yet even these are on so large a scale as to require two hundred tuns of coal per day.

In the machine shops, we noticed that eccentrics were all bushed with white metal, and we were particularly interested in the style of connecting rod ends. They are all made solid, without strap, gib or key, and bushed with white metal. No provision is made for taking up wear. When worn and beginning to shake, the bushings are taken out and recast. This is only found necessary at long intervals. Dome tops are struck up, and the seats of all boiler mountings are of wrought iron. The boilers are usually four feet in diameter and three eighths of an inch thick. Steam is carried at 120 to 130 pounds. Engine frames are of 1½ inches plate, cut out, as in all European shops, straightened and then ground smooth by a grindstone revolving horizontally in a tank containing water. All wheels are of wrought iron. Piston rings are of the Ramsbottom style, small rings sprung into grooves in the piston, and seem to give full satisfaction. Our forward trucks are never used, their small wheels being looked upon with great distrust. English and continental builders prefer a single pair of larger wheels. The solid bar Stephenson link is used, a decided improvement upon the strap link universally used in the United States.

Both injectors and feed pumps are fitted to all engines. The express engines of this road are driven at higher speed and are claimed to make better time than those of any other road in the kingdom. They are remarkable for the great size of their, usually, single pair of drivers. Six and a half feet is the usual size, seven and a half is not uncommon, and eight feet diameter has been reached, in the one example of the engine "Cornwall," which is still kept at work. This engine shakes badly and has large bills for repairs. The favorite design is now, as with us, two pairs of coupled wheels for express engines, but with drivers six and a half feet diameter. Freight engines are given five feet six inches wheels.

This whole establishment, with its fine buildings, excellent plant, and peculiar designs of machinery, and its excellent work, should be carefully inspected by every American engineer visiting Great Britain.

In iron making, the growth in size of blast furnaces seems to have ceased; the temperature of blast has not been elevated; the same forms of hot blast stoves are still used; and the yield of metal per tun of fuel consumed still remains as three years ago, about tun per tun, for the best known results. In the

CLEVELAND DISTRICT

the most generally approved size of furnace seems to be about 75 to 78 feet high, and 26 to 27 feet diameter of bosh. The temperature of blast is about 1,000° or 1,100° Fah., with cast iron stoves, and two or three hundred degrees higher with brick ovens.

THE CUMBERLAND REGION

was the most interesting section visited, both on account of its own importance and the magnitude of its yield, and of its peculiar relations to our own iron manufactures.

This district is situated on the extreme northwestern corner of England, and, until within a few years, was only known as a beautiful country abounding in fine scenery and picturesque old ruins. An excellent red hematite, capable of yielding exceptionally fine iron, was known to exist, but its distance from the market and the comparatively high cost of fuel forbade the successful development of the iron manufacture in that country. The introduction of that most wonderful of all metallurgical processes, the Bessemer steel manufacture, and the discovery of more convenient and very extensive deposits, both of ore and of flux, has, during the last two decades, produced an astonishing change.

The ore of Cumberland is the only known British ore which answers well for the process of Bessemer, and it therefore happens that the opening of this section of country has been pushed with a rapidity which reminds one of the mushroom-like growth of some of our own western towns. It thus happens also that the future prosperity of Great Britain must, probably, depend largely upon the extent of this single deposit, for it seems very certain that the prosperity of any manufacturing people, like the British, must depend in an important degree upon, if it is not absolutely determined by, the cheapness with which its demands for low steel can be supplied.

The principal town in Cumberland is

BARROW,

a city of twenty-five or thirty thousand people, occupying the site where, a quarter of a century ago, existed a small and unknown hamlet. Here, the wealthy owners of the soil and proprietors of all manorial rights, the Dukes of Devonshire and Buccleugh, have established what is probably the finest Bessemer steel works in Europe, in which, and in the neighboring mines, are employed from ten to twelve thousand people.

We found, at Barrow, sixteen blast furnaces, varying from fifty-six to sixty-one feet high and from sixteen to nineteen and a half feet in diameter, the larger of these sizes being considered to be about the maximum for economy here. The blast was heated in both iron and firebrick stoves, the temperature of blast being about 900°. A higher temperature had been tried with less satisfactory results. Nineteen blowing engines of a united power, as stated, of over two thousand horses forced this air into a conduit of immense size. The production of pig metal was given at 280,000 to 300,000 tuns per year, from unmixed Cumberland ore. The metal, which we had an opportunity to examine, was a fine, rich, dark gray iron, precisely the material best adapted to the manufacture of Bessemer steel.

Eighteen converters are set in the steel works, and the production of steel amounts to 100,000 tuns per year, principally rails and tyres. The roll trains and accessories were of the most approved modern design, and the heaviest train is driven by a Ramsbottom engine.

The plan of buildings and the general arrangement of plant are exceptionally excellent. The raw material enters the works at one point and passes through one process after another, continually approaching the opposite extremity, where it finally emerges in marketable shape. So fine an example of a well arranged and well built establishment is less often met with here than at home, where we have not a few engineers who know how such work should be done, and find a way of doing it.

The ore of Cumberland is smelted here without mixture. It is a rich ore, and is almost free from either of those poisonous constituents, sulphur and phosphorus.

The spiegeleisen is obtained from both Sweden and Germany, the former being now furnished of admirable quality. The coke is brought across the country from Durham, a distance of something more than a hundred miles, and the limestone is found, of good quality, nearer home. The material produced is, as might be expected, of most excellent quality, as was evidenced by the fine samples shown here as well as by the still more remarkable and beautiful specimens which we saw at Vienna. It finds a large demand in the United States.

We might wish that time would allow of an extended description of other establishments in which we have seen so much to admire or to criticize during our short stay on this wonderful island, but our letters have already, probably, occupied too much space in the crowded pages of the SCIENTIFIC AMERICAN.

In the great Cumberland iron-making district, we learned that, even there, the size of furnace and high temperature of blast had apparently reached its limit. In Lancashire and Staffordshire, we saw some of the worked out collieries which have drawn the attention of thinking Englishmen seriously and earnestly to the question of the future coal supply. The dozens of unused hoisting engines and water filled shafts to be seen between Birmingham and Stafford, and the startling figure—probably 150,000,000 tuns—representing the present annual consumption, when considered together, may well startle British statesmen. To an American this may appear also most important as indicating the rapid approach of the time when our markets must be supplied solely from our own iron and coal producing districts. Fortunately, we are most amply supplied with this kind of mineral wealth, more valuable than the gold deposits of California or the silver of Colorado and Nevada. At

SHEFFIELD

we saw the great mills in which were rolled the fourteen and fifteen inch armor plates for the British navy, and enjoyed a pleasant meal with the proprietors of the establishment noted, the world over, for the manufacture of the strong, tough Firth steel, of which is made the inner tubes of all British ordnance. We found there also a large number of men employed in making files. We visited the district where the well known brands of

LOWMOOR AND BOWLING

iron are made, and learned to attribute their excellence, their hardness, pliability and uniformity of high quality to the care taken in manufacture rather than to any special peculiarity of ores or of processes. We particularly noticed that no squeezers were used, but that puddle balls were invariably hammered. We spent a day at

SOHO,

inspecting the works founded by James Watt, and seeking out the old tools, of which so many were designed by that great man.

Of all these and of many other interesting excursions we cannot write at length, but, undoubtedly, what is here left untold will be related, sooner or later, by abler correspondents of the SCIENTIFIC AMERICAN.

And now we leave many places unexamined that we had hoped to visit, and we embark, our pleasure in anticipating our early arrival at home being mingled with some regret that so much still remains unseen.

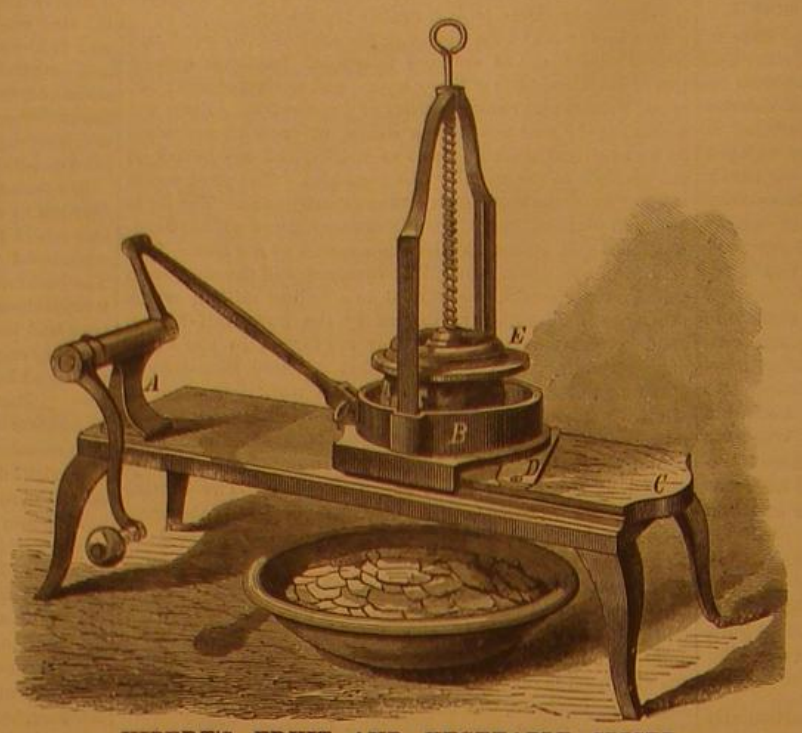
R. H. T.

FRUIT AND VEGETABLE SLICER.

Our engraving represents an ingenious little device for slicing potatoes, fruit, etc., preparatory to cooking. The mechanism is quite simple, and its work, judging from the performance of the machine sent us for examination, is expeditiously and nicely done. The hand crank shown actuates a shaft in the fixed standard, A. On the end of this shaft is an arm connecting, by means of the rod shown, with a bottomless metal receptacle, B. The latter has suitable flanges and projections, which, working in side grooves, confine its to and fro motion, caused by turning the crank, to the extent of the piece, C, which, it will be noticed, is elevated above the platform. The cutting apparatus is simply a two edged blade, D, in a slot in the bed piece, C. It is set at an angle, thus giving a drawing cut to the article brought against it.

Two bent standards are connected with the receptacle, C, and through their point of junction above passes a rod which is surrounded by a spiral spring, and carries at its lower end a follower, E. When the fruit is placed in the receptacle, B, this follower is pushed down upon it by the expansive force of the spring. The crank is then rotated, and the fruit and its holding apparatus caused to travel to and fro along the bed, C. The spring continually presses the fruit down, so that the blade, at each movement of the receptacle, B, across it, cuts off a thin slice, which falls through the slot into a dish below.

For further information regarding sale of rights, etc., address the inventor, Mr. F. C. Vibert, Hockanum, Conn.



VIBERT'S FRUIT AND VEGETABLE SLICER.

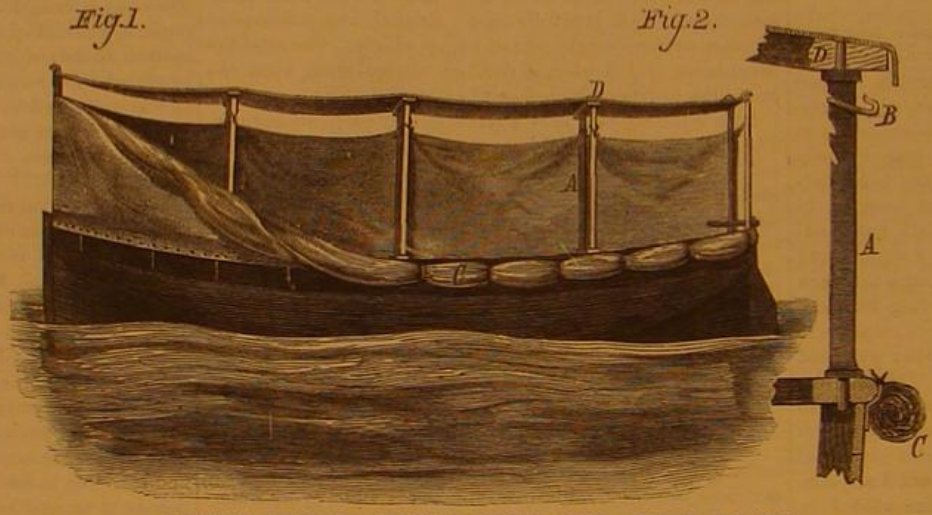
TENT ATTACHMENT FOR LIFE BOATS.

The inventor of the device herewith illustrated presents a simple and detachable arrangement for use in connection with life boats, which consists in suitable tent-like coverings, serving as protection to the occupants from exposure to the weather or sea.

To any ordinary boat are applied stanchions, A, which are either hinged so as to fold down upon the rail or may be set in holes made for the purpose, and thus readily detached for storage, etc. These supports are placed at intervals along the gunwale, as represented. Near the top of each are a number of notches, Fig. 2, which serve to hold at various hights the movable hook, B. C, Fig. 2, is a roll of tarpaulin or canvas, which, when not in use, is stowed as shown, and fastened in compact form by proper stops. One edge is riveted to the outer portion of the boat, and the other strengthened by suitable lining and provided with eyes into which fasten the hooks, B, which serve to hold the cloth up, making it a kind of weatherboard. The pin-shaped ends of the stanchions, A, fit into holes of the lateral pieces, D, which are slightly arched and attached to the top cover or awning, also made of suitable waterproof material. The bow and stern ends of the latter are held and stretched tightly by hook-shaped ends of standards arranged for the purpose. The side covering, it is stated, will serve to keep out spray and water, and suitable openings provided with elastic bands may be arranged in order to allow the use of oars when necessary.

Patented September 23, 1873, in the United States and also in England, through the Scientific American Patent Agency. For further particulars address the inventor, Mr. John R. Adams, Truckee, Nevada county, Cal.

Fig. 1. Fig. 2.



ADAMS' TENT ATTACHMENT FOR LIFE BOATS.

PLANER-TOOTHED SAW AND ADJUSTABLE SWAGE.

