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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT No. 1071.

For the Week Ending July 11, 1896.

Price 10 cents. For sale by all newsdealers.

THE PRIZE ESSAY COMPETITION.

Our readers will be pleased to know that, judging from the number of essays submitted for examination, the competition has been a great success. The papers are all in the hands of the committee, and we hope to be able to announce the name of the winner of the $250 prize in our next issue.

We would call the attention of our readers to the card published in another column concerning what invention introduced within the last fifty years has conferred the greatest benefit upon mankind. We hope that all our readers will fill out the ballot and send it to the editor, as the polls will close on July 13th, and it is desired to procure as large a vote as possible. Some who have not carefully read the announcement have cast their votes for such inventions as the printing press, the steam engine, etc. Of course, such ballots will have to be thrown out, as being too indefinite, or as not coming within the terms of the competition. The final result will be published in our special issue of July 25.

THE PARIS EXPOSITION OF 1900.

Exhibitions have come thick and fast in the closing years of the nineteenth century. The more frequent industrial displays of States, cities, and provinces have been the background which has served to show up the stately splendor of the less frequent international fetes—they are nothing less—such as that at Paris in 1889, and again at Chicago in 1893. At the close of our late exposition, which was universally admitted to have been more extensive, complete, and artistic than any that preceded it, it was predicted that the limit had been reached, and that nothing on a like scale would be again attempted.

Yet, as a matter of fact, before the blackened remains of the Chicago Fair are well cleared away, it is announced that the arrangements are complete for what is to be the most elaborate and brilliant industrial display of the century. If any people but the French had made the promise, those of us who had the privilege of seeing the proportions and beauty of the architectural display at Jackson Park would be prepared to doubt its fulfillment. There were not wanting visitors to our exposition who complained of its size, and suggested that a smaller display of selected exhibits would be more effective and intelligible. If the Parisians are aiming to gather a yet larger collection of exhibits, there is a danger that it will become bewildering and oppressive in its proportions. That the display of architectural and landscape skill in the buildings and grounds will be of a very high order goes without saying in a city so rich in artistic talent as Paris; and yet we very much doubt if any grouping of buildings in the Renaissance and later French styles, however skillfully carried out, can be made to equal the chaste beauty and dignified repose of the noble group which composed the Court of Honor at Jackson Park.

It is to be hoped that our Congress will deal liberally with the question of a subsidy to cover the expenses incidental to a worthy national representation at the Paris Exposition. With one exception, the great manufacturing nations made a noble response to our invitation to Chicago, and the present indications are that there will be a keen rivalry between England, Germany, Russia and France, which will lead to a magnificent industrial display on the part of each one of these nations. What is to be the relative standing of the United States? If we do anything at all it should be well done. Rather than make an imperfect display of our natural and industrial resources, it would be better to stay away altogether. We do not fear such a result; but we do think that it would be greatly to our national advantage to put up a really magnificent display which shall be fully representative of our vast resources and industries.

The time has come in our industrial history when we are beginning to turn our eyes abroad and push out more actively into foreign markets.

Many distinctively American products, whose market is at present exclusively American, would be found to be equally adapted to European needs, if a trial were once made. It is only within the last few years that the typewriter has been systematically introduced—and there are a thousand and one labor-saving devices, that are considered indispensable on this side of the water, which are as yet unknown in Europe. This is true not merely of the lighter trades, but even in the weightier matters of transportation. The European still navigates his rivers and lakes in uncomfortable and shelterless steamers; and the sight of a model of a Sound or Hudson River steamboat, with its spacious saloons and comfortable staterooms, would be a positive object lesson in matters of accommodation and comfort. Moreover, there is scarcely a trade which has any degree of connection in Europe that could not spend a large sum on its exhibits with the certainty of a profitable return.

THE secretary of Smithsonian Institution has leased one of the tables at the Naples zoological station for another three years for the benefit of American students.

A Singular Mode of Incubation.

