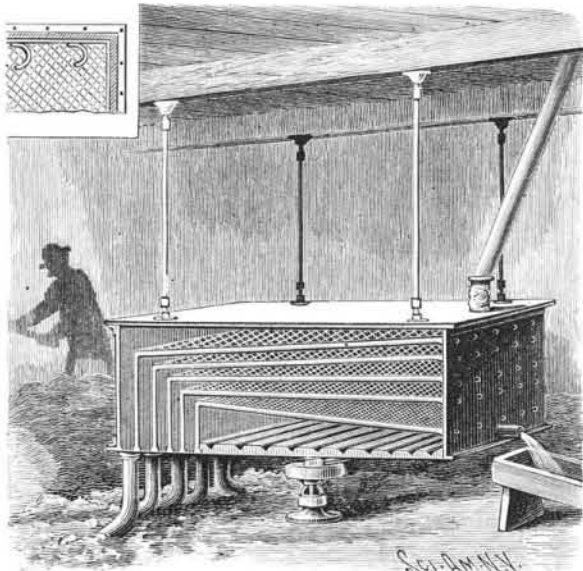


#### A GRADER AND AMALGAMATOR FOR SEPARATING PRECIOUS METALS.

This machine operates mechanically to separate the gold from the tailings. It consists of a gyrating box connected with a stock supply, and containing graduated sieves, the upper sieves inclined downwardly and the lower sieves inclined upwardly to their outlets. The improvement has been patented by Mr. John A. Armbruster, of No. 66 North Canal Street, Chicago, Ill. The top plate of the box is connected by suspending rods having at their upper ends ball and socket joints, with a ceiling or other suitable support, and at the bottom of the box is a suitable mechanism for imparting to it a gyrating motion. On one end of the box is a flexible inlet connected with a shoe leading from the stamp mill, and by means of which the stock, with a considerable quantity of water, is supplied to the box. Arranged in the box are graduated sieves, the larger and coarser of which, at the top, are inclined downwardly, while the lower and finer sieves are inclined upwardly toward individual discharge outlets connected at their lower ends with



ARMBRUSTER'S GRADER AND AMALGAMATOR.

flexible outlet chutes, discharging tailings on the ground or floor. Below the lowest sieve is a receiving chamber, with an outlet for carrying off surplus water, and in its bottom are recesses, or grooves, containing mercury, to readily take up the gold passing down into this chamber. On the sides of each of the screens are arranged hook-like projections, as shown in the small figure, which serve to throw the material toward the middle of the screen as long as the machine is in motion. The larger tailings, as the stock is discharged into the box with water, have a tendency to roll down the inclined upper sieves toward their respective discharge outlets, the material, as it passes through the successive sieves, remaining longer on the lower and finer sieves, to completely separate the tailings from the valuable stock. The valuable stock which passes through the fine meshes of the lower sieve is readily taken up by the mercury in the pockets, the amalgamated material being from time to time removed for further treatment.

#### A MEDIEVAL IRONCLAD.

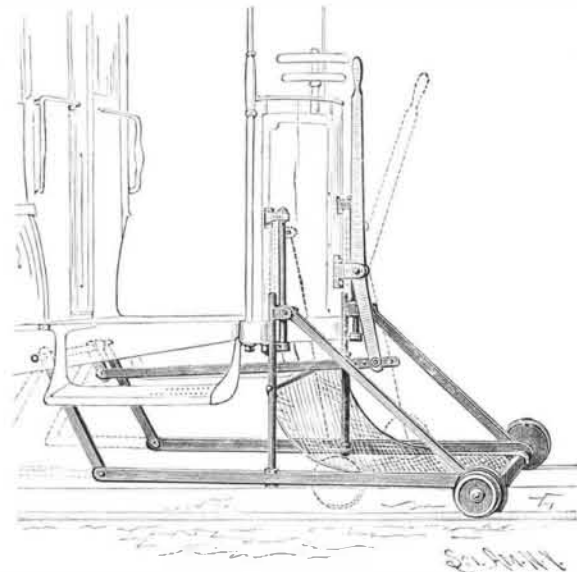
When writing on "A Man of War of 1893," in *The Graphic* of February 10, Commander C. N. Robinson,