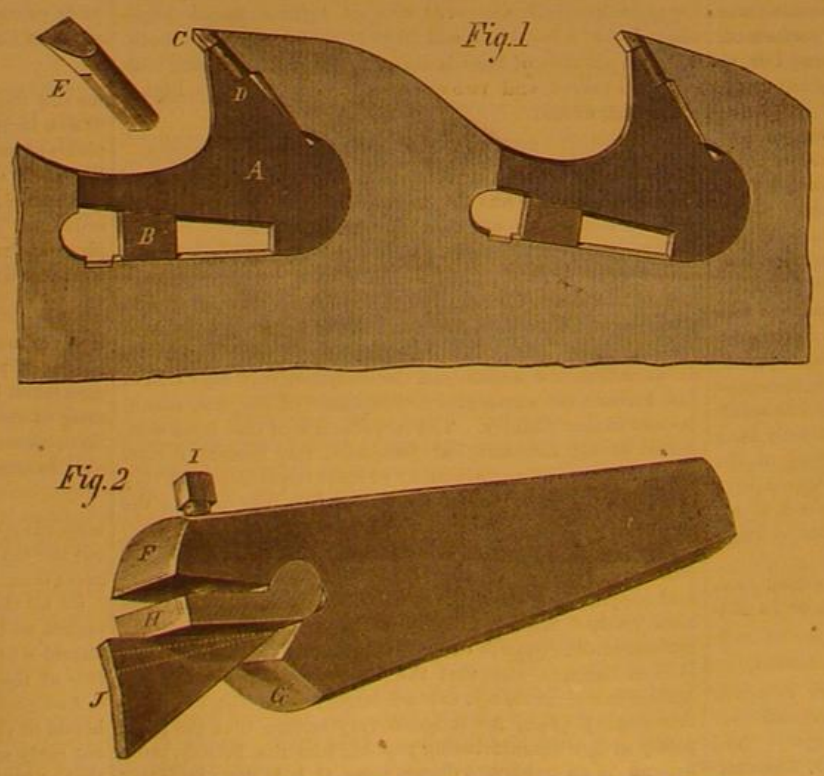
Mr. James E. Emerson, of Emerson, Ford & Co., Beaver Falls, Pa., an inventor whose devices have frequently found place in our columns, has recently patented the two novel and, doubtless, useful inventions represented in the accompanying engravings. The first (Fig. 1) relates to movable teeth in saws, and its object is to obviate, in a great measure, the expense of such teeth by so constructing them and adapting them to a saw plate that they can be used until dull at their cutting edges, and then removed and a new set inserted in their places. Our illustration is a section of the saw plate, in which clamp pieces, A, and wedges, B, hold the teeth, C, firmly in position. The pieces, A, have shoulders at D, against which the inner ends of the shanks of the teeth firmly bear.

E is a finished tooth, shown separately. It is made from a bar of steel of suitable shape, from which blanks are cut of proper length to bear against the shoulder, D, and thus be prevented from being pushed inward during the operation. The circular side of the tooth fits into a correspondingly shaped groove in the front side of the recess, and is thus securely held. There are no sharp angles either in the groove, saw plate, or the back of the tooth, which might cause the plate to spread or crack. The tang or shank is formed by a drop hammer and die, leaving the outer end, which is slightly hooked, and the edges to be the full width of the flat face of the bar. Cutting edges are thus formed which cut the width of the kerf and plane each of its sides. We are informed that the teeth thus made are durable and not liable to strain the saw plate, are intended never to be sharpened after insertion in place, and are sold in the market by the hundred.

The second invention, represented in Fig. 2, is an adjustable jaw swage for spreading the teeth of saws. The body of the apparatus has two fixed and diverging jaws, F and G, the latter of which comes in contact with the under side of the saw tooth, and is made convex in form. Through the body, at the intersection of the inner faces of the jaws, F and G, is a circular hole in which fits the round portion of a movable jaw, H, which is so constructed as to be upset or riveted in a countersink at the outer sides of said hole, so that, while it cannot be disengaged or loosened, the jaw, H, may freely turn in the socket thus formed. I is a temper screw passing down through jaw, F, and bearing on jaw, H, so as to adjust the latter to different angles with relation to the face of the lower jaw. J is a saw tooth inserted in position, showing, by the dotted lines, that the jaw, H, may be adapted to suit its particular shape or that of any other ordinary form of tooth.

In operation, the jaw, H, is adjusted as represented and firmly held in position. Blows are then struck with a hammer at the other end of the body, hard enough to upset the tooth and give it the desired form and sharpness at its cutting edge. This the device is claimed to do in better manner than the work can be performed with a file, while one size of the invention is equally well adapted to every size and shape of saw tooth, from a 72 inch, through gang mill and muley saws, down to the finest toothed bench implement.

These improved tools are covered by various patents, the most recent of which are dated September 16, 1873. Further particulars may be obtained by addressing the inventor as above.



EMERSON'S PLANER-TOOTHED SAW AND ADJUSTABLE SWAGE.

SAFETY RAILWAY SWITCHES.

We have lately examined, at the office of the Broadway Underground Railway, corner of Warren street and Broadway, this city, a large and splendid working model of Saxby & Farmer's railway lock switches, now so extensively used in England. The employment of this device is rendered obligatory upon all new railways in Great Britain, by act of Parliament, and it is voluntarily employed by most of the older companies. It is regarded in England as almost indispensable to the prevention of accidents.

This model, we understand, is a duplicate of the beautiful apparatus now on exhibition at the Vienna Exposition and which the London *Times* correspondent speaks of as follows

"Saxby and Farmer exhibit a beautiful model of their apparatus for directing the traffic at great railway junctions or termini. It has already come very generally into use, yet it cannot be too widely advertised; for, as it renders accident humanly speaking impossible, a grave responsibility rests with those companies who delay to adopt it. Its principles are that the signals are worked in inseparable connection with the points and switches. It is impossible to signal that the line is clear unless it actually is so, while the act of manipulating one set of signals locks all the rest and keeps them at "danger." Thus the signal man cannot mislead the engine driver; the worst he can do is to do nothing at all; the very worst that can happen is an unnecessary suspension of traffic. It may give some idea of the importance of this invention if we mention that the men in the signal box at Cannon street have to work 67 levers, which play on the points and switches of that intricate network of lines as the keys of a piano act on the chords. Thirty-six trains go out or come in in the course of the hour, and on an average there is a movement of signals or points once in each 33 seconds. Another invaluable subsidiary invention is Messrs. Saxby and Farmer's patent switch lock and bolt. Often the signalman has to change the points at a distance of some hundreds of yards from his box. He may work his levers and signal "all right" in innocent unconsciousness that anything is wrong; yet a stone may have interposed, the points may not have answered to his levers, and the train may be thrown off the rails. Messrs. Saxby and Farmer's bolt effectually prevents such accidents."

We are glad to know that this valuable improvement is to be employed upon the Broadway Underground Railway. Further information can be had of Mr. Joseph Dixon, agent for this country, as above, where the apparatus may be seen. It is well worth examination by railway people.

Travel between America and Europe.

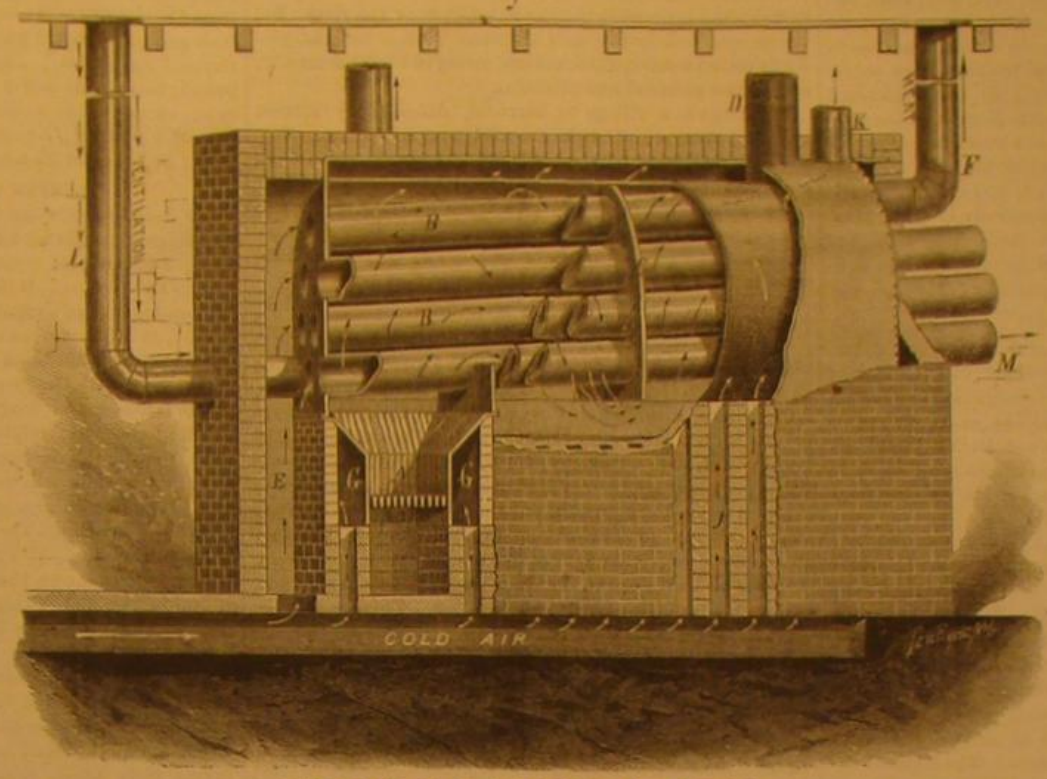
A new route between New York and London is proposed. It consists of railroad from the former city to Shippegan, on the Gulf of St. Lawrence, steamer to St. George's Harbor, Newfoundland, railroad to St. John's, steamer to Valencia, Ireland, railroad to St. George's channel, and steamer again to England. It is estimated that the voyage may be made in seven days and three hours.

IMPROVED FURNACE FOR BUILDINGS.

The improved heating furnace herewith illustrated serves not only as a means of warming the interiors of buildings, but also as an efficient ventilating apparatus. Its construction is such as to utilize the heat of the fire to the fullest extent, and also to distribute the same uniformly at every point to which the flues may be conducted.

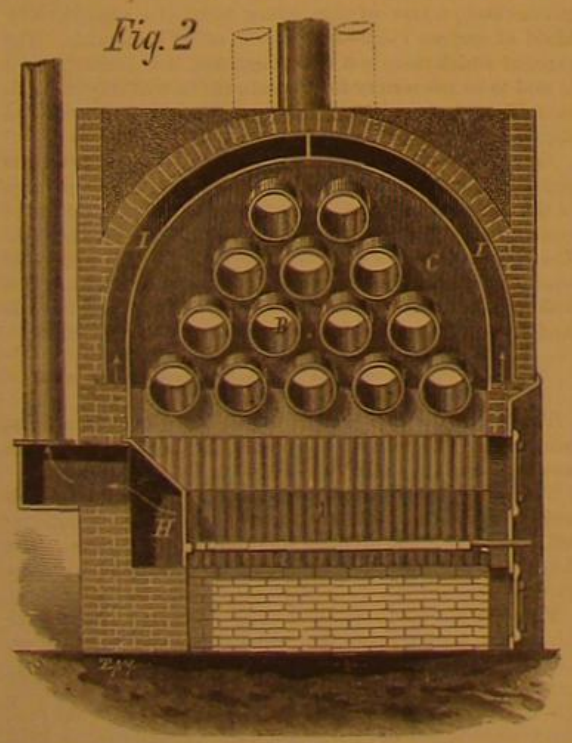
Fig. 1 is a longitudinal and Fig. 2 a transverse section. A is the fire pot, the heated air and gases from which pass up and around the tubes, B, thence down and under a partition, C, and, finally, emerge at the chimney, D. By this means the cold air, which enters the tubes, B, in the direction of the arrows, from the chamber, E, is subjected twice to the hot current; and thus becoming warmed, is led away by such tubes, a prolongation of one of which is shown at F. As there are fourteen of these flues, it will be noted, that if desired, the entire number may be utilized, each as a separate conduit to a single register. Cold air also enters below and outside the fire pot, into spaces, G, Fig. 2, and thence travels to the rear, where it passes into a heating chamber, H, Fig. 2. This reservoir may, by a suitable partition, indicated by the dotted line shown at the rear of the fire pot in Fig. 1, be divided into two compartments, from each of which a separate flue may be led. I, in Fig. 2, shows a section of still another heating chamber, formed by the space between the shell surrounding the flues and the exterior casing. Air enters this from below by the conduits, J, becomes warmed, and exits by the flue, K; or, when desired, this chamber may also be divided by a longitudinal partition, represented in section in Fig. 2, when the hot air will then be led away by the two pipes, shown in dotted lines. It will be here observed that eighteen separate flues are thus provided, each totally independent of the other, and all supplying pure heated air without any admixture of disagreeable gases. The current drawn directly from the outer atmosphere never comes in contact with the fire; but on the contrary, is securely confined in tight flues or chambers, where it is heated and at once supplied to the desired localities. It will also be observed that a uniform quantity is thus, it is claimed, insured, as, each flue or chamber forming a heater by itself, it becomes impossible for a strong current to escape in the lower part of the house while little or no

Fig. 1



FURNACE FOR HEATING BUILDINGS.

Fig. 2



heat reaches the upper stories, a frequent trouble in furnaces the parts of which are mutually dependent.

All the tubes, B, need not, in some cases, be used for heating purposes, in which event two or three may be advantageously utilized for ventilating the entire building. It is proposed to place registers close to the floor in the lower stories and to lead therefrom flues, one of which is shown at L, Fig. 1, connecting with the heater tubes used. The other ends of the latter, M, may connect with a shaft which passes up through the edifice, emerging at the roof. The hot air in the tubes will generate an up current in this shaft which, receiving its supply of air from the register and flue, L, will thereby draw from the lower rooms all the foul and heavy gases. The upper apartments, it is stated, need only be connected directly with the shaft, as the same may be arranged to pass in proximity to all. This furnace seems to be particularly well suited for hospitals and public buildings, where foul and deleterious gases are freely generated, and its effect is such as to keep the wards or halls perfectly supplied with pure air. Besides, the device aids in quickly heating rooms, as, its openings being placed low down, the cold air near the floor is drawn out, while the hot current from the heating register is continually pouring in.