It is well known that the Australian megapod is a bird that is accustomed not to sit on its own eggs. In certain parts of Australia are found numerous mounds of considerable size and height, which the first explorers took to be burial mounds. These were made by the Megapodius tumulus, which uses them for hatching its eggs. They have sometimes considerable dimensions: a nest that is 14 ft. high and 55 ft. in circumference may be regarded as large. Each megapod builds its own nest with materials which it gathers from all sides, and these are exactly what the gardener uses in the month of March to make his forcing beds, namely, leaves and decomposing vegetable matter, which, by their fermentation, give off an appreciable amount of heat. In the forcing beds, this heat hastens the sprouting of the seeds; in the nest it suffices for the development and hatching of the young birds, and the mother can go where she likes and occupy herself as she wishes, without being troubled by the duties of sitting. In the small island of Ninafou, in the Pacific, another bird has a somwhat similar habit, in so far as it also abandons its eggs; but in place of obtaining the necessary heat from fermentation, it gets it from warm sand. The leipoa, or native pheasant of Australia, acts like the megapod, and watches the temperature of its mound very closely, covering and uncovering the eggs several times a day to cool them or heat them, as becomes necessary. After hatching, the young bird remains in the mound several hours; it leaves on the second day, but returns for the night, and not until the third day is it able to quit the paternal abode.—Revue Scientifique.

Experiment with Rotary Motion.

An interesting experiment described in Invention illustrates the stability given to a moving body by rotating or spinning it rapidly, as in the case of a rifle bullet. The experiment can be made by any bicyclist when cleaning his wheel. "Assuming the front wheel is detached, lay it upon the floor and, keeping the axle vertical by the hand, give the wheel a vigorous spin. The axle remains unaffected, the wheel running in the ball races. Now lift the wheel by means of the axle and put the left hand under the wheel and catch the other end of the axle. You now have a horizontally revolving wheel, and you will be astonished to find how difficult it is to turn the wheel into a vertical position as long as the spinning continues. Let this cease and you can do as you like with the wheel, but give it a vigorous spin and you will find, whatever position it was then in, it will show the perversity of a pig if you attempt to change it. In making this experiment, get a good grip, as it throws a very considerable strain on the arms and feels, indeed, as though one were struggling with some aerial wrestler. Imagine now a shot starting on its course with this rotary motion; if it meets an obstruction fairly and squarely, the forward motion will be somewhat arrested, but the boring action due to rotation will give it a terrible penetrating power. Again, suppose it strikes at a slight angle, and you may think it will glance off like a stone from a smooth piece of walling. The new force, however, here comes into play, and most decidedly objects to the alteration of direction, thereby causing penetration that would be quite impossible under other circumstances. After making the above experiment, you will find you have a much increased respect for a shot fired from a rifled barrel."

How Colds are Taken.

A person in good health, with fair play, says the Lancet, easily resists cold. But when the health flags a little, and liberties are taken with the stomach or the nervous system, a chill is easily taken, and according to the weak spot of the individual, assumes the form of a cold or pneumonia, or it may be jaundice. Of all causes of "cold," probably fatigue is one of the most efficient. A jaded man coming home at night from a long day's work, a growing youth losing two hours' sleep over evening parties two or three times a week, or a young lady heavily "doing the season," young children overfed and with short allowance of sleep, are common instances of the victims of "cold.

Luxury is favorable to chill taking; very hot rooms, feather beds and soft chairs create a sensitiveness that leads to catarrh. It is not, after all, the "cold" that is so much to be feared as the antecedent conditions that give the attack a chance of doing harm. Some of the worst "colds" happen to those who do not leave their houses or even their beds, and those who are most invulnerable are often those who are most exposed to changes of temperature, and who by good sleep, cold bathing, and regular habits preserve the tone of their nervous system and circulation. Probably many chills are contracted at night or at the fag end of the day, when tired people get the equilibrium of their circulation disturbed by either overheated sitting rooms or underheated bedrooms and beds. This is specially the case with elderly people. In such cases the mischief is not always done instantaneously, or in a single night. It often takes place insidiously, extending over days or even weeks.

Recent Patent and Trade Mark Decisions.

