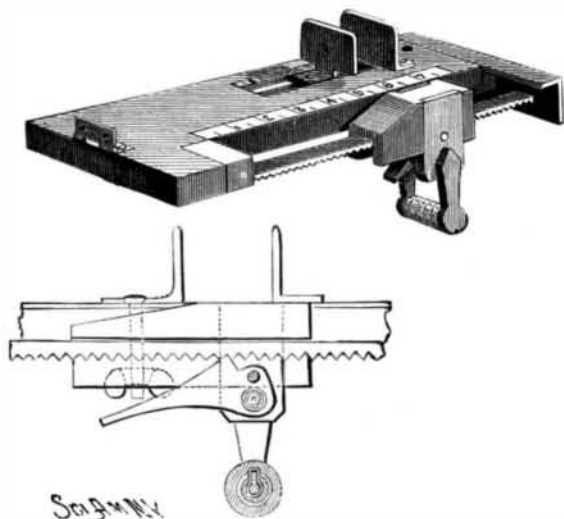


AN IMPROVED CIGAR MEASURE.

The illustration represents a simple and easily operated device, by means of which cigars may be accurately measured, and which is provided with a locking mechanism that prevents the measure from being tampered with. It has been patented by Mr. José Cruz Fernandez, of Key West, Fla. The picture shows a front perspective view of the measure and a broken longitudinal section taken through the slide block. The base has at one end a hinge, for attachment to the workman's bench, and in a recessed portion of the front edge of the base is a toothed bar, on which slides a block having opposite depending ears, pivoted be-

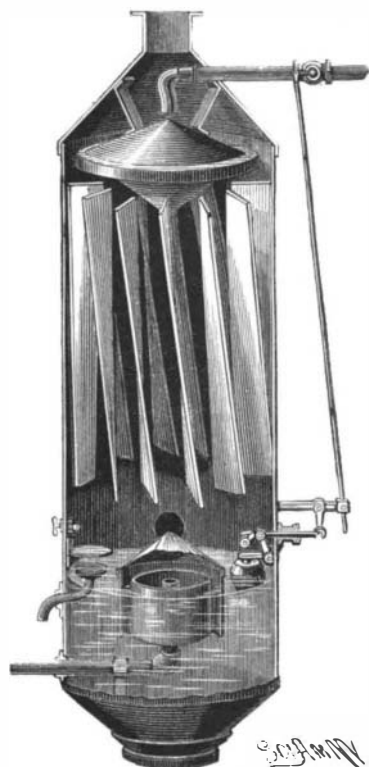


FERNANDEZ'S CIGAR MEASURE.

tween which is a locking lever which has on its upper side a tooth adapted to engage the teeth of the toothed bar, and hold the slide block in a fixed position. The pivoted end of the lever is enlarged so that its lower portion will project beyond the bottom of the slide block, and this portion is perforated to receive the sleeve of a lock. When the lock is applied to the measure, the locking lever is raised into engagement with the toothed bar, and is held by the lock in locked position, so that the slide block cannot be moved. Different forms of locks may be used, or a thumbscrew may be used, if desired, instead of the lock. The base also has a slot, at one side of which is a measure, there being at one end of the slot a fixed jaw, opposite which is a similar jaw having a bottom flange sliding on a slideway in the slot. The flange has a depending screw with a thumbnut, by tightening which the movable jaw will be clamped in place. These jaws on the top of the measure are used to regulate the thickness of the cigar, while the slide block is used to measure their length, it being necessary for the cigars of a certain brand to be of an exact length in order to be merchantable. The measure for the length of the cigars can be conveniently adjusted as desired, it being designed that this shall be done only by the operator who is using the measure, when the measure cannot be changed without the express permission of the operator.

AN IMPROVED FEED WATER HEATER.