The furnace, it is claimed, is well adapted to the heating of extension rooms; and by a nearly horizontal pipe, fifty feet long and ten inches in diameter, with only ten inches rise, an adequate amount of warm air is easily delivered. Half of the flues may be led vertically and half in a horizontal direction. The heating surface aggregates four hundred square feet, all of which, as we have already pointed out, comes in direct contact with the hot gases. The construction of the apparatus generally is said to be strong and durable, the metal parts being of wrought iron. The flues are eight inches each in diameter. The grate is in two sections, and is very easily controlled, while the air supply, entering through a single pipe, may be regulated at pleasure. The furnace, we are informed, has been in use for the past year, giving in every respect satisfactory results. For further information relative to supplying the apparatus, its cost, etc., address Mr. W. N. Abbott, 40 Cortlandt street, New York city.

To Clear Photo Baths.

When photo printing baths become discolored, various agents are employed in order to decolorize them. Among the best of these is the substance known as China clay or kaolin, which consists almost entirely of silicate of alumina. At the present period, paper is adulterated to a large extent by the admixture of clay, and hence, when a silver bath has become discolored, owing to the presence of organic matter, an effectual remedy is always at hand; for, in the absence of kaolin, all that is necessary is to burn any good, heavy bodied paper and shake up the ashes with the silver. On filtration it will be found to have become pure and bright.

This little bit of useful knowledge may prove beneficial to those who live at a considerable distance from a photographic chemist. Of course we all know, says *The British Journal of Photography*, that there are many agents by which the bath may be decolorized, among which may be named animal charcoal, camphor, citric acid, chloride of sodium, and others. Kaolin, however, is more generally adopted than any other; and many of our readers will be pleased at being made acquainted with the foregoing very simple method of obtaining a supply with no greater amount of trouble than that of igniting a piece of any heavy bodied paper.

Covering for Steam Pipes.

A new method of covering steam pipes is applied in the Saarbrucken district, Germany. A coat of thin loam wash is is first given, to increase the adhesion of the mass. The composition consists of equal parts of loam or clay, free from sand and brick dust, with an addition of cow hair. This is well mixed up and put round the pipe in a hot state. For better securing this coating, pieces of board 10 inches long are laid along the whole length of the pipes and fastened by thin iron wire. After applying the loam wash again to the dried mass till all the cracks have disappeared, the pipes receive another coating of the mass, until they feel quite cool, which will be attained after the mass has been laid on to the thickness of from 5 to 6 inches. A coat of linseed oil and cement is finally given. This method answers at present all requirements, the covering being perfectly airtight and free from cracks. The mass is not hygroscopic, a property making it all the more suitable for pipes in the open air. The cost of the covering per foot of 8 inch pipe is 12 cents.

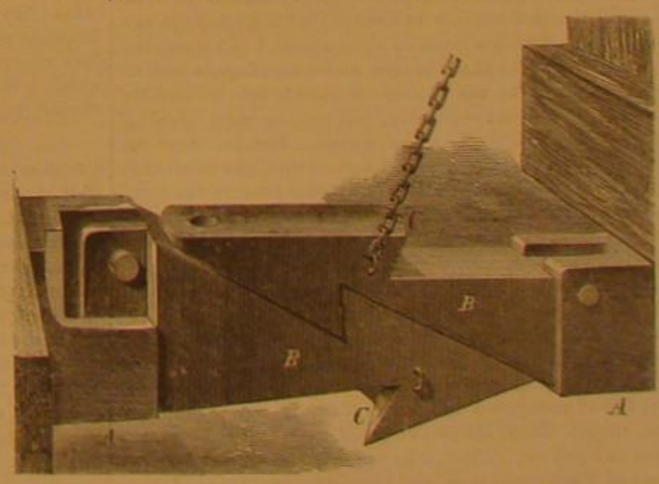
Concrete Foundations.

The Delaware and Hudson Canal Company are constructing an immense building on the corner of Church and Cortlandt streets, in this city, for their own use and as a coal exchange. The edifice is to be of brick and stone, nine stories high. Mr. R. M. Hunt is the architect. At the present time the foundations are being laid in concrete, under the superintendence of Mr. David Camp bell. The mortar used is made of 1 barrel of Portland cement, 3 barrels sand, and 28½ gallons water. These ingredients are shoveled into an inclined tube, which works a worm blade that incorporates them together and delivers them in a thoroughly plastic mass. Ten cubic feet of this mortar, fifteen of broken stone, and twelve and a half of gravel, are then placed in a box of boiler iron, four feet square, which is hung on bearings attached to diagonally opposite corners and rotated by gearing from a stationary engine. Eight revolutions completes the mixing, when the concrete is removed and transported to the point where it is to be laid. Beds of the mass, six inches thick, are placed, each being rammed down by hand before another layer is applied. The lower bed will, in all, be two feet thick; and above this, to support the walls, the concrete will be packed in bevel form to a hight, in all, of six feet seven inches. The piers are of stone, resting on a layer of concrete eleven feet square. The cost of the concrete, as compared with masonry, is estimated to be some thirty per cent cheaper.

LLOYD'S CAR COUPLING.

We present herewith an engraving of a car coupling which presents several points of novelty, while, at the same time it is of very simple design. It is intended to be automatic in action, and therefore to possess the various qualities which we have frequently alluded to in reference to inventions of this description, and which we need not here recapitulate.

A A are the drawbars, in mortises in the ends of each of which are jointed the coupling bars, B. A part of one drawbar is represented as broken away in order to show this connection, the object of which is to allow the bars, B, to be turned upward as much as is necessary, while it prevents them from falling much below a horizontal position. Upon the upper and lower sides of each of the bars, B, are formed shoulders, which are made V shaped and also dovetailed. This is more clearly shown at C C. The V shape prevents the shoulders from slipping apart when coupled, as represented, when the train swings around curves, and the dovetail stops the bars from jarring apart when the cars are run together or when in motion. The general form of the



drawbars, adapting them to slide upon each other, is already shown in the engraving and needs no description. The chain leads up to the platform or top of the car, and serves to lift the bar which is uppermost, and thus effect the uncoupling. The holes shown in the ends of the bars are for connecting them by a pin with the ordinary link coupler. It is claimed that, by this means, cars of the same or of different hights may be connected or run together with facility.

Patented October 21, 1873, through the Scientific American America Patent Agency, by Mr. R. Lloyd, of Lake Shore Railroad Bridge, Cleveland, Ohio, who may be addressed for further information.

It is announced that Mr. Bennett, of the *Herald*, is now organizing a new arctic expedition, to be sent in search of the North Pole.

THE NEW EXPLORATION OF THE AMAZON RIVER, BY PROFESSOR ORTON.—UP THE AMAZONS.

No. 4.

FROM THE NEGRO TO THE ANDES.

Manáos is an important point of departure for several lines of steamers. Steamers leave regularly for Pará and Tabatinga, and for the Madeira, Negro, Purús, and Juruá. The fare up the Madeira is $40, and up the Purús, $50. From Manáos to Tabatinga, on the frontier of the empire, is one thousand miles. The Icamiába, the first and only steamer, which has been running for nearly twenty years, leaves Manáos the 11th of each month; fare, $50; time, one week.

The Solimoens, as this middle portion of the Amazons is called, flows through a rank wilderness, broken at few points by the hand of man. There are, probably, not a hundred acres of cultivated land between the Rio Negro and the base of the Andes. The whole country is a vast plain of slight elevation, without hills or sandy campos, but with a soil of stiff clay covered with vegetable mold, and a lofty, luxuriant, humid forest. Palms are comparatively few, the most numerous being the short murumurú, the slender assaí, the spindle trunk pashiúba, the beautiful tucumá, and the urucurí, the nuts of which are used in smoking rubber.

VALUABLE TIMBER.

But it is heavily timbered with useful woods, as cedar, copal, andiróba, guacapú, capiróna (called pao mulatto in Brazil, furnishing the fuel used by the steamers), sicupéra (an excellent boat timber), acari-cuára, acariúba, moira pirárga or red wood moira coatiára or striped wood, itaúba, jutahi, sapupíra massarandúba or cow tree (one of the most valuable and durable woods on the river), paracu-úba (a very hard wood used for harpoons, etc.), cumarú, palo de cruz, palo d'arco, and many kinds of loiro. And yet there is not a saw mill between Manáos and Iquitos, a distance of 1,300 miles!

We see three varieties of banks: low, alluvial deposits covered with arrow grass or wild cane; slightly higher land covered with broad leaved plants and dwarf palms, with a dense forest of lofty trees in the *terra incognita* beyond, the most common aspect; and cliffs of variegated clay from 25 to 50 feet high, generally cut squarely away by the current, presenting a massive colonnade of trees loaded with parasites and wound with creeping plants. The signs of animal life are not proportioned to this exuberance of vegetation. White egrets and tall gray herons stalking along the edge of the water; hummers whirring among the flowers; macaws and parrots flying across the river; capybaras on the banks, and rolling porpoises and ugly alligators in the water; these are the most conspicuous forms. But the most numerous and the most dreaded of all animals on the Solimoens are the

INSECTS.

As we have already remarked, the strong trade winds keep the Lower Amazons clear of these pests; but soon after leaving Manáos, the traveller becomes intimately acquainted with five insects of torture: (1). The carapaná, called mosquito in the United States and Europe, and sancúdo on the Marañon and in Spanish America generally. (2). The piúm or sand fly—the scourge of the Amazons, called mosquito in Peru—a minute, dark colored dipter with two triangular horny lancets which leave a small circular red spot on the skin. It works by day, relieving the carapaná at sunrise. (3). The motúca (tábono in Peru) of the size and general shape of the house fly, of a bronze black color, with the tips of the wings transparent, and a formidable proboscis. (4) The moquim (ysanguí in Peru), a microscopic scarlet acarus, resembling a minute crab under the glass. It swarms on weeds and bushes, and on the skin causes an intolerable itching. An hour's walk through the grassy streets of Teffé was sufficient to cover our entire body with myriads of moquims which it took a week to exterminate. (5.) Carapátos or ticks, which mount to the tips of blades of grass and attach themselves to the clothes of passers by. In sucking one's blood, they cause no pain, but serious sores result if the proboscis breaks off in the wound. Besides these are ants innumerable in species and individuals, and of all sizes from the mammoth tokandára, two inches long, to the small red ant of the houses. The sauba is the most mischievous, from its habit of marching in broad columns and stripping the most valuable cultivated trees of their foliage. Everywhere, from Pará to the mountains, complaints are heard of this terrible pest. In some places, agriculture is impossible. These half a dozen forms of insect life must for ever hinder the settlement of the Amazons. It is true, however, that they have their migrations: Fonte Boa, for example, the paradise of mosquitos in Bates' time, is now nearly free from them. There are two kinds of bees on the River, the black and yellow. Their cells are not hexagonal, but like those of the humble bee, and the honey is thin and sour when collected. Scorpions and tarantulas exist, but not in such numbers as to be dreaded.

THE GREAT WILDERNESS.

Man makes an insignificant figure in the vast solitude of Alto Amazonas. From Manáos to the entrance of the Huallaga, a distance of 1,700 miles, there are probably not over 10,000 inhabitants scattered along the banks of the river and its inlets. The largest Brazilian town west of Manaos is Teffé, the Omaha of South America in position; yet it contains scarcely 2,000 souls, although the best agricultural region on the Solimoens. It exports annually 40,000 or 50,000 arrobas of rubber, and 4,000 or 5,000 arrobas of pirarucú fish. Here also are manufactured, by wild tribes in the interior, the celebrated grass hammock woven from the fiber of the tucum palm. The population of the Upper Amazons has not increased with the introduction of steamers. The climate is healthy, although one lives in a constant vapor bath, and Nature is bountiful. Epidemics are unknown, and ague is confined to dark colored or sluggish tributaries.

Between Teffé, where Bates spent four years and a half and Agassiz six months, and Tabatinga, the frontier fortress of the Empire, is the most uncivilized part of the Amazons. Yet here enter five great rivers which are destined to be famous: Japurá, Icá, Juruá, Jutahí, and Javarí. The only towns are Fonte Boa, Tonantins, and San Paulo, built on slippery clay bluffs, and exporting the produce of the forests and waters. Rice and cotton might be grown in vast quantities on the lowlands after the subsidence of the river. But the people, mainly the half civilized Tucúna Indians, prefer to collect rubber, catch turtles, swing in their hammocks, and live on pirarucú and plantains.

Tabatinga is a village of barracks, defended by sixteen guns and ornamented with graceful tucumá palms. This has been a military post since 1776. It stands on a high bluff of variegated clay which gives its name to the whole Amazonian clay formation. The depth of the river here is from eight to twelve fathoms, the difference between high and low water being thirty-six feet. The current, at flood time, is five miles an hour.

STEAM ON THE MARAÑON.

Here we exchanged the Brazilian Icamiába for the Peruvian Morúna. At present, the following steamers are afloat on Peruvian waters: Morúna, Pastássa, Tambo, Putumáyo, Napo, Moiro, Alceste, and Ucayáli, the last two belonging to private individuals. The Morúna is an iron vessel of 150 horse power, with a tunnage of 500, and consumes about 450 sticks per hour, which cost $14 per thousand. The rate is eighteen miles down stream, and nine up. The running time from Tabatinga to Yurimaguas is ninety hours; distance about 800 miles. She leaves Tabatinga the 21st of each month, and Yurimaguas, the 9th. The first class fare is $60, passengers providing their own bedding. There are no accommodations for ladies.

Travel on the Marañon exceeds that on the Solimoens. Nevertheless, the towns are decaying, excepting Iquitos and Yurimaguas.

TURTLES AND FISHES.