R. N., mentioned the fact that an armored vessel was constructed in the sixteenth century, thus proving that the idea of protected ships is by no means an absolutely new one. This early ironclad was built in the year 1585 by a shipwright of Antwerp during the wars with the Spaniards. The greater part of the Netherlands had come into the possession of the house of Hapsburg by the marriage of Maximilian of Austria to Mary, daughter of Duke Charles the Bold, in 1477, but under Charles V. the sovereignty was extended until it embraced all the seventeen Belgian and Batavian provinces. When the Lowlands passed to the Spanish crown the principles of the Reformation had spread among the Lowlands, and on the establishment of the Inquisition there in the middle of the sixteenth century disturbances broke out in the provinces, and great cruelties were committed by the Spaniards. Antwerp, which in those days was a margraviate, suffered greatly. It was pillaged by the Spanish soldiery in 1574, and was again besieged in the regency of Alexander of Parma, being taken in 1585. In the summer of that year it was closely invested by land and water, and the people of Antwerp made many gallant efforts to break through the line of the besiegers, especially on the river. For this purpose they built a craft of unusual size, with a flat bottom, and armed its sides with iron plates fastened into great beams of wood. The idea was to make not so much a ship as a floating castle, impregnable to the artillery and missiles of those days, which should crush all opposition. It contained a great number of men, some of whom were placed like sharpshooters in the tops of the masts, and the rest protected by the bulwarks. The men of Antwerp were so confident of the success of their new invention that they called it *Finis Belli*, feeling sure that by its means they would be able to raise the siege and put an end to the war. Unfortunately for the brave burghers of Antwerp, this early ironclad proved a disastrous failure. It was launched upon the Scheldt, and taken across the flooded country by means of a canal cut from the river; but it proved very unhandy, and after a short career got stuck upon a bank. This untimely end of the great vessel from which so much was hoped was a source of much delight and derision to the Spaniards, who nicknamed the monster *Caranjamula*, which signifies bogey, while the men of Antwerp altered its name from *Finis Belli* to *Perdita Ex-pensa*, or "Money thrown away." The crew then deserted the ship, and the Spaniards, after a naval battle, which took place in the flooded country, and resulted in the defeat of the Netherlander, took possession of the naval monster, as they called it, though they feared that, like the Trojan horse, it had been left in their hands from some evil purpose. However, finding that it was really deserted, they seized it, lightened it, and then towed it off and got it back into the river Scheldt. It was then taken in triumph to the camp of Alexander of Parma, where it became one of the sights of the time; and the Spaniards, accepting the omen of its original name, took it as a sign that the war was finished. And, indeed, it proved to be the last effort of the gallant people of Antwerp, for the city was taken on August 17, 1585, and so the first ironclad on record came to an unfortunate end. We are indebted to Mr. J. Coryton for the loan of the volume, "De Leone Belgico, 1588," from which our engraving is taken.—*The Graphic, London.*

#### AN IMPROVED CAR FENDER.

This is an efficient and simple safety device to be used at the front ends of electric and cable cars, to

prevent persons being run over by the cars. It has been patented by Mr. Benjamin Tranter, of No. 533 Park Avenue, Brooklyn, N. Y. From hangers at the front of the car is suspended a frame designed to be moved in and out at the car end, the front end of the frame resting on small wheels which run on the track, while at the lower ends of the suspension rods are rollers against which the side bars of the frame move without friction. The rear ends of these side bars are pivotally connected to swinging hangers on a trans-