Hostetter Company v. Becker (U. S. C. C. N. Y., Coxe, J.), 73 Fed. Rep., 297.

Unfair Competition.—The complainant in this suit had for many years sold "Hostetter's Bitters." The defendant made an article resembling it in color and other particulars and sold it under the name of "Host-Style Bitters" in large unlabeled demijohns, and in several instances had given the purchasers empty bottles bearing complainant's labels. The court held that, although the purchaser from the defendant was not deceived by this transaction, yet he had furnished the means for deceiving the public and should be enjoined from selling "Host-Style Bitters" and in connection with the sale giving to the purchaser empty "Hostetter" bottles.

Welker v. Weller (U. S. C. C. Penn., Buffington, J.) 73 Fed. Rep., 299.

Fastenings for Table Legs.—The Welker patent, No. 480,526, for a fastening for legs of knockdown tables, in view of the prior art, is not infringed by constructions which do not embody the longitudinal segmental kerfs and the tenons secured in the kerfs or grooves, and in which an old well known joint is used.

Design for Table Leg.—The Welker design patent, No. 22,997, has been held void for want of novelty.

Troy Laundry Machinery Company v. Adams Laundry Machine Company (U. S. C. C. A., 2d Cir.), 73 Fed. Rep., 301.

Laundry Dampening Machine.—The Wendell and Wilds patent, No. 401,770, was so limited by the action of the Patent Office and the acquiescence of the patentees therein, and by the specific language of the claims and specifications, that a thin textile covering of the dampening rollers is a material element of the claim, so that the claims are not infringed by constructions having a thick covering of felt for the rollers.

Croskey v. Atterbury (Pat. Comm.), 75 O. G., 1359.

Diligence in Reduction to Practice.—Croskey conceived his invention in the manufacture of hollow glassware in December, 1890, and reduced it to practice in October, 1892, while Atterbury conceived it in July, 1892, and filed an application in October, 1892. Atterbury was held to be the prior inventor in the absence of a showing of reasonable diligence by Croskey.

Reduction to Practice.—To reduce a method or process to practice, the series of acts which constitute such action or process must be performed.

Diligence in Reduction to Practice.—Where an inventor could have completed his process at any time within two years but failed to do so, he cannot establish a case of reasonable diligence against one who conceived the invention later but filed an application before the first inventor reduced his invention to practice.

Dewey v. Colby (Pat. Comm. Dec.), 75 O. G., 1360.

Subsequent Claim.—An illustration that amounts to not more than a suggestion does not warrant a claim filed nearly two years after the application and nine days after an interfering patent.

Reduction to Practice.—The drawing of a device is not reduction to practice.

National Conduit Manufacturing Company v. Connecticut Pipe Manufacturing Company (U. S. C. C. Conn., Townsend, J.), 75 O. G., 1361.

Effect of Estoppel on Validity of Patent.—A party selling a patent is estopped from denying its validity because he has received and retained a valuable consideration based upon an implied representation that the patent is valid, and the sale of the patent amounts to an agreement by th seller that whether the patent be found to be void or valid, he will not interfere with the rights of any subsequent holder of the patent.

Sale of a Void Claim.—When an application for a patent has been sold, and afterward it is found that a claim therein is void, but the purchasers complete the payment of the consideration after gaining such information, their acts amount to an election to stand by the contract instead of repudiating it.

Acts of a Contracting Stockholder.—A corporation is considered in law to have a distinct personality independent of its stockholders, and therefore is not responsible for the personal acts of its stockholders, but this doctrine does not hold where the seller of a patent has nearly all the stock of a corporation, and either uses such corporation as a mere cover for such transaction of his business or there is knowledge of his transactions on the part of the other stockholders, and hence the corporation will be bound by the acts of such stockholders.

Excelsior Guard and Hatch Cover Company v. Foote (U. S. C. C. N. Y., Townsend, J.), 75 O. G., 1364.

Means for Closing and Controlling Hoistway Covers.—Letters patent No. 278,528, granted May 29, 1882, to Daniel Frazier, have been held void because the improvement therein set forth did not involve the exercise of the inventive faculty over the prior art.