Life within the Marañon presents greater variety, at least for commercial purposes, than in the Amazons below. This is the great turtle field; and turtle hunting is the chief business in the dry season. They are to be found on the main river and all the tributaries from the Madeira to the Huallaga; but Caballococha is considered the best region: 4,000 were caught on one playa in one year. They furnish the staple meat of eastern Peru, and the oil expressed from the eggs is an important article of export. The turtles of commerce are the tartaruga grande (charápa), measuring three feet by two, and the smaller, but more delicious, tracajá (charapita). The females only are taken, so that the males, which are inferior in size, must far outnumber them. The average price of the larger turtle is two dollars, and of the tracajá, fifty cents. Besides these are the mata-mata and aiassá. The largest fish in the Amazons is the súngaro (in Brazil called the tuberon), sometimes weighing three hundred pounds, and is edible; but the most important, as furnishing the codfish of the Amazons, is the pirarucú (called payshi on the Marañon). It abounds throughout the Great River, chiefly in lagunes and in clear water; with farina it constitutes the chief food of the Indians; but it is far inferior to the Newfoundland fish. The Amazons, however, yields many others which compare favorably with the trout and perch; among these are the tambaquí (the gamitana of the Marañon), piranha, corvina, tucunaré, and acara uassú. Rays (at least two species), some three feet broad; the manati or vara-marina, which is potted under the name of mishíri; three kinds of dolphins, the small, dark colored tucuxí, the white bouto, and the flesh colored, which is the largest of all; and three species of alligator: abound, especially in the Marañon.

THE BIRMINGHAM OF THE AMAZONS.

Iquitos, the only village of size and enterprize on the Marañon is of recent origin, and now numbers 2,500 inhabitants, English, Americans, Peruvians, Indians, and nondescripts, the last forming a numerous class; for excepting a dozen lawful marriages, the rest are accidental unions. It was founded by the survivors of a massacre at Borga. It stands on a bank of dark clay (containing a multitude of fossil shells and a stratum of lignite), sixty-five feet above the average river, and three hundred and fifty above the sea. The mean temperature is 80°, and the range but 10°. The climate is unusually healthy, the diseases, such as exist, chiefly *la tinta* (dark blotches on the skin), abscess, fever, and dysentery, being due to improper food and want of cleanliness. But Sodom would shine alongside of Iquitos in point of morality and temperance.

The government works are the making of this place. Twenty years ago it was a fishing village of 227 inhabitants; now it contains a machine shop for the repair of steamers, a steam sawmill, and a brick factory. The superintendent and most of the hands are from England.

PRICE OF LABOR.

Carpenters, masons, and machinists get from $80 to $100 a month; the first engineer on a steamer has $145, and the second, $116, with rations; day laborers have $10 a month and rations. But the mischief is that this is promised, not paid; some of the foreign employees have not received a cent for sixteen months. By thus withholding payment, the government manages to hold on to imported skill. The Marañon at present is a burden to Lima, for the works and the steamers do not pay: and Congress votes a monthly subsidy of $20,000. But it is vital to Peru that she retain this Oriente. Iquitos even exceeds Manáos in

SCARCITY OF FOOD.

She exports nothing but money, and produces nothing eatable. She depends, strange to say, for almost every mouthful of food upon the east, instead of the west; upon Pará and New York rather than upon Moyobamba and Lima. And when the steamer fails to bring a supply, a famine is imminent. Iquitos receives its flour from Richmond and Baltimore; lard from Cincinnati; canned butter from England; potatoes from Portugal; coffee and sugar from Brazil; rice from Ceará and India; and all this, while almost any created fruit and grain would grow on the Upper Marañon or the slope of the Andes. Flour and potatoes sell at 20 cents a pound; butter one dollar a pound; fowls one dollar each; eggs, eighty cents a dozen; cachaça, one dollar a gallon; lime, $12 a barrel; Newcastle coal, $80 a tun; logs, $4 a piece; and it costs $5 a hundred feet for sawing.

SURVEY OF THE MARAÑON.

We were happy to meet at this place the Hydrographical Commission commanded by Admiral Tucker, which has been engaged for several years past in surveying the Marañon and its tributaries. It has just returned from an elaborate exploration of the Ucayali, ascending the Pichis to lat. 10° 22' 55", or 1,041 marine miles from Iquitos. We look forward to the publication of the report by the Peruvian government with the greatest interest. The determination of the latitude and longitude of prominent points by Captain Rochelle will straighten our geography of the Marañon region; while the meteorological and ethnological observations by Dr. Galt will make a valuable contribution to science. The Commission are about to map out the main trunk of the Marañon from the Javarí to Borga, and may then be called to explore Lake Titicaca.

Two little steamers, the Napo, of Iquitos, and the Urayali, of Nanta, run up the Ucayali to Sarayácu and Cachaboya monthly, the voyage to Sarayácu from Iquitos taking eight days up and four down. The trade at present is light, consisting chiefly in the exchange of English goods and Huallaga salt for salt fish and turtles. But this tributary, contributing more water than the Marañon above it, and navigable for about one thousand miles or within a short distance (*viâ* Tarma) from Lima, must ere long become a highway for commerce. A mule road is already projected to connect Sarayácu with the salt mines of Chasuta. Fine gypsum occurs above Sarayácu, and cinnamon around Cachaboya Lake. From the specimens collected by the Commission on the Pachita, exhibiting cyathophylloid corals, brachiopods, and ostreæ, we infer that the formation in that region is Upper Silurian. Nothing in this collection indicates the presence of cretaceous beds intervening between the Silurian and the tertiary clays. The Ucayali, which is built of galvanized iron, has a tunnage of sixty, and draws when laden but three and a half feet, is about to make an exploring trip up the Rio Napo.

The largest village above Iquitos is Nanta, but the busiest is old San Regio—a little huddle of mud huts, but mighty in cachaos. Here they distil and export 2,500 garrafones (seven gallons each) a year of this white rum—the apparent life-blood of eastern Peru—and sell it at $5 a garrafon. The cane, of which there is a vast plantation, is luxuriant, but it is said to be too watery for the manufacture of sugar. Salsaparilla and payshi (salt fish) are also shipped from San Regio.

From this point to Borga, the head of navigation on the main Marañon, where the river dashes through a deep gorge in the limestone mountains, is about 450 miles. But trade seldom calls a steamer beyond the mouth of the Huallaga. The Morona turned up this tributary and left us on the clay bank of Yurimaguas, where we leave our readers while we make our foot tramp through the forest and the ascent of the Andes.

JAMES ORTON.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of August, 1873:

The number of inspection visits made during the month were 1,087; boilers examined, 2,026; internal examinations, 563. The hydraulic pressure was applied in 180 cases. The defects in all discovered were 719, of which 176 were regarded as dangerous. These defects in detail were as follows:

Furnaces out of shape, 51—6 dangerous; fractures, 48—21 dangerous; burned plates, 35—19 dangerous; blistered plates, 123—27 dangerous; deposit of sediment, 105—15 dangerous; incrustation and scale, 97—7 dangerous; external corrosion, 77—22 dangerous; internal corrosion, 18—5 dangerous; internal grooving, 8—2 dangerous; water gages defective, 37—4 dangerous; blow-out defective, 27—6 dangerous; safety valve overloaded, 21—5 dangerous; pressure gages defective, 83—16 dangerous; boilers without gages, 100—3 dangerous; deficiency of water, 7—4 dangerous; braces and stays broken and loose, 47—25 dangerous; boilers condemned, 23. We feel compelled to call attention to the importance of often cleaning boilers out through hand holes. We have frequently recommended this precaution, and we speak of it again because steam users do not seem to attach the importance to it which they should. Scale is thrown off from the boiler, perhaps by some solvent, it accumulates on the bottom and, if not removed, becomes conglomerated with other impurities, covers the fire sheets, and the result is that they are sooner or later badly burned. We would advise all steam users to see that this work is not neglected.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations (which are approximate only) and for the observations collected in the following notes, I am indebted to students. M. M.

Positions of Planets for November, 1873.

Mercury.

On the 1st, Mercury rises at 8h. 33m. A. M., and sets at 5h. 39m. On the 30th it rises at 7h. 2m. A. M., and sets at 4h. 38m.

Venus.

On the 1st Venus rises at 4h. 17m. A. M., and sets at 3h. 51m. P. M. On the 30th Venus rises at 5h. 27m. A. M., and sets at 3h. 26m. P. M.

Venus can best be seen at early morning at present, but a small telescope will show it in the daytime; it comes to meridian or souths a little after 10 A. M. during the first half of the month, and before 10h. 30m. all through the month, its altitude in this latitude being about 45° on the first of the month, and 32° on the last of the month.

Mars.

Mars, which has been so favorably seen through the summer months, is at too low an altitude and sets too early in November to permit one to make good observations.

It rises on the 1st at 11h. 52m. A. M., and sets at 8h. 41m. P. M. On the 30th it rises at 49m. after noon, and sets at 8h. 39m.

Jupiter.

Jupiter is very unfavorably situated for observation at this time

On the 1st of November it rises at 2h. 44m. in the morning, and sets a little after 3 in the afternoon. On the 30th it rises at 1h. 13m. in the morning, and sets at 1h. 24m. P. M. Its apparent diameter is increasing, and it reaches a greater altitude from day to day, when it comes to meridian. It is moving among the stars of *Leo*; is east of the star κ *Leonis* on the 1st, and on nearly the same parallel of declination. On the 30th its diurnal course is very nearly in the celestial equator, its declination being only 1° 37′ N.

Saturn.

Saturn, which during the summer months has been so beautiful, is becoming smaller, and is setting earlier.

It rises on the 1st of November at 0h. 32m. A. M., and sets at 9h. 50m. P. M. On the 30th it rises at 10h. 45m. A. M., and sets at 8h. 7m. P. M. It should be looked for early in the evening, in the southwest, among the stars of Capricornus. On the 30th it has nearly the same right ascension as the double star of *Capricornus* known as α^2, which can be seen with the eye; and an imaginary line from this star, running below it some 9°, will reach Saturn.

Uranus.

On the 1st Uranus rises at near 11 P. M., and sets at 1h. 17m. A. M. On the 30th it rises at 9h. 3m. P. M., and sets at 11h. 23m. A. M. It is among the small stars of Cancer, and can be seen with a small telescope.

Neptune.

Neptune rises on November 1 at 4h. 25m. P.M., and sets at 5h. 27m. A. M. On the 30th Neptune rises at 2h. 29m. P.M. and sets at 3h. 33m. A. M. It cannot be seen without a good glass.

Spots on the Sun.

The record of sun spots by photography is from the 9th to the 13th inclusive, with the omission of Sunday, the 12th. On October 9th, one pair of small spots was near the western limb of the sun, another pair of larger, circular spots was between the eastern limb and the center, and an elongated spot was at a short distance from the eastern limb. On October 10th, besides a change of position, owing to the revolution of the sun on its axis, a fresh spot appeared, accompanying the elongated spot of the previous day. October 11th showed merely a change of position from the sun's revolution. On the 13th, the western pair had disappeared in consequence of the daily motion, the larger spot of the eastern pair had become circular, and, between it and the eastern limb, two small spots had appeared. Photographs of the 14th, 15th, 16th, and 17th show only daily change of position. On the 16th and 17th, the group nearest the western limb was surrounded by conspicuous faculæ.

Amount of Rain.

The rains in October have been very heavy.

The rain which fell between the morning of October 6 and the afternoon of October 7 amounted to 2·3 inches.

The rain which fell between the evening of October 19 and the morning of October 21 amounted to 3 inches.

Death of Donati.

Professor Donati, the director of the Astronomical Observatory in Florence, died recently in Vienna, where he had just arrived to attend to duties connected with the exhibition. His name is connected with a comet discovered by him in June, 1868, which, during the following August, passed around the sun within the orbit of Venus, exhibiting a nucleus as bright as Arcturus, and a tail of great brilliancy and more than twenty degrees in length.

The Hayden Exploring Expedition---Remarkable Natural Curiosities.

The last Congress authorized the geological and topographical survey of Colorado Territory, under the direction of the Secretary of the Interior, by whom the active work was committed to the charge of Professor Hayden. James T. Gardner was the geographer of the expedition, and he gives a variety of interesting particulars concerning the location of the mountains. The district surveyed comprises the grandest portion of the Rocky Mountains, where the highest peaks are found. The area surveyed was about 160 miles broad, and embraced Middle Park, South Park, and the Southern San Luis Park. The number of mountains surveyed and mapped is astonishing, large numbers of the of the peaks measuring from 13,000 to 14,500 feet in hight. The triangulation extended over 30,000 square miles.

Professor Hayden reports some very interesting particulars in a letter to the *Evening Post*.

The "explorers' experience on the Electric Mountains—a high and much exposed range separating San Luis Park from Wet Mountain valley—was most amusing. They could scarcely handle their instruments, sparks being elicited at every touch; their rifles, too, snapped under the electric influence, and were in continual danger of going off; while, when caught in a thunderstorm, their hair literally stood on end. The whole party experienced shocks more or less severe, but none were injured.

NATURAL SODA WATER SPRINGS.

These are at Colorado Springs, three days from Cañon City. The wide reputation of these springs is not undeserved, and the different ingredients with which the waters are charged, considering their close proximity, is quite remarkable. The waters of the main springs contain respectively iron, soda, and sulphur, together with other substances in minor quantities. The soda spring is particularly interesting, being heavily charged with carbonic acid gas, which bubbles up in a lively manner. Inverting your glass and plunging it quickly into the spring, you obtain a delicious draft far superior to any ordinary soda water. The water is led into bath houses, and is considered very efficacious in the relief of rheumatism. It is certainly most refreshing. The hotel accommodations are excellent and their situation very beautiful, built as they are in one of the main cañons leading up to the Rocky Mountains and entirely shut in by the foot hills. Pike's Peak rises grandly above all, forming the main feature in the scenery.

CURIOUS SAND HILLS.