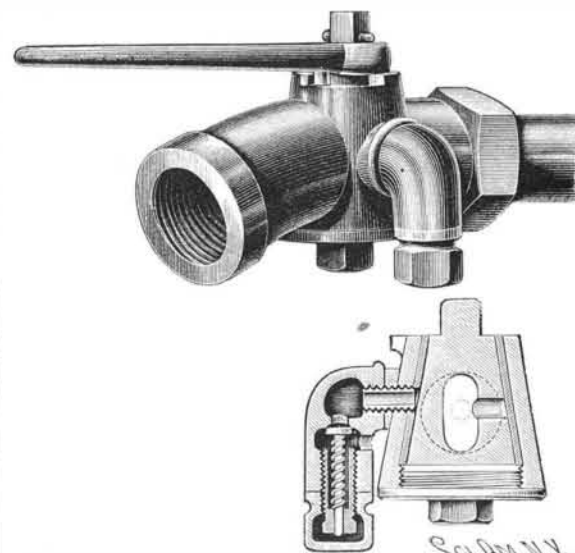


TRANTER'S CAR FENDER.

verse shaft beneath the car floor, and on this shaft is a crank, connected with a forwardly extending pitman pivoted to the lower end of a bent lever whose upper end forms a handle in front of the dashboard. The lever is fulcrumed in lugs on the front of the dashboard, and the front end of the pitman has several holes, so that it may be easily adjusted in relation to the lever. The transverse portion of the fender frame at the front is bent downward toward the track, and may have a rubber or leather covering, and to this portion is secured the front end of the netting, whose rear end is attached to a cross bar of the frame arranged a little below the car floor. The drawing shows in full lines the fender extended as when a person is likely to be run down, but when not in use as a safety fender, the upper end of the lever is thrown forward, as indicated by the dotted lines, swinging back the fender frame beneath the car, and causing its front portion to be drawn up slightly, so that the forward wheels are lifted off the track, in which position the fender is usually carried. The diagonal side braces, extending upward at opposite sides of the fender, may be employed or not as desired, the upper ends of these braces moving upward in slide boxes on vertical rods at the sides of the dashboard as the fender is withdrawn to its rear position.

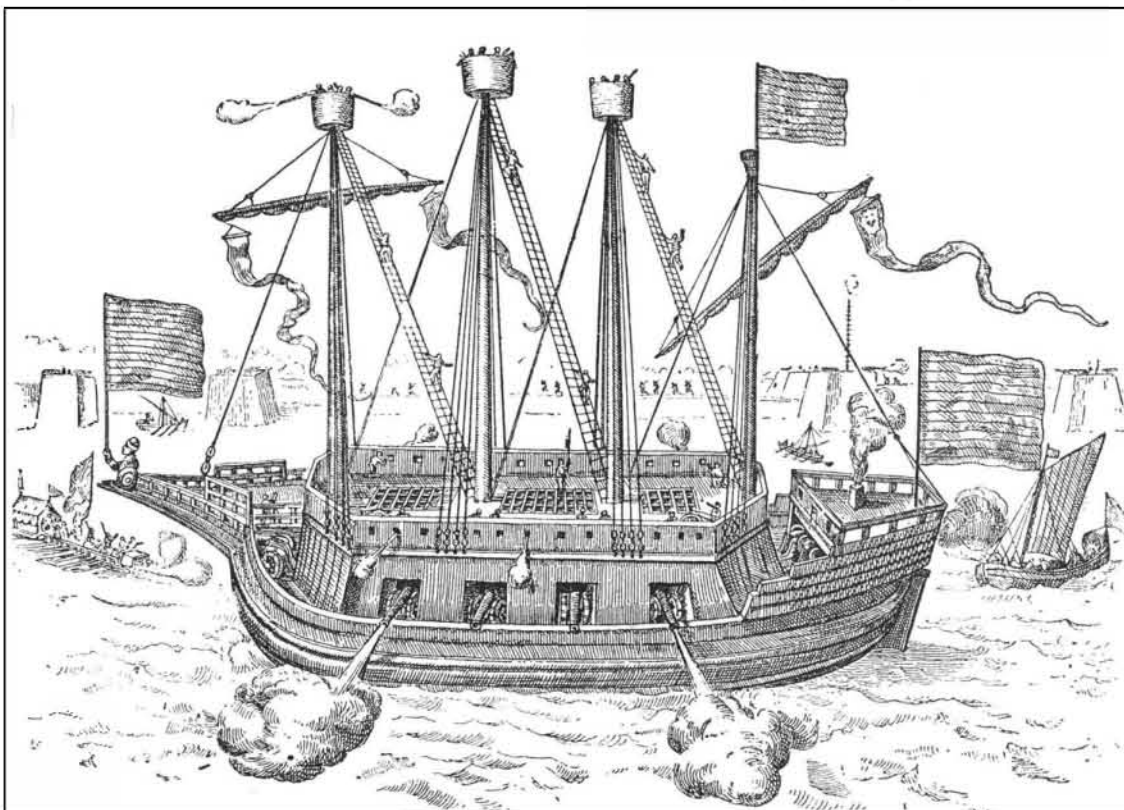
#### AN AIR BRAKE STOP COCK.