The heater shown in the illustration is arranged to heat the feed water by means of the exhaust steam of



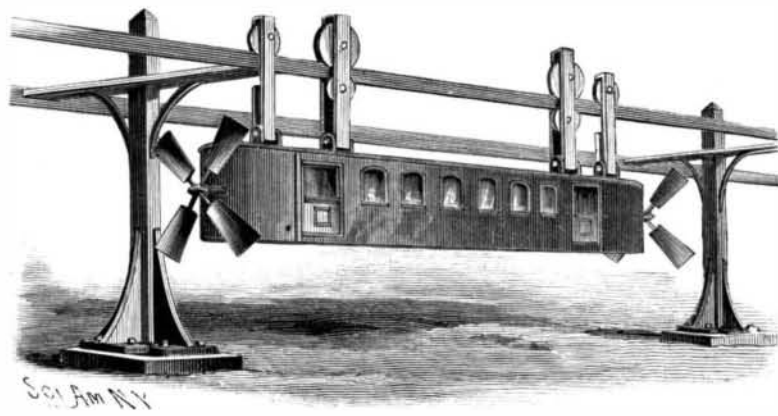
BELL'S FEED WATER HEATER.

the engine. It has been patented by Mr. Joseph Bell, of Troutdale, Oregon. The exhaust pipe discharges into the lower part of a casing which is open at the top, and above the point of entrance of the exhaust pipe are spirally arranged plates, so that the exhaust

steam in rising receives a rotary motion by coming in contact with the plates. Above the upper ends of the plates is a water distributor, made in the shape of a double cone, a water supply pipe discharging upon the apex of the upper cone. In this pipe is a valve connected by a link with a bell crank lever, the latter being in turn connected by a rod with another bell crank lever carrying a float controlled by the accumulating water in the lower part of the casing, whereby the valve in the water supply pipe is actuated to regulate the amount of water passing into the casing. In the lower part of the casing is a water outlet, having an exterior cylindrical casing open at the bottom and having on its top a cone-shaped cap, while an inside cylinder is closed at the bottom and open at the top, whereby the water in the lower part of the casing passes between the cylinders, and flows over the upper edge of the inner cylinder, finally passing to a pipe leading to the boiler, the scum, oil, and other impurities being thus prevented from passing into the boiler feed pipe. A suitable discharge pipe is arranged at about the height of the water level to draw off impurities, a plate protecting the inner end of this pipe from the water flowing down the spirally arranged plates, and the casing is provided with a gauge cock. The water flowing over the cone and the spirally arranged plates of the casing is thus brought into effective contact with the exhaust steam rising in the casing. The lower part of the casing has suitable doors or man holes for cleaning out sediment whenever necessary.

AN IMPROVED ELEVATED RAILWAY.

The illustration represents a form of elevated railway construction and method of car propulsion designed to permit of conveniently regulating the speed of the car, while the arrangement is such as to reduce friction to a minimum. The improvement has been patented by Mr. Anders Anderson, of Blossburg, Montana. Cross-beams supported at the upper end of posts carry on each outer end a rail, preferably of T-shape, the rails extending from one cross-beam to another, and forming a continuous track of a single rail on each side of the post. On the rails travel grooved pulleys, journaled in hangers pivotally connected at their lower ends with the top of a car, each hanger also having a small pulley engaging the under side of the rail to prevent the car from jumping, and there being safety pulleys to engage the rail if one of the main pulleys breaks. It is designed that the car shall be driven by a motor, preferably actuated by electricity, in each end of the car, each motor rotating propeller wheels. The propeller shafts are so set as to have a slightly lifting tendency upon the car, whereby the friction of the pulleys will be reduced as the car moves forward. The speed is regulated by different adjustments of the fans or wings of the propeller wheels.



ANDERSON'S ELEVATED RAILWAY.

Climatic Effects of the New Lake in Southern California.

The famous Salton Lake of Southern California, which was reported drying up, has not decreased to an area of less than 145 square miles since its formation last year. Early freshets in the Colorado and Gila rivers are causing the waters of this lake to rise again, although reports to the contrary have been freely circulated. As a matter of fact, the climate of the country near by this lake has undergone a distinct change since the waters appeared. Fogs, unusually low temperature at Yuma, Walters, Banning, and elsewhere are traceable to the influence of the lake. Cloud bursts at Banning in the dry season and the exceptional coolness of the winter in Southern California are other indications which competent climatologists accept as proof that Salton Lake exerts a climatic influence. Frosts in December injured the orange crop considerably. Some say that 25 per cent of the fruit was lost. No exact statements of the loss are obtainable.