One of the most wonderful sights of the exploration was encountered at the entrance of the pass. The wind sweeping down the valley is drawn towards the narrow gorge which furnishes the passage through the mountains, and has piled up a range of sand dunes seven hundred feet above the plain. They are several miles in extent, and, upon approach, glistening under the southern sun, resemble in their brilliancy mountains of pure snow; and the crossing was effected with even more difficulty than it would have been over a snowy range.

PLACES OF INTEREST.

The neighboring country contains many places of curious interest, such as "Monument Park" and the "Garden of the Gods." The former consists of a valley filled with pillars of hardened limestone, which have been left standing, the softer material having been eroded by the action of water and the atmosphere. As one looks upon these great monuments of Nature, he feels as if they might mark the resting place of the dread giants of the story books. The "Garden of the Gods" is of similar construction, only the remaining rocks are higher and more conical in shape, the material being a red sandstone; the pointed spires, upon approach, resemble a gothic cathedral.

PIKE'S PEAK.

A favorite expedition is the ascent of Pike's Peak, a feat that is now practicable even for ladies. A new trail has been constructed to the top, and a halfway house built to accommodate those who stay overnight, thus enabling them to reach the summit early in the day, when the atmosphere is clear and the view most extended. A signal station has been established on the summit by the War Department for the benefit of "Old Probabilities," forming an object of interest to those who reach the top.

RAILWAY RELIGION.—During the homeward journey of the western delegates to the recent Evangelical Alliance gathering in this city, a religious meeting was held on board of one of the trains, in a Pullman parlor car especially granted for the occasion. The returning delegates crowded the car, which was provided with an excellent organ, and had a splendid time of it; stringing out their prayers, hymns and exhortations for a distance of over sixty miles. Thus it is that science lends her aid to assist religionists. But it is ten to one that these divines will get up in their pulpits next Sunday and denounce scientific men as servants of the evil one, infidels and scoffers, because, having found out that the world was not formed in a week, they are bold enough to say so.

THERE is to be daily steamer service between New York and Liverpool, on the Cunard line. The company, we understand, are to withdraw their vessels from the West India trade and assign them to this duty. Eight new ships for this line are now in progress of construction at the yards of Messrs. J. & G. Thomson, on the Clyde.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From September 30 to October 9, 1873, inclusive.

CARBURETING AIR.—F. Cutting, Woburn, Mass.
CONNECTING HOSE.—N. Thompson (of Brooklyn, N. Y.), London, England.
CONNECTING HOSE.—N. Thompson (of Brooklyn, N. Y.), London, England.
FIRE ARM.—Providence Tool Company, R. I.
GUNPOWDER.—L. DuPont *et al.*, Newcastle, Del.
KNIVES AND FORKS.—H. Bramhall (of New Britain, Conn.), Sheffield, Eng.
LAMP BURNER.—T. Silver (of New York city), London, England.
LAMP.—H. Hitchcock *et al.*, Watertown, N. Y.
LIFE PRESERVER MATTRESS.—H. B. Mountain, New York city.
POWER PRESS.—N. C. Stiles, Middletown, Conn.
PRESSURE GAGE.—G. A. Everett (of New York city), London, England.
PUNCH.—I. P. Richards, Whitinsville, Mass.
STEAM LUBRICATOR.—W. Hamilton, Pa.
TREATING CAST IRON, ETC.—W. M. Arnold, New York city.

Recent American and Foreign Patents.

Improved Mode of Connecting Pitmen with Shafts.

Rudolph Cleaveland, Covington, Pa.—This invention consists in the mode of relatively constructing a bar and hand crank shaft, so that power other than that of the hand may be employed to operate. To the upper end of a vertical churn shaft is detachably attached bevel gearing communicating with a horizontal shaft. One end of the shaft projects, is flattened, and has a longitudinal slot formed in it. A crank is arranged so that the churn may be operated by hand power when desired, or a bar, in one end of which is formed a slot to receive the flattened end of the shaft, when it is secured in place by a spring catch pin. The other end of the bar is slotted to receive the end of the shaft of the driving power, where it is secured in place by a bolt and nut.

Improved Lamp.

Louis Berns, Middletown, N. Y.—This invention consists in the combination, with a loose drip cup, of the sections of a lamp column connected by intermediate rods, wide enough apart to allow the insertion and removal of drip cup.

Improved Harvester Rake.

James Irvine, Parkersburg, Iowa.—This invention furnishes an improved elevating rake for attachment to reapers and mowers to convert them into harvesters. As the shaft rotated by the driving wheel revolves, the rake will sweep across the lower part of the platform parallel, or nearly so, with the cutter bar, so as to collect the cut grain, and gather it into a gavel against the side board attached to the inner edge of the said platform. As the shaft continues to revolve, the rake slides the gavel back along the side board, a spring allowing the rake to accommodate itself to the size of the gavel. As the gavel approaches the rear inner corner of the platform, it is pushed into a trough attached to said corner. As the rake passes the end of the trough a guide pin enters a sharp angle in a guide groove, which swings the rake around, so that it may move forward along the outer part of the platform into proper position to collect another gavel. A small spring gate placed in the guide groove just in front of the sharp angle in said groove, which spring is pushed back by a pin and serves the double purpose of guiding said pin fully into the said sharp angle, and preventing it from leaving said angle by the route by which it entered it. The gavels are removed from the trough by binders standing upon the platform, and are laid to be bound upon the tables at the front and rear ends of the said platform.

Apparatus for Arranging Type for Type Setting Machine.

D. Brainerd Ray, New York city.—This invention consists of a new and improved apparatus for arranging type in rows for a type setting machine, and is designed to facilitate type setting by machinery. The construction and operation are as follows: A series of hoppers or troughs is arranged, one for each letter and character used in printing, upon a frame, at a convenient angle. Into these hoppers the type are distributed by hand, just as they are now, into the boxes of a type case. The type slide down to the channels or tubes, some having their notches turned one way, and some the opposite way; but the bottom and sides of said hoppers are so shaped that the type are all turned up edgewise as they enter the channels, and these are shaped so that they must pass through them on the edge or narrow side.

Improved Pruning Hook.

A. P. Bettersworth, Carlinville, Ill.—This invention relates to the class of pruning hooks in which a hook and sliding knife are so arranged that their cutting edges are made to approach each other by means of toggle or jointed levers, said effect being produced by a direct pulling or tractive force applied to the handle of the implement. The invention consists in the arrangement of double levers and a spiral spring in connection with a cutting hook and chisel adapted to slide on each other, said levers serving, by their extension, to operate the cutting devices, and the spring to retract and hold the same close together for renewing the operation.

Improved Steam Engine Governor.

Stephen P. Ruggles, Boston, Mass.—This invention consists of a pair of rotating registering disks side by side in the steam pipe, one of which is turned by clock work, or any power independent of the engine to be regulated, and the other is turned by the engine. The two are so connected that neither can advance or retrograde relatively to the other more than sufficient to close or open the register. The one turned by the clock geared to run as fast as the other should be driven by the engine, and they are so set relatively to each other that if an additional labor is imposed on the engine the retrograde motion of its disk will open the register and admit steam, or, if the labor is lessened the advance of the disk will close the register and shut off steam, and thus maintain the required uniform speed.

Improved Car Coupling.

Peter Kendrick, Trenton, N. J.—The object of this invention is improvement on the car coupling of Depew and Hall, patented July 2, 1867, and Smith and Utton, patented September 12, 1871; and the invention consists in employing a headed bolt sliding in opposite slots of the drawhead and a link with a cross stud for strengthening it.

Improved Rice Cleaner.

David L. Geer, Lake City, Fla.—This invention consists, first, in the rotating shaft of the machine, with blades so arranged spirally, and turned in opposite directions, as to throw the grain upward and backward and forward; and, secondly, in providing the cylinder into which the grain is delivered with a bulge, which form a cavity wherein the grain is forced by the spiral blades, thereby effecting the hulling.

Improved Traveling Thrashing Power.

Richard W. Faris, Murfreesborough, Tenn.—This invention is intended to furnish an improved power for driving a thrasher, so that each shock of wheat or other grain may be thrashed while passing to the next shock thus saving much of the labor required in harvesting grain. The invention consists in the combination of the gear wheels connecting with the rear wheels of the wagon and communicating with a transverse shaft. Upon the shaft is placed a gear wheel about eighteen inches in diameter, and which is provided with a clutch upon each side, so that the shaft may be kept in motion when the wagon is turning, or even when one wheel is standing still. The upper part of the wheel projects through an opening in the bottom of the wagon box, and connects by a gear wheel to a short shaft which is attached to a band wheel, about twelve inches in diameter, and which is connected with the pulley of the thrasher engine. By this arrangement the thrasher cylinder will make about seventy-two revolutions to each revolution of the wheels. A still greater speed may be obtained by varying the size of the wheels, or by employing more wheels.

Improved Coffee Pot.

Margaret J. Stubbings, Youngstown, Ohio.—This invention consists in a cylindrical steam cover, connected, by pipes, with a perforated drum, and a muslin bag attached to it. The steam generated in the bottom part of the pot forces the boiling water continually over the coffee in the bag till the full strength of the same is extracted.

Improved Oil Can.

Orrin H. Warren, Baldwinsville, N. Y.—This invention consists mainly of a tubular rod, of suitable length, in which is an oil receiving chamber, and to which is secured a hollow handle, in which the air chamber is arranged. From the oil and air chambers the oil is forced out through the discharge pipe at the end of the rod by means of a pump arrangement operated by the thumb. Projecting lugs or ears, at the end of the discharge pipe, raise the covers of boxes or cups over bearings.

Improvement in Indexing Books.

John S. Hicks, Roslyn, N. Y.—This invention relates to the indexing of books, and consists of a volume provided with index tags bound into the back with its leaves, and projecting beyond the side edges thereof.

Improved Springs for Vehicles.

George W. Lewis, Portsmouth, Va., assignor to himself and C. W. Walker of same place.—This invention consists in two lever springs, the long sections of the upper division being held by the backwardly curved ends of sections of the lower portion. The two divisions are separated by a considerable space by the metal or wood block confined between them in a yoke, which also tends to utilize the power of the springs. The ribs are raised in the upper surface of each leaf, at the center, by indenting the under surface, which ribs are nested with the indentations.

Improved Atomizer or Vaporizer.

John N. Gerard, New York city.—A hollow collapsible bulb is made in cylindrical form, and attached to the top of a hollow bottle stopper by stretching the mouth of the bulb over the top into a groove. A pipe, rising up from near the bottom of the bottle through the bottom of the stopper, extends by a bend through the side of the stopper, and terminates in a small nozzle. The nozzle for the air projects from the side of the stopper, surrounds the small nozzle, and terminates slightly beyond the latter, with a contraction arranged to cause the air jet to converge upon the liquid jet at a point a little in advance of the two nozzles, so as to vaporize the liquid in the most effectual manner. There is passage from the hollow stopper into the bottle below, to admit the air for forcing out the liquid.

Improved Binder Attachment for Harvester.

Washington L. Sanford, Ashton, Ill.—A hollow cylinder is made long enough to receive the longest grain, and large enough for receiving sufficient loose grain for a gavel in one part, and having another part in which to compress it. It is attached by a suitable supporting frame to the side of a reaper in such manner that the endless elevator thereof will deliver the grain into the opening near the top, where there is a shaft provided with curved teeth, to adapt it to clear the grain from the elevator, and press it downward and compress it in the receiver. At the bottom of the cylinder a shaft with teeth retains the falling grain in the side where it falls until a quantity sufficient for a gavel is obtained. There are also fingers to guide the grain as it falls from the elevator to the side where it accumulates. Guard wheels working in the grooved ends guide the grain into a space under the curves of the side arms, for compressing it to be bound. While the gavel is accumulating, movable compressing arms are holding the one being bound, and after releasing it they are swung upward to the left, over to the right, downward on to the grain, and then up again to the left until arrested by the pressure of the grain brought up by them under the stationary arm. The extent of the compression of the gavel is regulated by springs and auxiliary compressing arms. Other arms cast the bound gavel down and out of the cylinder speedily, in order that the rake may the sooner revolve and save time for the binding. When the bundle is thus compressed the band is put round it and fastened by the attendant who stands on the platform. Suitable mechanism then throws the bundle clear of the machine.

Improved Ironing Table.

Walter B. Grosh and Simon H. Foreman, Reading, Pa.—The object of this invention is to furnish a table for ironing shirts, skirts, and other articles, and it consists in a folding table so constructed that the ironing board or leaf may be raised for putting on or taking off a shirt or skirt or other similar article, and the whole be made to fold together, so as to occupy but little space when not in use.

Fictile Compound for Sanitary and Decorative Articles.

Jesse Rust, Bond street, Vauxhall, England.—This invention relates to the compositions for sanitary, pictorial, decorative, and building purposes. Glass of any kind is ground to powder and mixed with the same weight of sand or ground flints. This mixture is then placed in a suitable furnace and fused. When cold the same is reduced to powder, is afterward pressed into molds in a dry or in a dampened state by adding water or any glutinous liquid. Another compound used is of equal parts of fused and of powdered glass and sand, mixed with two or more parts of clay or sand, cohered with liquid, molded, and baked. The blocks or molded pieces, small or large, are placed in a potter's or such like kiln, and baked in the same way as pottery ware. When cold they are fit to use, and form a material which may be polished, painted, glazed, or decorated like other fictile ware.

Improvement in the Preservation of Pulp Pigments, etc.

P. C. Tiemann, New York city.—This improvement relates to what are known in the trade as pulp, or slip, or paste colors or pigments, including whites, or that class of paint or coloring materials that is prepared for use by precipitation in water, or by fine grinding in water. The improvement in the preservation of the said pigments consists in treating the wooden vessel, in which the pigments are to be stored, with a material or filling that shall so close the pores of the vessel as to prevent any oozing away of the contents or loss of consistency in the pigments. This is accomplished by lining or covering the exterior of the vessel with a suitable insoluble paint or varnish, such as paraffin, shellac, wax, or ordinary oil paint or other insoluble material.

Improved Tool for Making Button Molds.