This is a cock of simple construction, arranged to apply the brakes when the cock is shut off and retain



O'LEARY'S TRAIN PIPE STOP COCK.

part of the air pressure in the train pipe, or prevent its reduction to zero, to aid in the release of the brakes when the cock is again opened. The improvement has been patented by Mr. Joseph O'Leary, of No. 228 Iowa Avenue, Memphis, Tenn. The cock has the usual casing, connected at its rear end with the train pipe and at its forward end with the coupling hose leading to the car ahead. Within the casing, as shown in the sectional view, turns the usual plug with a main opening connecting the train pipe with the coupling hose, and into this main opening leads a port adapted to connect the opening with the train pipe at the time the plug is given a quarter turn by means of the handle. When this turn is given to the



THE FIRST IRONCLAD, 1585.



plug, the main opening cuts off the train pipe and coupling hose, and at the same time moves the port in register with the coupling hose, the main opening then standing with one end in register with an outlet pipe in one side of the casing. This outlet pipe connects with the interior of an auxiliary valve casing in which is a valve seat adapted to be closed by a valve held to its seat by a spring. The stem of the valve slides in a screw screwing in the casing and supporting its cap, the lower end of the spring also resting on an internal flange of the screw, while the other end of the spring presses against the under side of the valve to hold it normally to its seat. In the auxiliary casing is an outlet leading to the outer air, through which air passes when the auxiliary valve is opened, by which air is released from the train pipe, so that the brakes are applied in the usual manner. When sufficient reduction of air has taken place in the train pipe to equalize the pressure of the spring in the auxiliary valve the latter again closes, retaining a certain amount of air pressure in the train pipe after the brakes have been applied, assisting in the release of the brakes when the stop cock is again opened.

#### THOMAS' CAR FENDER.

The recent extensive introduction of power-driven street cars in cities has made imperatively necessary some means for protecting foot passengers from danger of being run over. The car fender illustrated constitutes an appliance which provides a catch net with a frame, which bends inward as a heavy body falls into it, forming an effectual receiver. Our cut shows the fender in actual operation. The fender is preferably secured to the grip frame in the case of cable roads or to a supplemental frame carried by the axles on other cars. The striking bar at the front lower edge may be covered by padding. The net, with its flexible frame, is held in position on a diagonal plane by wire helical springs. The thrust of the padded striking bar is received by the fixed frame. Then, as a person is struck, he inevitably falls toward the car and drops upon the net. This at once yields, the side members of the frame bend, the springs stretch, and the net forms a purse or bag, securely holding the person and protecting him from further injury, such as might be incurred by rolling off were the net inflexible.

The inventor, Mr. Charles F. Thomas, Buckeystown, Md., may be addressed for further particulars.