PHOTOGRAPHIC NOTES.

Blue Transparencies.—Beautiful blue transparencies may be produced, according to M. Rossel, in the following simple way: Commercial cyanotype paper is exposed beneath a negative until the image will be very intensely visible, when it is thoroughly washed and placed for fifteen minutes in a ten per cent solution of bichromate of potash. After the print has again been well washed, it is allowed to dry, and then rendered transparent by placing it on a warm glass plate and treating it carefully with paraffine. The print is then framed between two glass plates. The above mentioned cyanotype paper, giving white lines on a blue ground, may be prepared by placing plain photographic paper in a solution of 25 grammes of ammonio-citrate of iron and of 25 grammes of potassium ferricyanide in 150 c. c. of water, and then drying it in the dark.

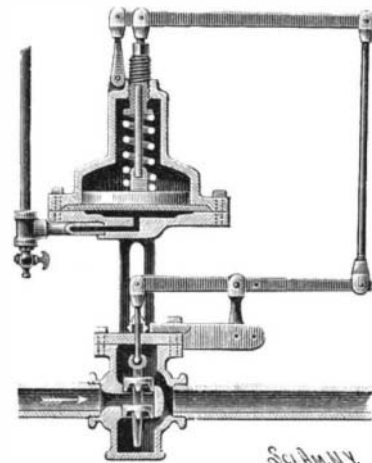
A New Restrainer.—It is a well known fact that po-

tassium bromide, if added to the developing solution, tends to produce harsh negatives with too dense lights and glass clear shadows. The following mixture, which is recommended in the *Wochenblatt*, is said to give much more harmonious and softer negatives. From 7 to 8 grammes of potassium bromide and from 2 to 3 grammes of potassium iodide are dissolved in 100 c. c. of water, and the solution thus produced is employed in the same way as the ten per cent solution of potassium bromide which is generally used.—H. E. Gunther, in *Photo. News*.

AN AUTOMATIC PUMP REGULATOR.

The regulating device shown in the illustration is applied on the steam inlet pipe of a steam pump, whose discharge controls and actuates the valve in the steam pipe, to increase or diminish the flow of steam in the pipe according to the force of the discharge of the pump. The improvement is the invention of Mr. John Acton, of Nos. 191 and 193 Worth Street, New York City. In the valve body in the steam supply pipe is fitted to slide a piston valve connected at the upper end of its stem by a ball and socket joint with a rod passing through a suitable stuffing box, the upper end of the rod being pivotally connected

by compound levers with a rod passing through and guided in a screw in the upper end of a casing supported from the valve body. The lower end of this rod engages the hub of a piston in the casing, the under side of the piston resting on a metal diaphragm pressed upon on its under side by the fluid discharged by the working machinery. On the top of the piston is a spring whose upper end bears against a washer engaged by the lower end of the screw through which the rod passes, whereby the tension of the spring may be increased or diminished to give the desired pressure on the piston. In the pipe leading from the discharge of the working machinery to the chamber below the diaphragm is a discharge cock for draining the pipe and the chamber. The flow of the liquid discharged actuates machines or apparatus to be driven, such as elevators, etc., but when the pressure is increased beyond the normal the diaphragm is pressed upward, and, through the motion of the piston, rod, and compound levers, the valve in the steam inlet pipe is partly or wholly closed. As soon as the pressure of the discharge diminishes, the diaphragm is forced downward by the spring, when the valve in the steam inlet pipe again opens, the slightest change of pressure in the discharge of the working machinery actuating the valve to increase or diminish the supply of steam. This valve is now also extensively used for regulating the



ACTON'S PUMP REGULATOR.

pressure of water in supply pipes from pumping stations, or from elevated reservoirs where the natural pressure would be sufficient to burst the usual pipes, it having been thus employed in one instance to give 30 pounds pressure in a service pipe and 150 pounds pressure in a pipe to run elevators, where the original pressure was over 700 pounds. These regulators are likewise used in all the electric light stations in New York City to control the pressure from the boiler to the engines.

How Matches are Made.