Adaptation is not Always Invention.—The adaptation from a different art of devices which successfully accomplish in a given apparatus results previously imperfectly accomplished by crude apparatus does not amount to invention.

Gould Coupler Company v. Pratt (U. S. C. C. N. Y., Coxe, J.), 75 O. G., 1547.

Car Couplers.—Patent No. 254,106, of Feb. 28, 1882, to Clinton Browning for car couplers of the Janney type has been held valid.

Patentability of a Simple Invention.—An invention does not cease to be meritorious because it is simple. The test is not whether the mechanism is simple or complicated, but whether the patentee has given the world something new, whether the public is richer for the contribution to the art, and whether he has produced new and useful results. Hence, invention should be determined more by the ascertainment of what the inventor has actually accomplished than by the technical analysis of the means by which the result is attained.

Infringement While Omitting Subordinate Feature.—Where the real value of an invention lies in one element of the invention and an infringer has appropriated that, he should not be allowed to escape on the plea that he had omitted a subordinate and apparently insignificant feature, unless it is apparent that he has omitted it. To find an invention meritorious and then defeat it by an illiberal construction is consistent and unfair. To decide that the inventor has conferred a benefit upon mankind and destroy his patent by a harsh construction is condemned both by the general principles of equity and by express authority, for the court should be diligent to give him a reward for his genius and resolve all questions in favor of the invention.

Car Couplers.—Claim 3 of the Barnes patent, No. 337,650, May 9, 1886, must be limited to the specific details shown and described.

The July Heavens.

The sun has now turned his face to the southward, and the days are forced once again to yield some of their time to the nights. On the 1st of the month the sun will rise at 4:32 and set at 7.35, making the day fifteen hours and three minutes long, whereas on the last day of the month almost three-quarters of an hour's difference will be found in the day's loss and the night's gain. The sun has two of the planets in conjunction with it this month, Venus and Mercury, the former on the 9th and the latter on the 31st. In both cases the planets pass on the further side of the sun from that on which our planet is to be found at the time.

The last quartering of the June moon will occur on July 2, and on the 10th the new moon for July is due. There is first quarter on the 17th and full moon on the 24th, when the moon, being well south in declination, will seem so very much nearer than when it rises further north and passes so high over our heads when it reaches our meridian. There are some very close meetings this month between the moon and several of the planets. The meetings between the remaining planets and Luna are at too great a distance to play an important part in the monthly events of interest.

On the 9th Venus is in superior conjunction with the sun, and passes once more to the realm of the evening stars. It will be some little time before we can see her face, but it will be very well worth seeing when we are permitted to have a look at it, and what still more concerns us is the fact that we shall have her with us throughout the year. The new moon and Venus are in conjunction on the 10th, which shows that both are fairly close to the source of light and heat.

Mercury, on his way to the eastward, passes the sun on the last day of the month, and again joins the ranks of the evening stars, where he will remain until October, when he is in inferior conjunction and rejoins the morning brilliants, to which he makes a very slight addition, as his face during this portion of his tour is hardly visible.

Mars and the fading crescent are in line on the 4th. At the time of this conjunction the planet is close to the constellation of the Fishes. Mars is moving toward the position of quadrature with the sun, a point that he will not reach until the close of August, and it will be almost the middle of December before he is in opposition with the sun. Between now and then his disk will have increased two and a half times its present size, and his cheerful, ruddy face will be a most welcome addition to our evening studies. Neptune still is numbered with the morning stars, and obstinately refuses to let us see him in all his glory. Even when in line with the moon on the 8th, the two are so far separated that we can form but a very vague idea of the planet's locality from that in which we see our satellite.

Uranus is moving toward quadrature, where he will arrive in August. He is an evening star at present, and is in the constellation of the Scorpion.

Jupiter for awhile ceases to have as lively an interest for us as he has been having for some months, as be has drawn in toward the sun so close that his face has become quite dim. When he reappears it will be as a morning star, there to be classed throughout the remainder of the year.