John T. Hawkins, Salisbury, Vt.—This invention consists of a chuck, with a conical cavity in the end, terminating in a cylindrical socket. There is a roughing tool in the conical cavity, and a finishing tool in the cylindrical socket, and also a center bit. All are so arranged that a square stick, being presented to the conical cavity and the roughing knife, will be turned down smooth and to the size of the required button mold, and then turned off upon the end by the finishing cutter to the required oval form for the top of the button mold. The stick, lastly, is presented to a saw and the mold cut off.

Improved Adjustable Tongue for Organ Reeds.

Maria Procopé, Stockholm, Sweden.—This invention consists in an improvement in tuning windreed instruments. A finger-shaped support is applied against the under side of the tongue to support the same near its root, and is attached to a slide which is held between guides that are fastened to under side of the board to which such tongue is secured. The slides are made with teeth at their sides, and a tuning key, having a pinion fastened to its lower end, is used for their adjustment. Whenever it is desired to tune the organ, it is only necessary to introduce the tuning key in one of as many openings as there are tongues in the board, and thereby to bring its pinion in gear with the plate to be moved, or with several plates successively. In this manner, therefore, the vibrations can be regulated by shifting the support and reducing or increasing the vibrating lengths of the several tongues. Instead of using an adjustable finger above or below the tongue to be tuned, the tongue itself may be made movable, and the length of its vibrating portion thereby increased or reduced.

Improved Fire Escape.

Peter W. Barnes, Albany, N. Y.—There is a box, one part of the top of which is stationary. To this is hinged a movable part, to the outer edge of which is hinged a plate which can be turned out of the window to rest upon the window sill. Another plate may be turned out to extend along the wall of building upon the outer side of the window blind. In the outer part of the latter plate is formed a hole where the ladder is dropped. This ladder is made of wire rope, and, when not in use, is kept in the box. Railings are hinged to the plates so that they may be turned up into a vertical position as a guard to those using the escape, and turned down into a horizontal position when said plates are to be folded together. Arms provided with springs are arranged to rest against the inner side of the window casing to hold the device steady and prevent it from being drawn out of the window. These are locked, when extended, by stops, and, when closed, are held in position by catches, so that they may be released by opening the device.

Improved Machine for Driving Brush Handles.

John Ames, Jr., Lansingburgh, N. Y.—To the table is attached a frame in which a plate slides up and down in grooves. To the rear side of the plate is attached a rack which connects with a pinion on a shaft by which said plate is raised or lowered. A handscrew limits the downward movement of the plate and insures that the handles of the brushes are driven to exactly the same point. To the forward side of the plate is secured the follower, by which the handle is forced into the brush. Two blocks have half round notches to receive and hold the handle while being driven, and are so arranged in connection with arms as to be kept horizontal while moving toward and from each other. Said blocks, by suitable means, are kept exactly in line with each other as they move out and in, and may be moved back out the way to enable the brush to be conveniently removed from the machine. In operation, the point of the brush handle is passed down through the hole between the blocks, and is inserted in the center of the brush head, the lower end of the driver resting upon the upper end of the brush handle. A lever is then operated, forcing the brush handle down through the brush head until the forward end of a set screw strikes the top board of the frame. As the forward end of the brush handle passes down through the brush head, its point or forward end enters a socket in a guide which keeps it centered. The brush handle is thus always supported at two points, and kept accurately centered. When the brush handle has been fully driven, the driver is raised from between the blocks, the blocks and arms are pushed back out of the way, and the brush is removed.

Improved Bee Hive.

Charles J. Sperry and Lyman Chandler, New London, Minn.—This is a double bee hive with two sets of honey frames. The roof is made in two parts hinged together at the center, and fits over the hive. The honey frames are suspended from cleats by means of projecting top pieces. The bottom of the hive consists of two inclines corresponding in form with the roof, the edges of which form the bee lighting boards. A slat partition extends from a cross piece to the center ridge of the floor, and a shutter closes the communication between the two parts of the hive. When the shutter is reversed, the bees can pass freely from one part to another. This is a great convenience in dividing swarms. Outside of honey frame of each part of the hive there is a compartment closed by means of the movable partition and a top slat. The partition is hinged so that, when the loose slat is removed, the top of the partition will drop over against the side, which allows the honey frames to be removed without difficulty. The bee entrances through the top bars of the honey frames are of peculiar construction, and are formed by cutting out the top part and inclined under sides of the bar, leaving the bottom part entire, the object being to avoid weakening the bar and to form passages for the bees, through which they may pass up or down on either side of the comb or comb frame.

Improved Combined Shutter Worker and Blind Operator.

Daniel M. Leonard, La Crosse, Wis.—The object of this invention is to provide mechanism for operating, adjusting, and locking the window shutters and blind slats from the inside of the window. A cog wheel is keyed on a sliding shaft to be brought into engagement, alternately, with a toothed disk attached to the shutter, and toothed segmental lever connected with the blind slats, whereby both the shutter and slats may be adjusted as desired.

Improved Potato Cutter and Planter.

Lemuel G. Mewborn, Kinston, N. C.—This invention relates to a potato cutter and dropper on wheels, and consists in combining mechanical instrumentalities so that whole potatoes are fed to a hopper, cut up into an average size, and dropped at regular intervals in the drill or in hills. It seems to meet a want long experienced by farmers, who find hand-cutting and hand-cropping of potatoes a very tedious, a very laborious, and a very expensive undertaking.

Improved Locomotive Smoke Stack.

James Hughes, Scranton, Pa.—The object of this invention is to provide the smoke stack of locomotives with an improved cone by which the draft is increased and the rapid wearing out of parts of the stack by the exhaust steam prevented. This invention consists of flat plates and rings of varying sizes, which are placed above each other in such a manner that the steam cannot pass through without striking the plates and rings, varying thereby the direction of the steam and distributing it equally so that it will pass out from the stack without impinging on the sides of the same and bringing the bonnet into use over its whole surface. The draft is regulated by making the top plate and ring adjustable on the central standard.

Improved Trotting Gear.

Henry Schmalhausen, Bridgeport, Ill.—The object of this invention is to provide an elastic gear for horses, by which they can trot faster, raise their feet higher, and step higher, preventing them also from balking, kicking, backing, or rearing. It consists of an elastic strap, which plays easily through the hame ring, either end being fastened to a hind and fore foot.

Improved Ore Washer.

Ira T. Halstead, Fredonia, N. Y.—This invention furnishes a simple apparatus for collecting sulphurets, gold, silver, etc., from ores. The invention consists in the employment of one or more sleves, in connection with one or more sluices and pivoted boards, for separating the sulphurets and heavier particles of ore from the stream of water and pulverized ore passing through the apparatus.

Improved Neck Yoke Holder.

George R. Huntley, Hubbardston, Mich., assignor to himself and Carlos E. Hait, of same place.—This invention consists in constructing the holder of a flexible sheet metal plate, which laps around the yoke and is secured to the perforated leather plate by rivets. Thus the plates lap around the yoke, and, being flexible and formed in one piece, they form a strong device for the purpose.

Improved Lubricator.

William A. Pratt, Baltimore, Md.—This invention consists in using on the inside of a reservoir a slide sleeve, to adjust the upper of the two valves of a locomotive lubricator toward or from its seat, to regulate the flow of oil into the feeding channel that leads to the parts to be lubricated.

Notes & Queries

W. E. says: I have a painting on the back of glass. It must be fifty years old, and the colors are getting loose from the glass. How can I fasten them t the glass again?

J. A. asks: How can I make artificial meerschaum, ivory, buckhorn, and coral?

W. B. C. asks: What is the best method of hardening soft soap, and molding it into cakes?

J. N. C. asks: Is it practicable to have a kind of a fender attached above the cowcatcher of a locomotive to prevent injuring cattle thrown off the track?

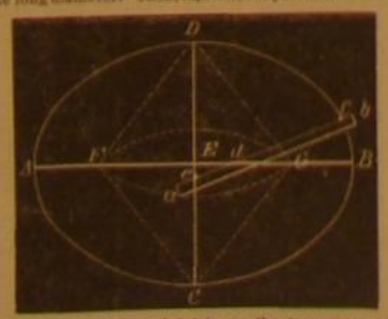
J. N. Q. says: Not long since I saw in a scientific paper the following process for taking leaf photographs: "Put ten cents worth of the bichromate of potash in a two ounce vial of soft water. After as much of this substance as possible has dissolved, pour some of the solution into a shallow dish and place in it a piece of white letter paper. When thoroughly saturated, take it out and carry it into a dark room, and fan it about until nearly dry, when it will be of a bright yellow color. Next, place upon it the leaf to be photographed, and under it put a piece of black cloth, and below this several pieces of newspaper. Place all these between two pieces of window glass of equal size, and fasten together with spring clothes pins. Expose this now to the sun, so that the rays will fall perpendicularly upon the leaf. The paper will soon turn brown; and, in from half an hour to several hours, there will be a perfect print. Next, wash the paper in clear water, which renew every few moments until the paper is nearly or perfectly white." This photograph will resemble a dead leaf. I want to get a picture that is green. Is there any solution, as cheap and simple as the above, by which a green picture can be obtained? Or is there any way of converting the picture obtained as above into a green color by pouring some solution over it, or otherwise? Can we obtain, similarly, a red leaf?

Answers to Correspondents

H. B. C. will find the process of nickel plating described on p. 266, vol. 29.—J. S. will find a recipe for lemon sirup on p. 266, vol 29. You can make copying ink by dissolving sugar in common ink.—J. C. N. will find rules for calculating the dimensions of fly wheels on p. 289, vol. 28.—J. B. W. can waterproof canvas by the process described on p. 122, vol. 27.—J. can temper gun and other springs by following the directions on p. 314, vol. 28.—C. E. C. will find directions for French polishing on p. 266, vol. 29.—C. F. P. will find a recipe for a blackboard composition on p. 299, vol. 28.

S. says: It is asserted and believed by many people that, if a man be stretched at full length, say upon stools, and six persons gather about him (opposite, two and two) and place the forefinger of each hand under him, he can be raised with ease into the air by the joint strength of the six, exerted in this manner, provided that all seven of them inhale and retain air to the full capacity of their lungs. All stress is laid upon the inhalation. Is there any virtue in this? For a body to take in any amount of the fluid in which it is bathed does not increase its buoyancy; nor does a full and retained breath assist vital power so well as sustained and regular breathing. The only way in which I can imagine its assisting is by its giving the upper part of the body greater rigidity through the increased arch of the chest. This would make the distribution of power uniform over the body of the lifted, and give a better brace to the lifters. There is no trouble about averaging a lift of thirteen pounds to each finger, but it is the mysterious and all potent full breath which excites my curiosity. The believers in this, I have no doubt, experience an additional buoyancy equivalent to the weight of a volume of air equal to their cranial capacity. Answer: We have often made the experiment you speak of; and our idea is that the effect of the inhalation by the lifted is to give rigidity to his body. As for the lifters, the inhalation probably strengthens the muscles: how, it might be difficult to explain.

R. says: Is the method of drawing an ellipse, described on page 84 of the pamphlet published by you and called "The United States Patent Law, etc.," a correct one? If so, please explain the principle by which the figure is thus drawn. It seems to me that the method is incorrect, and that no part of the curve of a circle can coincide for any appreciable distance with the peculiar curve of an ellipse. I have proved, satisfactorily to myself, that the figure is not an ellipse. My plan is to compare the area of an ellipse of given axes, drawn with regard to its foci (the method of drawing generally given in scientific works) and to compare this area with the area of a figure, having the same axes, called an ellipse by you, but composed of the arcs of four circles whose centers are the four angles of the enclosed square. The difference is so large that it must be the difference in shape between the two areas. Answer: Your statement is correct. The method given in our pamphlet for laying down an ellipse is approximate in its results. We present herewith another method, strictly accurate and quite as convenient. Mark on a ruler, or strip of paper, $a\ b$, a distance, $c\ d$, equal to the semi-conjugate axis, or half the short diameter, and a distance, $c\ e$, equal to the semi-transverse axis, or half the long diameter. Then, in whatever position the strip,



$a\ b$, is placed, if the point d is on the transverse axis and the point e is on the conjugate axis, the point c will be on the curve. Hence, any desired number of points can readily be obtained. It is easy to make an instrument which shall fulfil these conditions; and by placing a pencil at c, a continuous curve can be described. Most of our readers know that if a string, the length of the transverse axis, has its ends secured to the foci of the ellipse, the curve can be traced by a pencil held in the bight of the string. To find the foci, F G, of an ellipse when the axes, A B and C D, are given: from C or D as a center, with a radius equal to A B divided by 2, describe the arc of a circle. The points, F G, in which it cuts $a\ b$, will be the foci.

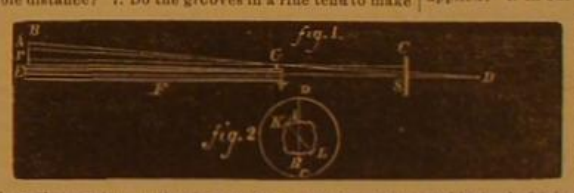
D. A. B.—Extract of hemlock bark is in common use for tanning purposes.

H. A. J.—Minors can obtain patents. Read our advertisement about patents.

E. T. C. says: I saw, a few days ago, in the Louisville Exposition, a number of models from the Patent Office. They were scattered over a couple of tables, and seemed to receive no care and very little attention. I should like to know how they came to be there, and why there seemed to be no care taken to prevent their being destroyed or carried away. Answer: Probably they were old models of rejected cases, which were sold some time ago at auction by the Patent Office.

F. E. S. says: A fellow workman claims that wood cannot be set on fire by coming in contact with a steam pipe. I claim that it can. Who is right? Answer: The heat of ordinary steam pipes is not sufficient to set wood on fire. But some kinds of wood, enclosed in a certain way and subjected for a sufficient length of time to the heat of steam pipes, will after a long while become charred. It is known that charcoal made from certain kinds of wood, and warmed to a certain temperature within a suitable enclosure, will absorb oxygen so rapidly from the atmosphere as to inflame spontaneously. This is one way in which steam pipes may indirectly be the cause of fire. Again, some kinds of wood, if long subjected to moderate heat, treated with oil, and suitably enclosed, will inflame spontaneously. Thus the interior of a wooden jacket of an engine cylinder, so situated that in oiling the valves small quantities of oil became incorporated with the wood, has been known to take fire. But such examples are rare. The practice is to set steam pipes an inch or two apart from the wood, not because they will directly burn the wood, but to prevent the accumulation, near the pipes, of materials and conditions which favor what is termed spontaneous combustion.