In match making one does not know which to admire most, the neatness of the machinery or the dexterity of the match girls. Both must be seen to be appreciated, for no description can do them justice. Nothing could be further from the truth than the notions perpetually disseminated about match makers; who are supposed to be a set of diseased and pallid slaves, toiling wearily from dawn to midnight, and turning out incredibly large numbers of matches for incredibly small sums of money. They do turn out incredibly large numbers of matches, but, owing to the use of machinery, the work is of the lightest, and so swift that the numerical statement of the "tale of bricks" is altogether misleading. During the government inquiry into sweating, the members of the committee were startled at the low price paid to needlewomen for making buttonholes; but when they had one before them and saw how many buttonholes she could make in ten minutes, the figures assumed a different aspect. And so it is with match making in a first-class modern factory. To fill three gross of boxes for 2¼d. sounds very hard; but a steady worker can manage thirty-six gross in a ten hours' day and earn 2s. 9d. And though the introduction of machinery has lightened labor and enormously increased the output, at the same time it has given employment to a far greater number of hands. The industry is one of the prettiest and most interesting imaginable. The following is a bird's eye view of it, as carried on in the leading factory in London—which is to say, in the world.

To begin with wooden matches. They are of two kinds—"lucifers" and "safeties," but as the process of manufacture is almost identical, we will confine ourselves to the lucifers. The wood, Canadian pine, comes to the factory ready split up into little sticks—or splints, as they are called—of the same size as a match, but double the length. The first process consists in preparing these splints for dipping in the phosphorus paste. Imagine a very large airy room, with several rows of stands or tables running from end to end. On each stand is a small machine driven by steam—say 250 machines in all—and to every two machines a match girl. All she has to do is to feed the two machines alternately, first one and then the other. She takes a handful of splints and puts them into the feeder exactly as you put coffee into a coffee mill. They pass through and are bound together in a most ingenious way by a strap, so as to form a sort of wheel or drum about the size and shape of a large flat cheese. The splints, it must be understood, lie across, so that their projecting ends represent the sides of the drum, and each one is separate. It only takes a few minutes to put together 5,000 or 6,000 in this way, and as soon as they are ready the machine stops automatically. The whole bundle is then removed and carried to the dipping place. Here the phosphorus composition is ladled out of a vessel and spread on a slab. By simply laying the wheel down flat on the slab every single splint of which it is made up receives a dab of phosphorus at one end, and by turning it over the other end is similarly treated. This work is done entirely by men, and takes place in a shed with an open roof, so as to allow very free ventilation. Each splint has now been converted into a double match with a head at both ends; we have, in fact, got a bundle containing 10,000 matches. For clearness' sake some details have been omitted; but it will be seen that the preparation of 10,000 matches only takes a few minutes all told.

After dipping, the bundle is dried in a hot chamber and then unrolled, which is done very prettily by another machine. The end of the strap binding the lot together is caught and drawn between two rollers, and as it goes the wheel unwinds and the matches come off in a perfect shower. It is all done in a moment. One more operation remains, and it is the most interesting of all. The matches, as has been said, are so far double. They have to be cut in half and packed in boxes. This is done by the match girls with astounding rapidity. Each one stands at a table; on her left are a lot of empty boxes half open, on her right a pile of double matches, and between the two a lever knife like those used for cutting tobacco. She takes a handful of matches in her right hand; and the extraordinary thing is that she always picks up exactly the right number to fill a box, never varying by more than one or two. She puts them under the knife, cuts the bundle into two, and fills two boxes with them in the twinkling of an eye; the swiftness and accuracy of her motions are indescribable. The whole performance does not take more than five or six seconds. And it is not one woman only. Here are rows upon rows of them throughout a vast building, all doing the same thing with equal or almost equal proficiency. In another department an instance of still greater dexterity may be observed. Every one knows the wrappers of transparent paper in which the safety match boxes are commonly enveloped, and a look at them will show that they are folded several times in different directions. This folding is done by women like a flash of lightning or a conjuror's card tricks. The eye fails to follow the movement of their hands. There is only one thing more nimble than a woman's hand, and that is her tongue.