Saturn is an evening star, and next month will have completed one-quarter of his journey, and will be in quadrature with the sun. Three months later he will be in conjunction, and after that will belong for the remainder of the year to the morning stars. The planet is now to be found in the group of the Virgin.

Just now we must look toward the south to find the most glorious display of stars in the evening. The contrast between the northern and southern skies is very strange. Toward the north the region below the pole shows not a single star above the fourth magnitude, while in the opposite direction it is singularly rich in large stars, chief among them being Antares, perhaps the most beautiful of all the red stars. The large constellation Ophiuchus has been supposed by some to represent Æsculapius and by others to be another celestial Hercules. In the constellation Corona Borealis there was a star suddenly blazed out some thirty years ago, and, though it soon failed in luster, it can be found with the telescope. When at its brightest it appeared as a second magnitude star. In the eastern section of the heavens th Milky Way has now risen high above the horizon, and in clear weather can be studied very advantageously. With a good peraglass the bright parts of the galaxy here will be found to be ablaze with stars. The little group known as Delphin is now conveniently located for observation, with the Lesser Horse below it and Pegasus from the left. The constellation Cygnus is now well placed or observation, and the cross that one can fairly picture here is fully as fine as the famous Southern Cross. In the west Regulus is the most brilliant star: then there are the constellations Hydra, Leo, and overhead Ursa Major.—New York Times.

Spiders that Catch Birds.

Mr. W. J. Rainbow, an Australian naturalist, gives the following description of the large bird-entrapping spiders of his country, which we quote from the American Naturalist: Representatives of this genus abound in tropical and subtropical regions. Their webs are composed of two kinds of silk—one yellow, exceedingly viscid and elastic, the other white, dry, and somewhat brittle. The latter is used for the framework of the web, the guys, and radii, and the former for the concentric rings. These snares are at varying heights, sometimes within reach, again ten to twelve feet from the ground, but always in a position exposed to the rays of the sun. The diameter is also variable, from three feet upward. One seen by Graffe in the Fiji Islands constructs a web thirty feet in diameter. These snares are strong enough to entrap small birds.

In the author's opinion the web is not set for such game, and the spider does not feed on her ornithological victim. In the cases where she has been observed with her fangs in the body of the ensnared bird it is probable that it is for the purpose of hastening the death of the bird in order to prevent its injuring the web in its struggles to escape. Spiders of the genus Nephila are easily tamed. Although exceedingly voracious, they can neverthless exist for many days without either food or water. They pair in autumn. The sexes inhabit the same web for a considerable time, the female in the center and the male on the upper edge of the web. His efforts to ingratiate himself in the favor of his mate are not always successful. It not infrequently happens that he has to retire from her presence minus two or three legs.

Population of Paris in 1896.

The administration, says the Revue Scientifique, has just made known the first results of the census of Paris taken on the 29th of March. These results show a population of 2,511,955 inhabitants for the entire capital. If this figure be compared with that obtained five years ago (say 2,424,703 inhabitants), we find that the increase has been 87,250.

It is found that the entire center of Paris, say 31 quarters out of 80, nearly half of the most populous quarters, is visibly becoming depopulated to the profit of the suburbs and periphery of the capital. In fact, the total of the diminutions reaches the figure of 19,000 units, which represents practically the loss in the main departments of the city proper, while the total increase of the 49 quarters whose population has augmented exceeds 106,000 individuals, that is to say, exceeds the population of cities such as Rouen, Havre, Reims and Roubaix.

Hereafter, it will be no longer in the most populous quarters that it will be well to look for the seat of the normal increase of the population of Paris. The center is saturated, and it is toward the outskirts—toward the suburban and freer quarters, and especially beyond the fortifications—that Parisians are tending more and more to emigrate.

ROENTGEN rays have been used to take pictures of flowers. They show the ovules inside the ovary in an unopened bud, the seeds within a seed vessel, and even the veins upon the white petals of a flower.

A New Secular Version of the Bible.

