

injured. Formerly such practice was regarded economical, but it is now well understood that the most economical fires are those where the coal is small, and evenly scattered over the grate. In short, thin fires, more frequently fed.

Objection may be made to frequent feeding, on the ground that fire sheets are injured by a current of cold air impinging against them.

The time required to feed a fire, managed as described above, is very short, while in the old-fashioned way, the doors must be kept open some minutes to remove the slag that has accumulated on the grate bars; and further, the draft is always more or less impeded.

Internal corrosion is a difficulty frequently met with; it is deceptive and dangerous, and can only be detected by careful internal examination. We have found sheets badly defective in this respect, when the exterior of the boiler appeared sound and in good condition. This difficulty arises from impure water, and is common to a considerable extent all over the country. We are informed by the English companies that it is common there, especially in the mining districts. We have recently received from them photographs of plates, pitted and corroded to an alarming extent.

Water gages, it will be seen, are far from infallible; they are valuable, as a visible means of indicating the height of water in a boiler, but they should not be relied to the exclusion of gage cocks.

What we would say to engineers is, Look well to all the appliances and attachments of your boiler, they all need your constant attention. It is neither guaranteed nor expected that they will do your work for you, especially if left to themselves for months and years together.

Incorrect steam gages are too common, and in the reports for this month are several, 15 or 20 pounds out of the way. We have commented on this subject so often that we will now merely ask, How many who are now running steam boilers would be willing to increase their pressure 20 pounds steadily, especially if they are now running all that they dare?

The company employs for its inspectors competent men, who, by experience, are familiar with the construction and management of steam boilers, and know where to look for weak points and defects.

NEW RULE ABOUT PATENT OFFICE DRAWINGS.

Hereafter, in accordance with the new rule of the Commissioner of Patents, all drawings sent to the Patent Office will be returned to the applicant or his agent, unless they are artistically made. The principal reason for this regulation grows out of the fact, that duplicate drawings are to be photographed—one copy to be attached to the patent, and other copies are to be used for the convenience of the examiners in charge of the respective classes. The Commissioner advises applicants to employ competent artists to execute their drawings, which is also a good suggestion.

The promulgation of this new rule leads us to remark, that recently there has grown up a practice on the part of some agents to file miserably prepared drawings, simply for the reason that their slipshod method of doing business has forced them to adopt the cheapest possible plan. The consequence is, that the portfolio of the office are encumbered with a mass of rough outline sketches, which are neither artistic nor creditable to the office. The Commissioner, evidently, does not mean to encourage this disregard of artistic merit. He has a right to insist that all drawings hereafter to be filed shall possess a certain degree of excellence, and to faithfully illustrate the invention in detail.

To the North Pole by Balloon.

A new and daring experiment is noted by the *Pall Mall Gazette*: "The invariable failure which has hitherto attended nautical expeditions to the Arctic regions has induced two Frenchmen, Messieurs Tissandier and de Fouvillle, to undertake the enterprise of reaching the North Pole in a balloon. The machine in which the bold adventurers are about to embark on their perilous journey, and which is appropriately named "Le Pôle Nord," is now being completed in the Champ de Mars, which the government have placed at their disposal for the purpose.

The monster balloon, beside which even the famous Gécant would seem a mere toy, will contain over 10,000 cubic meters of gas, and is composed entirely of a cloth manufactured from caoutchouc, which will allow of great expansion in the rarefied strata of the atmosphere. The seams uniting the different pieces form a total length of three English miles. The car, a marvel, it is said, of strength and lightness, is constructed to carry ten passengers, 4,000 pounds of ballast, and provisions for a month.

The East River Bridge.