G. M. A. says: In your answer to C. M. B., page 345, volume XXVIII, as to thickness of the barrel of a rifle, you say that the thickness of the barrel at the breech should be twice the diameter of the bore. 1. What is the thickness of a barrel? Is it the thickness of the metal as B C, Fig. 2, or is it D A × B C? 2. What is decarbonized steel? How does it differ from the best wrought iron? Why is not cast steel as good? 3. What is the diameter of the bore? Is it the diameter inside the grooves, or is it the line K L, Fig. 2? 4. How are the sights of a rifle arranged? Are they parallel to the bore? 5. In Fig. 1, let F be the barrel of a rifle, E D the path of a ball, C S a target, and P, G, the sights parallel to the bore. Now if C was aimed at, I should think that the ball would strike at S. Is it not always necessary, therefore, to have one of the sights movable, for instance P? And would it not be necessary to have it as high as B for the distance V S, and as high as A for the distance V D? 6. If a man standing on a level plain holds a gun of any kind perfectly horizontal, does not the ball, if unobstructed, reach the ground as soon after leaving the gun as if it had been dropped from the muzzle? Must not the ball reach the mark so soon after leaving the gun that it has not time to fall any appreciable distance? 7. Do the grooves in a rifle tend to make



the ball go swifter, as it offers more resistance to the powder, and so the powder has time to exert its full force on the ball? 8. Will a good rifle, if held immovably in a vise or other support, send a ball into exactly the same place every time, at 100 yards? Answers: 1. B C is the thickness. 2. You probably refer to what is commonly known as blistered steel. It is stronger and less malleable than wrought iron, and is capable of being tempered. Cast steel is the most perfect kind of steel. 3. We think that the generally received definition of the bore of a rifle is A B plus the depth of the groove; we would be glad to hear from sportsmen on this matter. 4 and 5. It is impossible to give definite rules for arranging the sights of a rifle, as so much depends on the weight of the charge of powder, and the weight of the ball. Hence one of the sights is made movable, and the experience of the marksman teaches him how to adjust it. 6. Yes. The amount the ball falls is allowed for by the adjustment of the sights. 7. We think that the principal object of the grooves is to impart a rotary motion to the ball. 8. Yes, if all the conditions are the same, at each trial. In practice, it is generally impossible to avoid slight differences in the weights of charges, and it is also far from an easy matter to hold a rifle immovably in a vise.

E. D. W. asks: 1. How can I prevent the oiled silk lining of a dressing case from sticking together in the hot weather? 2. If a magnet that will lift two pounds be suspended from one that will lift a quarter of a pound, do both gain in strength, and does the smaller one gain as much as it would if a piece of iron were suspended from it? Answers: 1. We do not believe you can remedy the trouble in any way, except by placing a piece of tissue paper over the oiled silk, before rolling up the case. 2. The magnets do not gain in strength under such circumstances.

R. H. asks: What materials are used in grinding lenses for optical instruments? I can make a very good lens, but have some difficulty in getting the excellent polish necessary. Answer: First, use quartz sand, with the lead grinder, then coarse emery. Second, washed or elutriated emeries of increasing fineness, with the iron grinder. Third, rouge, with the pitch polisher. Rouge is obtained by calcining copperas in a covered crucible.

C. W. G. says: I have a steam boiler about 5 feet in diameter and 7 feet high, of which 5 feet is the length of the flues. My engine has a cylinder 4½ x 12 inches. What power ought I to obtain from it? Answer: It would be impossible to answer this question without receiving more data. In any case, only an approximate estimate could be made, without an actual trial.

D. B. K. sends a paragraph about the performance of the new Corliss pumping engine now working on the city water works, Providence, R. I., but fails to give any particulars as to size or construction of the machine.

E. W. G. asks: Will water which has a highly mineral quality, indicating iron (a red deposit as it flows along from the source), be injurious to a steam boiler? Answer: We do not think this water will injure your boiler, if you blow it out frequently.

J. M. S.—We know nothing about the concern you speak of. Stockholders, we presume, are liable for debts. Brass expands under the influence of heat about twice as much as glass. For each degree of heat, up to a certain point, a bar of brass one thousand feet long will expand an eighth of an inch. A bar of glass, two thousand three hundred feet long, expands an eighth of an inch for each degree of heat.

C. A. C. asks: 1. How can I make a solution so that, by dipping anything into it, I can silver plate it? 2. How can I make colored lights? 3. What is the best material for making a small air balloon? Answers: 1. You can silver brass or copper, previously well cleaned, by rubbing them with the following: chloride of silver 1 part, pearlash 3 parts, common salt 1½ parts, whiting 1 part; rub with a piece of soft leather or cork, moistened with water and dipped into the mixture. Then wash in hot water containing a little soda, and wipe dry 2. Colored flames can be produced by the combustion of alcohol upon certain salts in fine powder. For green, moisten chloride of copper with alcohol and inflame. For red, use nitrate of strontia. For yellow, nitrate of soda. For violet, potash and its salts. 3. The best material for small air balloons is thin tissue paper.

R. H. B. says: 1. I recently heard two men discussing patent laws. One said that the inventor of a process for making gas from petroleum could prevent any one else from making an improvement on the same for ten years. 2. Can a patentee prevent the purchaser of his article from lending it to a friend? 3. Is dynamite a fluid, and how is it made? Is there any fluid as powerful as nitro-glycerin? Answers: There is no process of law or letters patent by which an inventor can prevent another from continuing to improve an art or process. 2. There is no law to prevent one who has bought a patented article lending it to another for temporary use. 3. Dynamite is a solid substance, made by saturating siliceous earth with nitro-glycerin. There is no known fluid substance with the explosive power of nitro-glycerin.

W. A. G. asks: How can I plate iron wire with brass without using a battery? Answer: A method invented in France is thus described: Clean the wire and place it in the sulphate of copper. When it is coated with copper, remove it, and cover it with a paste made of pure oxide of zinc. Then heat it to a temperature sufficient to melt the copper. Great care must be used in this operation to avoid volatilizing the zinc.

H. B. M. asks: If I compress a cubic foot of air so as to obtain a pressure of 40 lbs. per square inch, what space will it occupy? Answer: If the temperature remains constant during compression, the volume, at a pressure of 40 lbs. per square inch, will be about 0·267 of a cubic foot. But if no heat is lost during the compression, the volume will depend on the original temperature of the air. Suppose, for instance, that the air, before compression, is at 70° Fah.; when it has a pressure of 40 lbs. per square inch, its temperature will be about 249°, and its volume about 0·491 of a cubic foot.

G. B. M. says: 1. We have a well 20 feet deep with 10 feet of water in it. We wish to conduct the water (from 2 to 3 barrels a day) to a point 20 rods distant and at the same level as the bottom of the well. We have a lot of half inch lead pipe which we propose to lay as a siphon. Should we have to use a pump or air chamber, or both, and at what place should they be applied? 2. In our dwelling we keep, in cool weather three coal fires for heating purposes only. At a distance of 100 feet, we have a 5 horse engine and a 6 horse upright tubular boiler. These are in use on Mondays, Wednesday and Fridays. Would it be practicable to heat the house by steam from this boiler, and if so, would it be economical? We could dispense with the three fires in the house, and instead of firing up the boiler every other day with cold water, we could start the engine any time without much delay. Answers: 1. It would be necessary to use a pump, and it could be used either to draw or force the water. If an air vessel is added, it should be placed beyond the delivery valve. 2. Properly managed, it would probably be more economical to use steam for heating purposes, in the case you mention.

C. D. H. asks: 1. How can I transfer surplus power from an engine to one near by which is overloaded? 2. Can I run an engine with the exhaust steam of another engine? 3. Is there a well authenticated case of fire originating from steam pipes in a dry house? How can such danger be prevented? Answers: You might carry a steam pipe from the large boiler to the small engine. 2. This is done in the compound engine, but it would hardly be advisable in your case. 3. Insurance companies are divided in opinion on this question. Where ordinary precautions are observed, we do not think there is any danger.

J. A. M. says: I recently undertook to make an engine of about one horse power. I got along well, excepting in the valve in the steam chest on the cylinder; and I wish to get some information on the position of the piston head and slide valve. Answer: Consult Auchincloss on "Link and Valve Motions."

B. F. M. says, in reply to J. D.'s assertion about tumbling rods for separators: I have been running a 10 horse separator for nearly two seasons; I used a belt the first two months, and tumbling rods ever since; and I assert that I can do more threshing with the rods than with belt. I have coupled to the engine, right to fly wheel end of crank shaft, my tumbling shafts, consisting mostly of gas pipe of 2 inches diameter and 13 feet length; but one or two are each but ¾ inch diameter, and 6 or 7 feet long, of solid wrought iron. Those latter are intended to spring somewhat, and also to twist off in case of accident. The gearing at machine is bevel, 6½ to 1, and this gives us the proper motion; it is also furnished with a clutch, so that the engine can be stopped and machine run ahead. With the above we thresh from 300 to 500 bushels wheat, and twice that amount of oats, per day, which is more than any one of three other machines does, though we have the lightest engine of the four. They use belts and we use tumbling rods. Answer: This is an interesting statement, though not conclusive as to the greater efficiency of tumbling rods, in the absence of a test with dynamometer. We shall be glad to hear from others on this matter.

C. H. D. says: I have an upright boiler which is required to carry 40 lbs. pressure. Every time the water is supplied, the pressure is reduced to 25 lbs., as the water is heated but imperfectly by the exhaust steam. I propose to lead the water to top of boiler, let it go down one of the flues, return by another and then enter the boiler as before. Will the water evaporate from the pipes, after working hours, when the pressure leaves the boiler, and will the pipes receive injury from the action of the fire when steam is again being made? Answer: Your plan will probably work very well, as many heaters are in use, constructed on substantially the same principle.

F. H. H. says: If I make a square vessel with partitions cast in copper (all in one piece), filling each alternate compartment with zinc, would it produce an electric current? It is on the principle of the electric disk or soles, the only difference being that, in the disks and soles, the pieces of copper and zinc are connected and joined with copper wire, while this one of mine is one solid piece. Would the solid body of copper prevent the passage of a current? Answer: Your arrangement would not produce an appreciable electric current, as something more than mere contact of metals is required in a galvanic battery. It is true that in the dry pile, so called, a current of electricity is generated ordinarily, but not when the parts are perfectly dry, showing that moisture, which gives rise to chemical action, is necessary to produce an electric current. Even if a current were generated in your arrangement by the mere contact of zinc and copper, there are no means of isolating and making it available. If a current should flow from the zinc to the copper, it would return immediately by the copper connections, around to the zinc again, and vice versa. To make an effective galvanic battery, there must be chemical action upon one of the metals used, and the parts of the battery must be arranged and connected in a particular way. See "galvanic battery" in any text book on electricity.

W. A. J. says, in reply to C. C., who asked, on page 230 of our current volume, as to power of a hay press: If C. C. will measure the amount of chain taken up on his pulley at P while his follower travels ¼ or ⅛ inch, he will readily get a ratio by which to multiply his 1,600 lbs. power, and that ratio will increase as his levers become nearer parallel. A very simple rule (which I have never seen published) for all purchases or leverages is: The distance which the resistance or object is moved is to the distance which the power applied moves as the ratio of the purchase or leverage. This rule applies to pullers, gears, tackles, and all descriptions of levers. Take, for example, a compound lever punching machine, where you cannot measure the separate levers: The punch moves ¼ inch, while the lever where it is grasped by the hand moves 30 inches; this gives a ratio of 6) to 1, that is, the lever moves 60 times as far as the punch, and 100 lbs. applied at that point of the handle will exert a pressure of 6,000 lbs. (less the friction of the machine) on the punch. With a tackle and fall, by the same rule, you hook your movable block to an object, and move it 1 foot; it, doing so you have moved 20 feet of fall, which is 20 to 1. 100 lbs. power applied gives 100 × 20 = 2,000 (less friction). For a series of gears turned by a crank: A weight is winding up by a rope and has moved 1 foot; the crank is 1 foot long and has made 30 revolutions. A crank 1 foot long travels around a circle of 6 2 feet circumference; this, multiplied by 30 revolutions, makes 186 feet, the distance the power applied travels to every foot of rope wound up; and 186 multiplied by the power applied in pounds would give weight raised, less the friction. "With these rules and examples, I hope the readers of the SCIENTIFIC will be able to make their own calculations without troubling our editor, so that he may be able to give us something more valuable and interesting."

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

J. S. H. P.—The specimen is limestone conglomerate, of no value, unless a chemical analysis should show the presence of some metal.

F. J. P.—Clay ironstone, interspersed with veins of limestone.

J. J. T.—The specimen is the *debris* from some disintegrated sandstone rock.

R. H. McG.—No. 1 is iron pyrites, used for the manufacture of oil of vitriol. Whether it will pay to mine, depends upon whether it would pay to manufacture sulphuric acid in your locality. No. 2 is a mixture of sandstone, clay, mica and oxide of iron, of no value.

B. K. D.—The specimens are quartz pebbles.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Carbonic Acid in Wells. By F. A. H.

On Elliptic Pulleys. By F. H. R.

On Traction Engines on Public Roads. By H. B. P.

On Spectacular Exhibition of Diffraction. By A. E. D.

On the Easterly Current. By J. E. V.

On the Fireless Locomotive. By J. P.

On Boiler Explosions. By ——

On the Providence Pumping Engine. By D. B. K.

On a New Reactive. By J. T.

Also enquiries from the following:

H. C. B.—Z. G. T.—W. H. B.—F. T. H.—H. B.—J. J. D.—J. G. M.—J. O'N.—A. L. H.—A. A.—F. S.—J. P. C.—H. M. McK.—W. H. C.—R. H. R.—J. V. R.