A new English version of the Old Testament, from a text corrected by comparison of the best manuscripts, has for some years been in preparation by the Johns Hopkins Press, says the Baltimore Sun, under the supervision of Prof. Paul Haupt, of the Johns Hopkins University, and by the end of the present year a number of the books composing the Hebrew Scriptures will have been published. A feature of the enterprise is that it is not in the hands of theologians. It is purely a secular work, and the only aim has been to get, first, a correct text, and then a correct translation, without regard for its bearing upon any creed or scheme of unbelief. Since the time of King James, when the received version was made, many new helps to the right rendering of the Hebrew text have been discovered. Semitic scholarship has made great advances in methods as well as the acquisition of ampler materials for comparison, elucidation and study. By the coöperation of Semitic scholars of the whole learned world, Prof. Haupt has secured a Hebrew text which is being printed at Leipzig. It is printed in colors, the same page having sometimes as many as four colors, each color denoting a different element in the construction of the text. A single line may contain several colors to distinguish the undoubted original from portions that are in doubt. The fact that parts of the same book belong to different periods or authors will also be indicated. For example, in the book of Leviticus the "Priestly Code" will be in black letters on a white background. The parts added later will have a brown background and the Law of Holiness will be in yellow. Interpolations are indicated by overlining. Where the original is poetry this will be indicated in the translation.

After securing a perfected text the various books were allotted to the most learned Orientalists of this and other countries for translation, the book of Ecclesiastes being allotted to Prof. Haupt. In a recent issue of the New York Journal an article by Rudolph Block compares the new version of chapter xii of Ecclesiastes with the old with some interesting results. The chapter is chiefly an exhortation to the cheerful enjoyment of the good things of life, with an allegorical conclusion in which the decay of the several faculties is ingeniously depicted. Everyone recalls the familiar passage, "Remember now thy Creator in the days of thy youth, while the evil days come not," etc., and the following passage: "In the days when the keepers of the house shall tremble and the strong men shall bow themselves and the grinders cease because they are few and those that look out of the window be darkened." In the new version this runs:

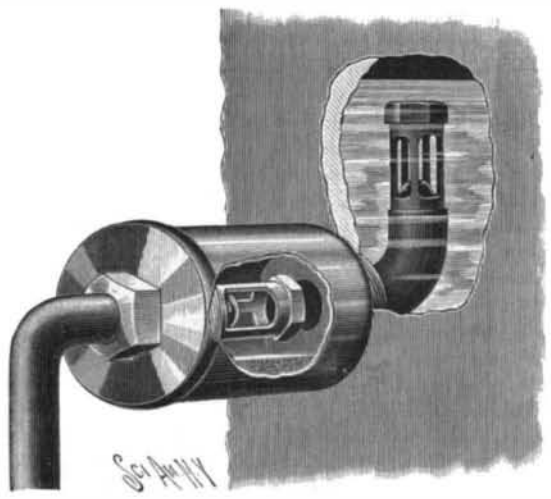
> Remember thy wife in the days of thy vigor,
> Ere there come the days of evil,
> And the years draw nigh
> In which thou wilt say I have no pleasure.
> Ere is darkened the sun and the light of day,
> And the moon, and the stars,
> And the clouds return after the rain,
> When the keepers of the house tremble,
> And the men of power bend themselves;
> The grinding maids cease
> And the ladies that look out through the lattice are darkened.

The meaning is plainer in the new version. "Ere is darkened the sun," the professor says, refers to the sunshine of childhood, when all is bright. The "moon" suggests the tempered light of boyhood, while the "stars" indicate fewer moments of happiness in mature age. As age advances there are many days darkened with rain "and the clouds return after the rain," so that there are few bright moments. The "keepers of the house" are the hands. As age proceeds erectness of carriage is lost—"the men of power bend themselves." Man loses his teeth, which are "the grinding maids," and his eyes grow dim—"the ladies that look out through the lattice are darkened." The old man's sleep is short and "he rises at the voice of the birds." The "daughters of music are brought low" means that the sense of hearing is lost. The septuagenarian dislikes to go upstairs or climb a hill—he is "afraid of that which is high." His hair becomes white—"the almond tree blossometh." The pessimism of the chapter is intensified in the concluding line of the new version, "All is vanity and all that is coming is vanity."