We may take this opportunity to say a word about the match girls. They are all genuine East-enders of the most pronounced type. Not one but wears the regulation fringe plastered down over the forehead, and the knowing look of the Mile End Road. But they are by no means the stunted, sickly creatures described by our sham humanitarians. The majority are well grown, sturdy young women, fully able to hold their own in the battle of life, and doing it bravely. All are neat and tidy, not a few good-looking; and, taking them all round, a blither, jollier set of workpeople cannot easily be found. For health and spirits they will compare favorably with the female clerks in the great telegraph gallery at St. Martin's le Grand. The one scene recalls the other, both in the number of women collected under one roof and the nimble-fingered character of their work. But if the telegraphists carry it off for refinement, which cannot be denied, the match girls are a good deal more cheerful. Snatches of song and laughter rise perpetually from among them; and, indeed, they are very contented. "If only these agitators would let us alone, we are right enough. We can earn a jolly sight more in the match factory than anywhere else, and we don't want any one a-coming and interfering."

As for the healthiness of the occupation, it is like many other trades: if proper precautions are preserved, there is no danger. Some years ago necrosis of the jaw from phosphorus poisoning was not uncommon among match makers; but it is now extremely rare, and if a case occurs it is due to want of cleanliness, just as lead poisoning is among plumbers and painters. Wages average 12s. 3d. or 12s. 4d. per week among girls, 14s. or 15s. among women. Match girls are the chief customers for those enormous plumed hats which never go out of fashion in the East End; and they spend an amount of money on them which would surprise a good many ladies at the other end of the town. It is done systematically by means of "feather clubs." Every girl—more or less—belongs to a club, which consists of eight members. The subscription is half a crown per week, making £1 for the whole club. This sum buys an ostrich feather; so that every week a feather is bought by the club, and the members take it in turn.

We have no space left for the wax matches and must leave them for the present, merely remarking that the work is even lighter than the other and done by younger hands. The question of foreign matches should be mentioned. They come from Sweden, Norway, Holland, and Belgium; and they are principally used by the working classes on account of their apparent cheapness. Among the poor they have a very extensive sale. Messrs. Bryant & May reckon that if no foreign matches were used in London, employment might be given to 2,000 more English hands. "This 'ere foreign competition," in face of which "the pore workingman don't get no chanst," is encouraged by no one so much as the poor workingman himself.—*St. James's Budget.*

[FOR THE SCIENTIFIC AMERICAN.]

Privately Illustrated Books.

To many book collectors, and to the large and multifarious groups of readers who gather small and miscellaneous lots of books into so-called libraries, it will doubtless prove a surprise and a revelation to learn that, among the various forms of devotion to books, there exists that of the private illustrator—that there is a class of bibliomaniacs who buy books for the express purpose of "inlaying" them with pictures, hunting out every possible pictorial hint or possibility that they contain, and enriching them with prints and etchings of great beauty and rarity. This mysterious and fascinating field of book worship has received lately at the hands of Mr. Daniel M. Treadwell very painstaking and elaborate study. Mr. Treadwell, himself a devotee and proficient in this elegant pastime, has prepared and published a monograph on this subject, wherein he recounts the marvelous exploits of rich and cultivated collectors, and offers a meed of unaffected praise to those who, less rich but equally enthusiastic, have created masterpieces of the illustrator's art.

The aim involved in this accomplishment is to insert in some work, lending itself naturally to illustration, appropriate prints "which do not belong to the book, but which are pertinent to the subject treated." For instance, Mr. Treadwell's first venture was in Giraud's "Birds of Long Island," a book of some standing, and which naturally suggested a wide range of picturesque illustration. Mr. Treadwell does not, however, recall this early experiment with any sense of satisfaction, as it led him, in his search for material, to destroy a handsome quarto volume of the "Natural History of New York." One of his later and greater efforts was the illustration of Dr. Stiles' "History of the City of Brooklyn." In this interesting and suggestive effort he has added to the original work about two thousand three hundred pages, embracing portraits and prints of old historical landmarks, together with maps, manuscript additions, water colors and letters. Of course, any amount of research and costly and lavish enrichment may be expended upon a book. The work itself may