The plan of the East River Bridge, as proposed by Mr. Roebling, has met with the approval of the Board of U. S. Engineers, appointed to examine it, and of the Government, and has been fully adopted by the Board of Consulting Engineers, consisting of Horatio Allen, Wm. J. McAlpine, J. J. Serrell, Benj. H. Lathrop, James P. Kirkwood, and J. Dutton Steele, who have made to the Directors of the Bridge Company their final report, of which the following is the substance: The plans, including foundations, towers, and superstructure have been laid before the Board by Mr. Roebling at various times between February 16 and April 26, and from him they have received the fullest information touching all the details. Having completed the examination of the plans and the investigation of the combinations and proportions proposed, the Board deemed it an appropriate part of their duty to examine the structures of the same general character erected by Mr. Roebling across the Monon-

gahela and Allegheny, at Pittsburgh, in 1846 and 1860; across the Niagara Falls in 1850, and across the Ohio, at Cincinnati, in 1860. They have thus had an opportunity of learning the successive steps in bridge building, which, beginning with a span of 822 in 1854, and one of 1,057 feet in 1867, all standing this day—a practical demonstration of the soundness of the principles and proportions on which these structures have been erected, and rendering unnecessary, at least for spans of 1,000 feet, any other demonstration, and affording the best source of information as to the practicability of taking another step in a span of 1,600 feet. The bridge proposed by Mr. Roebling, a steel wire cable suspension bridge, 1,600 feet between the towers, 135 feet above the water, will be, in the opinion of the Board, a durable structure of a strength sufficient to withstand six times the strain to which it can under any circumstances be subjected, that it will bear the action of the greatest storm of which we have any knowledge, and that the method of joining the parts cannot be surpassed for simplicity and security in the result.

Editorial Summary.

THE TENNESSEE CENTRAL FAIR.—It will be noticed, by reference to our advertising columns, that this association proposes to hold a fair at Murfreesboro, Tenn., and offers liberal inducements to exhibitors of all classes of improved labor-saving machinery for mechanical, agricultural, and household purposes, and to producers of "blooded" stock, and all varieties of superior seeds for garden and farm. The liberal offer to receive the articles and have them exhibited without the expense and loss of time necessary for a personal visit from the owner, is a new and attractive feature in this class of exhibitions, and manifests a progressive and liberal spirit upon the part of the officers, which should be promptly and freely responded to by all who are interested in building up a community of social and financial good feeling between the two sections of the Union, and who desire a market in that fertile and fast-improving region of country. We hope the efforts of the directors will meet with a liberal response.

M. BRONNE has submitted the following opinion upon the nature of comets to the Academy of Sciences: "Comets are bodies which describe spirals originating in a nebula terminating in the sun; each spiral may be considered as an ellipse. Formed of the incandescent matter of the nebula, comets would appear to be the regulators of the grand movement of celestial bodies, the agents of that vast transformation of calorific work into mechanical work, and would come at the end of their course to lose themselves in the atmosphere of the sun, to which they would serve as an aliment."

THE NEW OCEAN CABLE.—The steamship *Great Eastern* is now engaged for the second time in laying a cable across the Atlantic ocean, this time, however, from the coast of France. The latest account represents that everything was proceeding favorably. The ship was 294 knots out of Brest, and had paid out 310 knots of the cable, the signals through to the shore continuing perfect. This affair is proceeding with all the quiet of a determined success, and we hope soon to learn of the safe accomplishment of the undertaking.

TURPENTINE.—The Bridgeport (Conn.) Iron Works are now engaged in making several large stills for the Wood Distilling Company for the manufacture of turpentine. This company has purchased several thousand acres of wood land in North Carolina, and have erected turpentine works, which are now successfully running near Bridgeport. The charcoal is said to be a valuable product of the distillation of the wood.

FORTY-SIX new discoveries of rich silver deposits are reported in the White Pine district, causing considerable excitement in that region. The shipments of bullion from thence latterly have averaged from \$70,000 to \$80,000 per week. The mining facilities will soon be doubled, and it is estimated that \$500,000 will be shipped in July.

GRINDSTONES.—A correspondent says: "The grindstone is a self-sharpening tool, and after having been turned for some time in one direction (if a hard stone) the motion should be reversed. Sand of the right grit applied occasionally to a hard stone will render it quite effectual."

THE Dale Silk Company, of Paterson, has obtained seventeen skilled weavers from Lyons, and quartered them in the company's houses, preparatory to entering extensively into broad-silk weaving. American dress silks are selling in New York at \$5 a yard.

THE Puget Sound lumber trade has increased very rapidly of late years. Upward of fourteen hundred vessels were loaded with lumber from the mills on the Sound within a year past, and there is a demand for new mills to supply the California market.