#### A FUNERAL ON THE RIVER SPREE.

About fifty miles south of Berlin, in the Spreewalde, on the borders of Bohemia, funerals on the ice are of no uncommon occurrence. Here, says the *Graphic*, is one of the few districts still inhabited by the Wends, a branch of the Slavic population of Lusitania, who yet retain their distinct language, costume, and national characteristics. The numerous ramifications in which the Spree penetrates the woods and forests of this country before reaching Berlin are in the winter securely frozen over, when they take the place of roads, and are used as such even for funeral processions. Every one is, of course, perfectly at home on skates. So the young men, skating, take the ropes attached to the sleigh on which the coffin is borne, the old men, women, and children follow, skating, behind. The skates used are old-fashioned in character, tied with string. The men wear black coats and hats on such occasions, but the women vary their costume with white hoods, scarfs, and aprons.

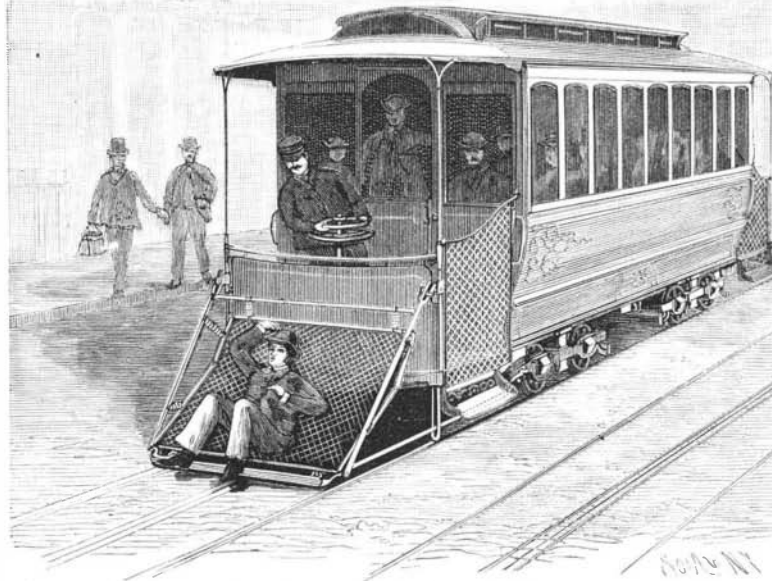
#### Skeleton Leaves.

E. D. Bartlett, in the *Optical Magic Lantern Journal*, reminds us of having in the long, long ago employed with much success skeleton leaves as lantern slides. The lantern is now much more than then used for educational purposes, and a set of skeleton leaves would form a valuable addition to an educational collection of slides. Mr. Bartlett recommends taking the green leaf from the tree, soaking it in rain water in a warm place till fermentation has destroyed the soft parts, and washing by a gentle stream of water till the fibrous network is clean. Heating in a suitable solution of caustic soda will very much

shorten the operation. In fact, quite a number of skeletons may in that way be made in a single evening.

#### The Emotions of Animals.

Dr. Gibier has reported some valuable observations upon the physiological influence of the emotions in animals. The observations go to establish, as foreseen, that these effects of the emotions are identical with those of similar emotions in man. None the less is the demonstrative proof of this forecast both valuable and important. Its special importance is that in studies upon the lower animals, prosecuted with a view to ameliorating the condition of man, allowance must



THOMAS' CAR FENDER.

henceforth be made by all observers for moral effects. It seems that Pasteur, enlightened by the quickness of his sympathy with animals, has always made this allowance; but it is doubtful if all of his disciples have done so. Or, rather, it is not doubtful that often they have not. The evidence now adduced by Dr. Gibier being of a sort that appeals to their understanding, will avert one source of error that might vitiate their conclusions.