THE College of Civil Engineering at Cornell University is engaged in the determination of the longitude of Cornell. They are working conjointly with the United States Naval Survey and Harvard University. Two officers of the naval survey are stationed at Washington, D. C., for accomplishing this purpose. The astronomical observations at the three places must be carried on simultaneously, and great difficulty is experienced in getting nights which are sufficiently clear at all three places. Twenty stars are to be observed, in sets of four each night, and ten nights of simultaneous observation will be required to complete the work. The Cornell observer will then go to Washington to correct his personal equation, after which all the three sets of observations will be reduced to a common standard of time, and the special relation of Cornell to the rest of the universe will be determined with final accuracy.

SAFETY CHECK FOR BOILERS.

The safety check shown in the illustration has been patented by Mr. Frank Albin, of Dodge City, Kansas, and is especially intended for use on locomotive boilers. It consists of an exterior mud pocket, which is threaded into the shell of the boiler, and receives at its outer end the injector pipe. The mud pocket is closed by a threaded cap which is perforated, and on the inner side is extended to form a valve cage in which is located a ball valve. The passage from the mud pocket to the boiler terminates in a short elbow which is screwed into the neck of the pocket and extends upward within the boiler, where it terminates in a ball valve similar to that in the pocket. The feed water, in passing through to the boiler, will deposit any solids and foreign matter which it may contain, within the mud pocket, where it will collect and settle. It

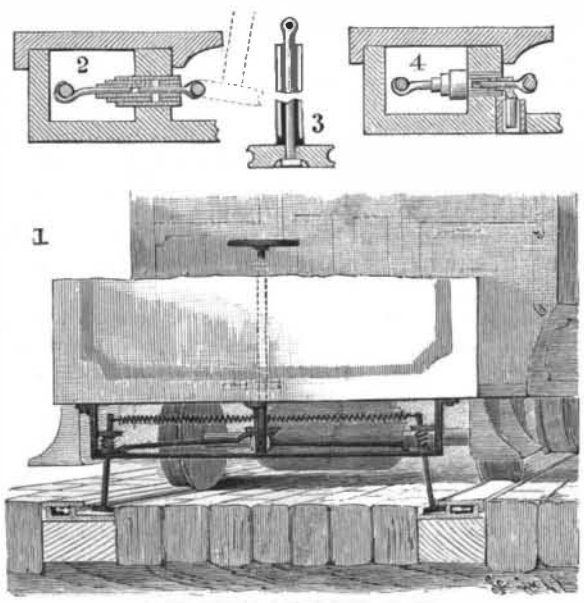


ALBIN'S SAFETY CHECK FOR BOILERS.

will be seen that the ball valves will prevent the return of water from the boiler, and should the mud pocket be broken off, the valve on the inside of the boiler will effectually prevent the terrible effects which ordinarily follow from the escaping water and steam in the event of collision. The inner ends of both the valve chambers are closed by spanner nuts, and the various connections are threaded, so that the device is easily taken apart for inspection. The valve in the interior of the boiler, moreover, enables the mud pocket to be opened and cleaned at any time when the boiler is under steam.

THE DUCT TROLLEY RAIL.

The device shown in the accompanying illustration is intended to dispense with overhead conducting wires, or the underground duct, as commonly used on electric railroads; and its construction is such that leakage of electricity is prevented, and the danger of accident to persons or horses in crossing the tracks is entirely removed. It has been patented by Mr. Charles Sill, of 301 West 12th St., New York. Each rail contains a continuous longitudinal duct, in which is carried the



THE DUCT TROLLEY RAIL.