GUN-cotton explodes when metallic sodium or metallic potassium is brought in contact with it. The amalgams of these metals do not produce the same effect. Finely divided, arsenic requires percussion before it explodes the cotton.

THE canebrakes of the South are being cut down, steamed, baled, and sent to New England, where the fiber is made into wrapping paper.

AN effort has been making to change the location of the Allerton Steam Fire Engine Works, now at Naugatuck, to Norwalk.

INTERFERENCE CASE--DECISION OF THE COMMISSIONER OF PATENTS.

Commissioner Fisher has just rendered a decision in the interference case of Townsend vs. Fowle, for an improvement in submarine drilling apparatus, which reviews the general theory of interference so full and clear that we give the decision complete.

Cases of interference may be naturally divided into two leading classes. The first comprises those in which the applicants are both original and independent inventors, and the only question for decision is, which was the first inventor? The parties in this class of cases may be, and usually are, widely separate, and have no connection whatever with each other. The coincidence of invention is accidental, or rather results from the fact that the improvement is one which is demanded by the state of the arts, and one which many men are seeking at the same time to discover or develop.

The question of priority in these cases is usually one of easy solution. It is to be determined by ascertaining which of the parties first reduced the invention to practical form, either by a drawing sufficient of itself to enable an artisan to make the thing invented, or by a sketch accompanied by a written description, or by a model, or full-sized machine. It should be a willing, in such cases, to accept mere conversation as proof of invention, however explicit in details, unless such conversati ns were directed to workmen to construct the machine, and it was actually built at the time from such directions.

The second class of interferences comprises those cases in which two men have been more or less connected in the work of invention when the relations of partner or employer, and employer or friend or fellow-workmen have in some form existed. When the invention, if it is the act of both, takes place at the same time, and when the real question is not so much one of priority as of originality; when, in short, it is charged or inferred that one of the parties is in fact claiming that which he has taken from the other to whom it rightfully belongs. This class may be again subdivided into three: First, where the parties are fellow-townsmen or workmen, or so situated that either might have known of the movements of the other. Second, where one party is the general employer of the other, and in the course of his work makes some improvement upon the tools or method with which he works. Third, when the one has been specially employed by the other to assist in developing or embodying the very invention in controversy.

The cases which fall within the second class are by far the most difficult. The testimony is usually contradictory, and the parties surrounded by a troop of partisans, clerks, or workmen appear, and like the seamen of opposing vessels in a collision case swear directly in each other's faces. Each is at pains to deny every fact, material and immaterial, asserted by the other, until the judge is compelled to grope painfully through a mass of contradictory evidence to find some fact, as a base for a decision, which has escaped the fury of the conflict.

There may be some presumptions which will render it possible to approximate to the truth. It may be said in general that in cases falling under the first subdivision the evidence necessary to establish priority should be substantially the same as in cases of the first class, to wit: That he is the first inventor who has reduced the invention to practice. As to the second and third subdivisions it may be safely asserted that the presumption is that the workman is the inventor in the former case and that the employer is in the latter.

When workmen are employed in large establishments it is a natural and common mistake for employers to suppose that they are entitled to the brain work as well as the hand work of their employees; that if a valuable invention is made as in some measure it is their product, being that of the mind of their servant, they have acquired a title to it as to be able to consider themselves the inventors. This is especially the case when the employer has conversed with the workmen during the progress of the work or has exhibited any interest in its successful completion. They confound the supply of material with the supply of ideas, and sometimes confidently claim to be the inventors of mechanism which they would find it difficult to describe and impossible to operate.

But when a man has conceived an idea and given to it more or less development, and employs a mere workman to put it into shape, it is obvious that much confusion is likely to follow, proportioned to the mechanical skill of the workman and the lack of it in the projector. So many suggestions and hints may be furnished by the workman that at last he ceases to remember the parentage of the underlying idea, and fancies that the whole machine is the product of his own invention. It must be rare, however, in such cases that the laborer or mechanic or model maker can raise him to a rank higher than that of joint inventor with him who has the original conception, while in the great majority of cases the safer rule is undoubtedly that laid down by the Supreme Court of the United States in the late case of *Agawam Woolen Company vs. Jordan*, where it is said, "When a person has discovered an improved principle in a machine, manufacture, or composition of matter, and employs other persons to assist him in carrying out that principle, and they in the course of experiments arising from that employment make valuable discoveries auxiliary to the plan and a preconceived design of the employer, such suggested improvements are in general to be regarded as the property of the party who discovered the original improved principle, and may be embodied in his patent as a part of his invention."