Correspondents in different parts of the country ask: Who makes the best files in the United States? Which is the cheapest ice making machine? Where can devil fish be bought by the dozen? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal" which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

October 7, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Ankle supporter and filler, S. Silberschmidt..... 143,527
Auger, underreaming, P. Sheldon..... 143,535
Awning, H. Sykes..... 143,542
Axle, vehicle, T. F. Coleman..... 143,495
Bayonet socket, B. Burton..... 143,496
Bed bottom, A. Turnbull, (r)..... 5,591
Bed bottom, spring, Ames & Frost..... 143,397
Bedsteads, etc., fastening for, J. M. Baird..... 143,481
Bedstead, sofa, S. M. & S. A. Winn..... 143,563
Bellows for furnaces, operating, H. Crumlish..... 143,499
Belt fastening, P. Subitt..... 143,474
Billiard table ball holder, H. W. Collender..... 143,500
Blinds, machine for wiring, C. McGill..... 143,521
Bolster, pillow, etc., C. P. Cooper..... 143,502
Boot jack, F. Dorsett, Sr..... 143,406
Bullet, Rein & Stock..... 143,419
Burial case, J. B. Cox..... 143,498
Buttons, fastening, Johnson & Worth..... 143,512
Car coupling, A. W. Bohaker..... 143,491
Car coupling, Merrill & Kempton..... 143,524
Car coupling, S. A. Otis..... 143,469
Car coupling, J. B. Tracy..... 143,429
Car coupling attachment, Brown *et al.*, (r)..... 5,587
Car, hand, L. H. Kenyon..... 143,513
Car lamp, J. L. Howard..... 143,411
Car running gear, railroad, J. S. Lester..... 143,516
Car, stock, T. J. McCarty..... 143,414
Car stove, Mooney *et al*..... 143,526
Carburetor, W. T. McMillen..... 143,523
Carbureter, I. W. Shaler..... 143,534
Carriage, child's, H. M. Richardson..... 143,471
Carriage and wagon seat, C. K. Lehmann..... 143,515
Carving machine, B. J. Tayman, (r)..... 5,594
Chimney or flue attachment, J. E. Starnes..... 143,540
Chisel, C. E. L. Jelliffe..... 143,413
Cloth, manufacture of felt, J. E. Pollard..... 143,536
Coach and car truss, G. F. Chalender..... 143,498
Commode, J. D. Averell..... 143,486
Corset, J. Waterman..... 143,479
Corset clasp, J. Burke..... 143,493
Curtain fixture, H. H. Burritt..... 143,494
Dyeing, mordant for, G. A. Hageman..... 143,449
Electric railway signals, F. L. Pope..... 143,529
Engine, rotary steam, S. B. Frank..... 143,504
Envelope, Kuhn & Atkinson, (r)..... 5,592
Feather renovator, R. B. Cooper..... 143,427
Fence, wood, R. F. Ward..... 143,478
Fire arms, attaching magazine to, H. Metcalfe..... 143,415
Fountain and aquarium, J. Moore..... 143,456
Furnace, blast, E. B. Andrews..... 143,487
Furnace, cupola and other, L. Quincke..... 143,463
Furnace for tempering, etc., W. M. Watson..... 143,548
Furnace, hot air, O. S. Kelsey..... 143,453
Furnace, tyre heating, J. G. Rogers..... 143,465
Furnaces, operating bellows for, H. Crumlish..... 143,439
Gaining machine, J. Richards..... 143,531
Game register for cards, J. W. Sheppard..... 143,536
Gas machine, portable, B. Sloper..... 143,426
Gate, automatic, E. P. Wheeler..... 143,551
Gate, farm, W. S. Brown..... 143,493
Grain register, G. W. Nesmith..... 143,527
Hammers, die for forging, T. Daffin..... 143,406
Harrow, D. B. Maze..... 143,520
Harvester binder attachment, J. H. Garnhart..... 143,505
Heater, steam, P. H. Merrill..... 143,525
Heel burnishing machine, C. W. Glidden..... 144,597
Hemmer, O. L. Brown..... 143,433
Hoisting apparatus, G. B. Massey..... 143,518
Hoisting apparatus, Massey & Darling..... 143,519
Hook, siding, P. J. Coon..... 143,436
Horses, grooming, J. J. Greenough, (r)..... 5,589
Horses, device for attaching, S. Sykes..... 143,428
Horse bridge, E. Batzel..... 143,480
Hose coupling, W. Kilburn..... 143,514
Inking apparatus, F. L. Bailey..... 143,480
Knitting machine, L. D. Sanborn..... 143,468
Ladder, fire escape, G. Pfleeger..... 143,462
Lamp, F. Kampfe..... 143,452
Lamp, car, J. L. Howard..... 143,411
Lantern, signal, I. W. Shaler..... 143,425
Leather skiving machine, G. Andrews..... 143,398
Leather straps, waving or embossing, D. H. Unger 143,477
Liquids, freezing, S. S. Fitch..... 143,446
Lock, seal, J. E. Thomson..... 143,544
Locomotive head light, W. Westlake..... 143,550
Loom stop mechanism, Wheeler *et al*..... 143,552
Lubricator, W. A. Pratt..... 143,540
Lubricator, J. Ross..... 143,472
Matter, treating refuse, C. Whittier..... 143,482
Medical compound, J. P. Barnett..... 143,389
Medical compound, F. Stützel..... 143,427
Metal for casting plows, G. K. Smith..... 143,539
Mill, fanning, E. M. Gilbert..... 143,506
Musical instruments, pedal for, H. Haas..... 143,509
Nail extractor, G. J. Capewell..... 143,496
Ore, etc., separating, H. Bradford..... 143,492
Oven, baker's, D. McKenzie..... 143,522
Paper pulp, fiberous, A. Ungerer..... 143,546
Pavement, concrete, G. Bassett, (r)..... 5,586
Picture frame, F. Reifschneider..... 143,464
Picture holder, stereoscopic, Samson & Smith..... 143,467
Pitman, J. Swan..... 143,475
Planter, corn, E. E. Henegan..... 143,450
Plow carriage, H. M. Bullitt..... 143,434
Press, book-holding, L. Heitkamp..... 143,410
Privies, sinks, etc., cleaning, R. R. Retowsky..... 143,429
Pulley block, A. S. Dickinson..... 143,441
Punching and shearing, S. R. Houser..... 143,510
Punching sheet metal, M. Stephens..... 143,473
Purifier, middlings, Brandon & Wiggim..... 143,490
Railroad rail joint, T. Rodes..... 143,528
Railroad signal, W. Wickersham..... 143,483
Railroad ticket holder, J. C. Maloy..... 143,517
Railroad tie, P. S. Devlan..... 143,407
Railroad time signal, G. B. Cummings..... 143,405
Ratchet rod, adjustable, E. H. Smith..... 143,538
Rein holder, E. Fahrney..... 143,409
Rivets, machine for heading, J. A. Wells..... 143,549
Roofing, sheet metal, R. A. Smith..... 143,471
Sad iron, R. Jones..... 143,451
Saw set, T. E. Grimes..... 142,445
Scaffold pole clamp, Haering & Alles..... 143,448
Scale pan, J. P. Chatillon..... 143,490
Screws, making metal, N. C. Hubbell..... 143,412
Separator, middlings, R. L. Downton..... 143,442
Sewing machine and water wheel, I. Hyde, (r)..... 5,590
Sewing machine ruffler, A. Rush..... 142,474
Shears, A. Lapham..... 143,451
Shoe fastening, Fitch & Jones..... 143,445
Shutter fastening, A. J. Palmberg..... 143,460
Shutter worker, L. Muller..... 143,416
Slag, iron, etc., granulating, C. Wood..... 143,585
Slaughtering apparatus, M. Brenner..... 143,401
Soap alkalies, J. W. Wyld..... 143,550
Spinning machine condensing tube, J. Good..... 143,508
Stamp, ore, L. D. Webb..... 143,480
Staves, cutting gores in, C. Ruggles..... 143,466
Stove, car, Mooney, Van Dorn & Winterburgh..... 143,526
Stove flues, extension for, F. Warriner..... 143,457
Stove grate, G. W. Eltonhead..... 143,443
Stove grate, W. H. Stryker..... 143,541
Stove platform, C. Brownell..... 143,402
Streets of snow, clearing, R. A. Shinn..... 143,470
Suspenders, Potter & Smith (r)..... 5,593
Tables, slide for extension, Zen *et al*..... 143,554
Teeth, artificial, W. C. Tracy..... 143,476
Teeth, retaining filling in, E. Osmond..... 143,418
Tenoning machine, Richards & Berry..... 143,532
Tobacco, etc., packing, J. H. Trowbridge..... 143,545
Toilet rack, Cooke & Kenfield..... 143,501
Toy for making bubbles, S. B. Bliss..... 143,432
Toy gun, R. T. Murphy..... 143,457
Trap, ay, C. S. Rouse..... 143,625
Treadle, Tisdale, Putnam & Allen..... 143,543
Tub support, wash, G. F. Shaw..... 143,469
Tube, speaking, C. A. Fredericks (r)..... 5,588
Vehicle coupling, C. H. Crater..... 143,504
Vehicle wheel, M. B. White..... 143,481
Vessels, forcing ashes from, J. Palmer..... 143,461
Vessels, propulsion of, G. B. Delbouchervillle..... 143,440
Washing machine, dish, C. H. Williams..... 142,484
Watch chains and bracelets, etc., W. C. Edge..... 143,503
Watchmaker's lathe, J. M. Oram..... 143,458
Wheel for wheelbarrows, W. E. Jacobs..... 143,511
Whip socket, F. B. Munroe..... 143,417
Winding machine, cop, Chadwick and Lownds..... 143,497
Wire, machine for pointing, F. H. Aiken..... 143,486
Wood, etc., apparatus for graining, C. Falke..... 143,444
Wood paint, etc., Snow & Davis..... 143,472
Wood splitting machine, D. Milliken..... 143,455

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

27,065.—COFFEE MILL.—J. & E. Parker.—Jan. 21.
27,262.—FARE BOX.—J. B. Slawson. Dec. 31.

EXTENSIONS GRANTED.

23,726.—BLIND WIRING MACHINE.—B. C. Davis.
23,731.—DOUBLE FRICTION COUPLING.—J. Hendy.
25,747.—EMERY WITH CAOUTCHOUC.—T. J. Mayall.
25,767.—CUTTING AND PANNING CAKES.—J. R. Shrote.

DESIGNS PATENTED.

6,900 to 6,908.—CARPETS.—R. B. Campbell, Lowell, Mass.
6,909 to 6,931.—CARPETS.—O. Heinigke, New York city.
6,932.—CARPETS.—H. Horan, East Orange, N. J.
6,933.—LATHE DOG.—B. L. Lathrop, New Haven, Conn.
6,934.—CARPETS.—L. G. Malkin, New York city.
6,935.—MACHINE FRAME.—J. H. Marston, Boston, Mass.
6,936 & 6,937.—CARPETS.—D. McNair, Lowell, Mass.
6,938 to 6,941.—CARPETS.—E. J. Ney, New York city.
6,942 to 6,945.—CARPETS.—J. H. Smith, Enfield, Conn.
6,946.—TOY BANK.—T. Swann, Philadelphia, Pa.
6,947.—BUTTONS.—J. E. Wheeler, Westport, Conn.
6,948.—LAMP FOOT.—T. B. Atterbury *et al*, Pittsburgh, Pa.
6,949.—BUTT HINGE.—M. Bradley, Springfield, Mass.
6,950.—CARPET.—H. F. Goetze, Boston, Mass.
6,951.—OIL CLOTHS, ETC.—C. T. Meyer *et al*, Bergen, N. J.
6,952.—HATS.—J. S. Fayerweather, Bridgefield, Conn.
6,953.—SWORD HILT, ETC.—V. Price, New York city.
6,954.—PRINTING TYPE.—E. C. Ruthven, Philadelphia, Pa.
6,955.—ADVERTISING FRAME.—C. H. Shackford *et al*, Syracuse, N. Y.

TRADE MARKS REGISTERED.

1,481.—GIN.—J. W. Culbert, New York city.
1,482.—IRON AND STEEL.—Leng & Ogden, New York city.
1,483 to 1,485.—LIQUORS.—M. M. Smith, Chicago, Ill.
1,487.—SOAP.—W. L. Troxell, Brooklyn, N. Y.

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About the 15th of November, we shall publish a SPECIAL edition of 60,000 copies of the SCIENTIFIC AMERICAN, which will be mailed in separate wrappers and the postage prepaid to every post office in the United States, Canada, and adjoining provinces.

It is intended that a copy of the paper shall reach the principal manufacturers, workers in lumber and and iron, railroad shops, and the works of other mechanical and chemical industries in the United States. Advertisements will be taken for this extra edition on the same terms as in the regular issue, namely, 75 cents a line inside, and $1 a line on last page. A few notices, in the Business and Personal column, not exceeding four lines in length, will be inserted at $1 50 a line. This affords an unusually favorable opportunity for advertisers to reach a class of persons not accessible in the ordinary channels of advertising. The names have been selected with care, and the publishers guarantee the number issued to be full 60,000; the postage on these copies, which is twelve hundred dollars, will be prepaid, thus insuring the prompt forwarding of the papers to their destination.

Advertisers will bear in mind that this announcement is for a *Special* Edition which is to be circulated gratuitously among non-subscribers, and that the same advertisements which appear in the regular edition, if ordered in the extra, will be seen by entirely different persons.

ENGRAVINGS.

A few illustrations and descriptions of machines or articles of utility, whether they have already appeared in this paper or in other publications, will be received for insertion in this Special Edition on reasonable terms.

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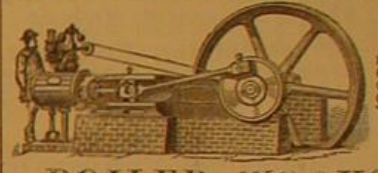

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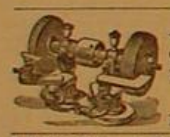

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