conductor, and on the inner side of the rail is formed a recess, in which is carried a sectional trolley wire which is engaged by a trolley wheel, whose rod is adjustably mounted in a bracket attached to the under side of the car. The upper ends of the trolley rod are drawn together by the tension of a coil spring, and they terminate in wires which lead to the motor, the action of said spring serving to keep the trolley wheels in contact with the trolley wire. The conductor and the trolley wire are normally disconnected, and they are automatically connected as the car passes along the track. This is done by means of a contact making and breaking device, which is adjusted in the inner web of the rail and consists of two rods, one of which carries the conductor and the other the trolley wire, said rods being normally held apart by the tension of a rubber spring. These rods are carefully insulated from the rail, which carries them, so that only upon their being brought into contact with one another by the pressure of the trolley wheel as it passes can any circuit be formed between the conductor and the trolley wire. The transversely extending rod which carries the trolley wire is slidably supported at the upper end of a vertical rod, which is carried by the base of the rail, and carefully insulated therefrom. The whole of the insulation is carried out with great care, and the construction is such that all moisture is excluded from the conductor and leakage prevented. The trolley rod is hung pivotally on the upper arm of the above mentioned bracket, and has a rocking motion transversely to the car, in a slot in the lower arm of said bracket. The trolley rod is joined by a connecting rod to a crank disk, secured on a shaft extending longitudinally to the car, which is connected at each end by bevel gear wheels with the controller shaft on each platform.

By turning the controller in one direction, the crank disks operate to press the trolley rod wheels against the trolley wire, and thus push its carrying rods into electrical contact with the carrying rods of the conductor within the rail duct, thereby forming a temporary circuit on that particular section of the track, during the passage of the car. A coil spring, engaging the trolley rod and the two carrying brackets, allows sufficient vertical adjustment to meet the irregularity of the track or the passage of the car wheels over an obstruction.

The Heat Conducting Power of Metals.

After a thorough investigation of this subject, Herr W. Beglinger has arrived at the following conclusions: The results show that the heat conducting power of the different kinds of iron is altogether different. It is, therefore, of the greatest importance to know the coefficient of the inner heat conducting power. Steel and wrought iron show a more uniform behavior in this matter than cast iron. It is not confirmed that hardening reduces the conducting power of steel by almost one-half, though it may be conceded that hardening will reduce it slightly. The difference in working, by forging or rolling, showed only in one case, with wrought iron, considerable differences for the conducting power. Casting seems to cause far more irregularities.

Wrought iron showed generally better conducting power than did steel. Herren L. Holborn and W. Wien have compiled a table showing the heat conducting power of the different values. The average value for the different kinds of iron and steel is given. The factor, R, indicates that through a plate of 1 centimeter thickness at a difference of temperature of 1°, for 1 square centimeter each, a quantity of heat passes which will increase the temperature of R gramme of water by 1°:

Copper	R = 0·918
Iron	R = 0·156
Steel	R = 0·062 to 0·111
Zinc	R = 0·292
Tin	R = 0·150
Lead	R = 0·079

Aluminum Glass.

M. Leon Appert, the distinguished glass expert, has contributed to the Moniteur de la Ceramique et de la Verrerie an able article in which he discusses the prominent part which, he thinks, alumina is destined to play in the manufacture of glass. "After having made numerous analytical tests of ancient window glass," says M. Appert, "I have arrived at the following conclusions, which appear to be of practical industrial value. The introduction of alumina into glass prevents or at least retards devitrification, which will occur always by the slow and repeated lowering of the temperature. The presence of alumina makes it possible that a part of the alkaline bases, soda or potash, may be replaced advantageously by an equal quantity of lime. Glass thus modified in its composition is more solid, less changeable and more elastic. The alumina can be added to the silica without any inconvenience in a proportion not exceeding 7 to 8 per cent. The fusibility of glass is slightly increased thereby, while its ductility is not sensibly diminished. The only inconvenience that can arise from the use of aluminum is that it will color the glass to some extent. This coloring does not result from the alumina itself, but from the action of the iron oxide, which is always found in it when in an impure condition. To sum up, the use of alumina, which permits its introduction only into bottle glass containing larger proportions of sand bases, should be extended equally to glass destined for other purposes, such as mirror glass, window glass, and especially drinking glasses. The quality of such glass would be greatly improved thereby. In the latter case the addition of alumina could best be accomplished if pure clay or, still better, if feldspar is used, which can be obtained at a low price. For the batch the purest materials possible should be selected among those destined to furnish the silica, soda and lime bases."