The present case belongs to what has been called, in this opinion, the third subdivision of the second class. Fowle was a model maker. He had some experience in rock-drilling machines, in which he had made some inventions. He was without experience in submarine drilling or apparatus, and had never seen such apparatus at work.

Townsend was a submarine diver, and having opportunity to contract for the removal of rocks in Boston harbor, sought the services of Fowle for the construction of a model of a machine which should embody his inventions. According to Fowle, he brought to the latter nothing but a desire to obtain a suitable machine without any idea of the means. In other words, he proposed a result to Fowle, and left him to devise means for effecting it.

According to Townsend, on the other hand, the idea when communicated to Fowle was already so far developed, even as to details, that nothing remained for the model maker but to embody the plan in a piece of wood or case of the inventive faculty. The testimony is very contradictory. Each party has proved his case to a demonstration, if the testimony of certain witnesses only is to be considered. Taking the testimony as a whole, however, I am of opinion that it strengthens the presumption afforded by the relative situation of the parties at the beginning of the controversy; that Townsend was the inventor and Fowle the artificer, furnishing, no doubt, some hints and suggestions; perhaps some decided improvements, but in the language of the case already referred to, "not amounting to a new method or arrangement which in itself is a complete invention."

The decision of the Board of Examiners is affirmed.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

At the late meeting of the New York Draftsmen's Association it was decided that the prize for the best original design for a capital, competition for which was open to all, be awarded on or about the first of July next. Three prominent architects of this city, members of the New York Chapter of the American Institute of Architects, were chosen, and have consented to act as judges. The prize is to be \$10 and a diploma.

A contract has been concluded between the Baltimore and Ohio, and the Indianapolis, Cincinnati, and Lafayette Railroad Companies, for permanent business connections to and from the West via Cincinnati. This arrangement provides for through trains, rates, and proper facilities for the development of a joint traffic. The former company becomes largely interested in the securities of the latter. The arrangement is regarded as very important, particularly to the cities of Cincinnati and Baltimore.

The discovery of extensive clay beds at Syngack, Passaic county, N. J., has had an enlivening influence on that place. Some two or three hundred men are at work preparing for extensive operations in the manufacture of brick. Two or three acres of sheds are erecting, and a branch canal has been excavated to connect with the Morris Canal for transportation purposes.

An experiment has been made at Munich, for the purpose of determining if a railway carriage wheel rolls regularly without sliding, so that by recording the number of revolutions of a wheel, the circumference of which is known, the distance accomplished could be accurately ascertained. The difference between the measurement by mathematical instruments and that obtained by noting the revolutions of the wheel, was found to be no more than 1-68,000 of the whole.

The street railway companies of Cincinnati have adopted the following expedient with the two-fold object of encouraging travel on their lines and of diminishing the opportunities for stealing on the part of conductors. All the tickets are numbered, and are like theater tickets in having coupons. The passenger retains one part with a number upon it corresponding to that which he gives up. All the tickets taken in a week are saved, placed in a wheel, and one is drawn out. The holder of the coupon whose number corresponds to that of the ticket, draws a prize of fifty dollars.

A submarine diver, who has recently been at work in the Shetucket river at Laurel Hill bridge, Norwich, Conn., says it is the worst place for diving he ever saw, the river bottom being covered with rocks. In one place there is a rock, the top of which is only five feet under water, while at its base there is a depth of thirty-five feet. Back of this is a cave of considerable size, the hidden beauties and strange formations of which, could the water be drawn off so as to make it accessible, he thinks would be one of the wonders of the age.

On June 24, Lord Houghton presided at a public breakfast given in London to fourteen English artisans who were about to sail to this country for the purpose of entering Cornell University. The speech of the learned chairman was full of encouragement and good advice for the enterprising young men.

In Wittenberg, Germany, an industrial exhibition was opened, and no less than 800 manufacturers, with 4,000 specimens of their industrial skill were represented on this occasion. The display was composed almost exclusively of products of German industry.