be very suggestive, and if the illustrator is fastidious, he will hunt out the most striking, beautiful and rare forms of illustration. For instance, Mr. Daly, the distinguished dramatic author and manager, has illustrated Macklin's Bible with thousands of illustrations, many of them originals, extending the book to thirty volumes folio. Nothing could be more superb. The work when finished is often inclosed in the most sumptuous bindings, which, with the cost of simply "inlaying" the illustrations, forms itself a respectable outlay. Take again the "Biographies of the Signers of the Declaration of Independence," by John Sanderson. This book, illustrated by Dr. Thomas A. Emmet, was extended to twenty thick volumes folio. It contains over three thousand autographs, eighteen hundred portraits, hundreds of prints and drawings, and fourteen water colors of American scenery by English artists who accompanied the British troops to America. These last were purchased at the sale of the Marquis of Hastings at \$50 each. Here are signatures and letters of the signers, rare manuscripts and innumerable embellishments on India paper. This wonderful compilation is said to have cost twenty thousand dollars. The library of illustrated books owned by Mr. Hamilton Cole, of St. Mark's Place, New York, is another example of delicate taste and cultivated judgment. He has Izaak Walton, of 1836, enlarged to seven volumes, by the addition of two thousand prints, water colors, drawings, and many etchings. He has the "Memoirs of the Count de Saint Simon" in twenty volumes, royal octavo, "in faultless condition, with seven hundred portraits, nearly all proofs, including the one hundred and eighty portraits, proofs before letters, intended for the book, bound by Chambolle Dunn, in polished levant, with inside borders and watered silk linings." But perhaps the most gigantic and amazing example of this generous and refined industry is Mr. Stauffer's illustration of Wescott's "History of Philadelphia." Mr. Stauffer has added 8,000 illustrations, and expanded a book of some 2,500 pages to fifty volumes. Mr. Treadwell's estimate of the outlay and present worth of this extraordinary effort is \$80,000, an estimate which, we believe, the distinguished illustrator considers altogether too high. Mr. J. H. V. Arnold, of this city, has extended Ireland's "Records of the New York Stage" to twenty volumes folio, by the unrivaled addition of five thousand five hundred illustrations, and has expended over \$9,000 upon his yet unfinished labors. It would be impossible in a short space to review the exquisite results of this form of bibliolatry, and the large work of Mr. Treadwell's is itself a fitting tribute to the zeal and enterprise of American illustrators. Few of our general readers and collectors are aware of the glorious and luxurious gems of the illustrator's art to be found in the private libraries of this metropolis, and Mr. Treadwell's monograph will perhaps stimulate and widen this pleasant form of literary diversion.

One word as to "inlaying," itself a delicate and skilled phase in the illustrator's craft, may be added. The master artists in this art, according to Mr. Treadwell, are Messrs. Trent, Toedteberg and Lawrence, of Brooklyn. The process of "inlaying" is as follows: First comes the selection of paper of the proper quality and the size to which the book is to be extended. This done, the text of the book is all inlaid, page after page being inserted in the openings made in the paper sheets chosen. Then follow the prints. As these are of various sizes and shapes, they are cut down neatly, removing all extraneous margin, and have their outer edges beveled, the bevel extending about one-quarter of an inch upon the margin of the print. An opening is then cut into the sheet, of the size and shape of the print, making an allowance for a quarter of an inch lap on the inside, which is also beveled to conform with the print. The edges of the print and of the opening into which it is to be received are fastened together with rice flour paste. The sheets are then placed under a gentle pressure until required to be bound together in their proper order in separate volumes. In many cases, where print occurs on the back of a wood cut, etc., which must be removed, the paper holding the engraving, etc., and the printed matter on its back, is split, by pasting the sheet between two pieces of stuff, which, when separated, removes on one side the printed matter, on the other the woodcut.

The artistic resources of the illustrator are drawn upon in this art, his historical knowledge and his technical appreciation of the excellence of engravings, woodcuts, etchings, and photographs. L. P. G.

SEVEN of the World's Fair buildings are now so far advanced that they are fast assuming the appearance of finished structures. The rough carpentry work on them is practically done and the ornamental and finishing work is in progress. These buildings are the Woman's, Horticulture, Transportation, Mines, Administration, Forestry, and Fisheries. Five more—the Government, Fine Arts, Agriculture, Dairy and Illinois State—are erected to the roof lines. The Electricity, Manufactures and Machinery buildings are being advanced rapidly.