Darwin investigated the expression of the emotions in man and animals, demonstrating that similar impulses affected identical nerves, producing identical visible muscular phenomena. Dr. Gibier's demonstration merely extends the area of these observations, showing that those secondary effects recognized as morbid or disease effects are also identical in the different animal orders. Sir John Lubbock has added systematically to the immemorial observations that establish the reasoning faculty as existing in the lower orders. In all of these there is nothing essentially new. On the contrary, the substance of it all is old as the human record itself. Man has always, at least from his earliest records, recognized the essential kin-

of his day, he found it needful to impute to man a faculty or quality apart and additional to those shared with him by his "poor consins" of the animal creation. Hence the words addressed by him to the Thesalonians, speaking of man as possessed of a threefold nature—spirit, soul, and body, the English words assigned as equivalents to those he used. "Spirit," here, is held to express an immortal nature capable of conceiving what is called an "abstract" right and wrong and God. "Soul" as here used means, according to the Rev. Lyman Abbott and the Rev. J. T. Conant, D.D., the lower or animal nature which man has in common with those whom he calls the brutes.

During his dark ages, European man lost sight of these earlier metaphysical distinctions, as he lost all other higher insight. In such an age, his natural vision closed to the natural facts plainly visible at one end of the human scale, to the savage in direct contact with nature, and no less plain at the other end to the enlightened mind, whether this repose on the observations of a pagan Pliny or the minuter researches of a Darwin, a Lubbock, a Pasteur, and a Gibier. Yet the attitude is that of ignorance merely, not of any dogmatic teaching, for the kinship is equally clear to a Paul, learned after the learning of the Greeks, and to an Abbott, learned after the learning of eighteen centuries later. The last, to express the facts of intelligence as common to man and animals, adheres to the English word assigned to this use by the translators of the Greek Scripture, "soul." To designate a different set of concepts, of attributes which both assign to man to the exclusion of all other animal orders, Dr. Abbott equally adheres to the translators, and uses the word "spirit."

The distinction is one essential to all intelligent expression on the subject, since its function is to discriminate the domains of verifiable and unverifiable knowledge. Unless this distinction be maintained in thought and speech, all converse on perhaps the highest and most interesting subject to which the human understanding can devote itself is reduced to vain babble of words.—*N. Y. Sun.*

#### The Steffens Process.

Many have inquired as to the object and operation of the Steffens process to be put in at the sugar factory here next summer. James G. Oxnard and N. R. Cottman have courteously furnished us with the following description, which will prove interesting:

Steffens' "Auscheidung" (extraction) process is a process patented by Mr. Carl Steffens for the purpose of extracting the sugar remaining in the molasses after the ordinary process now in use.

It consists in mixing fine powdered lime with the molasses in such quantities and under such conditions of temperature as will effect a chemical combination between the sugar and the lime by which a saccharate of lime is formed. This saccharate of lime precipitates from the solution in a solid form, and is recovered by passing the mixture through filter presses, the saccharate of lime remaining as a solid and the impurities of the molasses running off in a liquid form. This saccharate of lime is then dissolved in water or the beet juice and treated with carbonic acid gas,  $C O_2$ . The carbonic acid gas breaks up the chemical combination between the lime and the sugar, forming a carbonate of lime, which precipitates as a solid and liberates the sugar, which goes into solution. This mixture is again passed through the filter presses the carbonate of lime being caught in the presses, and the sugar, in the form of a solution, running off.

By this means we see we have first separated the sugar in the molasses from its impurities by combining it with the lime, then separated it from the lime by means of carbonic acid gas, giving us a comparatively pure sugar solution, from which we are enabled to extract the sugar by means of the vacuum pan and centrifugal machine. The molasses, while lime is being added to it in small quantities, has to be in iron vessels surrounded by cold water, as the chemical combination will only take place when it is at a very low temperature.—*Chino Champion.*



BOHEMIA—A FUNERAL PROCESSION ON THE ICE.

ship between himself and the rest of the animal kingdom. Indeed, the less sophisticated his own mind by his advance in civilization, the more distinct and frank is this recognition.

The knowledge, it appears, is lost only by a race that lapses from civilization to barbarism, carrying with it the sophistication of the higher state without recovering its clarity of vision. Thus when the Apostle Paul had to enforce spiritual truths on the acute generation,