s so increased, that for use in the arts this mixture acts almost like a new substance. Gold and silver miners have long complained that their mercury was too feeble in solvent power, was liable to "flour" and to get "sick," etc.; that the gold is often in a condition, as in Colorado, where it slips through the fingers of any device set to catch it. Dr. Wurtz's invention is said to be a complete remedy for all these ills. Whenever sodium amalgam touches gold it sticks to it and does not let it go; it sticketh like a brother; to gold and silver it is as adhesive as tar to a contraband. Sodium amalgam is sometimes called magnetic amalgam.

Dr. Wurtz has found other uses of sodium amalgam; we have space only to allude to them. He proposes to solidify mercury by means of sodium, and transport it in solid blocks, and when the mercury is to be used, the sodium is removed by a simple process. If a broom be made of iron wire, and charged with the amalgam, it is very useful for sweeping together mercury which has been spilled. Every little particle sticks to the broom, from which it may be shaken off at pleasure. An iron brush may be used like a paint brush, in amalgamating zinc plates for the battery, etc.

Mr. William Crookes, the able editor of the *Chemical News*, appears independently to have discovered the useful properties of sodium amalgam. But there is little doubt that Dr. Wurtz is the original and first inventor. He antedates Mr. Crookes eight months by his patent, and there is evidence that he has been investigating the subject for several years.

## COLLAPSE OF AN ENGLISH BOILER FLUE.

The London *Engineer* of the 13th ult., publishes a handsome engraving of a boiler which collapsed a flue in the brewery of Messrs. Bass & Co., Burton-on-Trent, England.

The boiler was one of a class comparatively unknown in this country, the Cornish boiler, but very popular in England. A Cornish boiler is one tube inside of another, a single flue boiler we should call it, with the grate bars in one end of the tube.

The boiler which gave out was 32 feet long and 7 feet in diameter inside, while the tube was 4 feet in diameter and but $\frac{7}{16}$ths *of an inch thick;* in addition it was out of round by 2 inches.

The safety valves were loaded to a pressure of 50 pounds per square inch, and the sides of the flue were shut together by the pressure, so that it looked like the figure 8.

"The whole boiler was torn off its seating, and launched about 7 or 8 feet. This effect was doubtless due to the reactive force of the steam, which probably issued a contrary direction to that in which the boiler was driven. One end of the engine house was made a complete wreck—some of the bricks being sent eighty yards. The flue tube was found collapsed from one end to the other, rending at the angle iron at the back end of the shell, and at some of the other transverse seams of rivets. We have stated that it was fed by an injector, and a sort of attempt was made at the inquest to show that, as it was shut off, this accounted for a lack of water and consequent collapse. It is also true that the same witness stated that the top of the flue, for a space of four feet, bore evident marks of having been overheated. Mr. R. B. Longridge, chief engineer to the Boiler Insurance Company, Manchester, however, plainly contradicted this evidence, attributing the collapse "entirely to over pressure," as the flue could not safely bear a working pressure of more than 40 lbs. Mr. L. E. Fletcher, the chief engineer of the Manchester Association for the Prevention of Boiler Explosions, was not examined at the inquest, but, as the result of a personal investigation, he writes, in his report for last July:—"There could be no doubt that the explosion resulted entirely from the weakness of the flue, which was insufficient for any pressure above 30 lbs., but could have been made perfectly safe at 60 lbs. or even at a much higher pressure, by the introduction of flanged seams, or incircling hoops of T iron, or bridge rail section, applied at the ring seams of rivets. There are also other means for strengthening furnace flues, such as water pockets, or water tubes, etc., but since these strengthening pockets or water tubes cannot extend into the furnace, it is well to supplement them at that part with flanged seams or T iron hoops. After boilers are completed and set to work, the furnace tubes can readily be strengthened with angle iron hoops made in segments so as to be passed into the boiler through the manhole, and fixed to the tube when in place."

Mr. Bass, M. P., has made himself conspicuous by legislative measures against the noisy nuisance of barrel organs. Would it be inappropriate to ask him to direct his faculties to the prevention of the more serious noises made by boiler explosions?

## AN UNPALATABLE TRUTH.

After a large number of broadside ironclad ships of war have been built in England on the old fashioned plan, necessitating the expenditure of millions of pounds, practical men there discover that they are useless, and that in the event of any contest with a nation possessing invulnerable ships—monitors for instance, they stand no chance of success.

"Coming events cast their shadows before," and we find such men as John Bourne, one of the first engineers in England, beside others, advocating the monitor system as the one good thing that has been tried and not found wanting.

"A naval architect" writes to the *Mechanics' Magazine*, "I am glad to find that you are drawing attention to the penetrable character of our ironclad navy, and to its utter futility in the case of a maritime war when opposed to monitors of the American construction, such as the *Puritan*, *Dictator*, *Monadnock*, etc.," and the letter concludes by averring that the monitors are the only safe vessels at sea and that they have repeatedly sunk ships equal to the English iron clads.

These statements are all true, and it must be an unpleasant reflection for those in authority to know that they have been walking blindly and that the expensive experiments they have made in the way of vessels are thrown away.

We have no wish that the English Government should adopt our plan of constructing war vessels, but that those who shape public opinion on these points are preparing the way for them is an unmistakable conclusion.

## Novel Application of Turpentine as a Fuel.

On the 18th of February, Capt. Shpacovski, professor at the Paul Military School, exhibited at the Old Admiralty, St. Petersburg, certain applications of combustible fluids, reduced to dust or spray by means of an apparatus which he calls a pulverizer. This process enables the inventor to burn every particle of the fluid; he effects this in a lamp of a peculiar construction. The flame produced by turpentine spray in the apparatus is enormous, and reaches a hight of two feet, rushing through the burner with a noise similar to that of steam escaping from a pipe. The color of the flame is a whitish yellow; the temperature is equal to that of molten steel (1,040 deg. Reaumur, equal to 1,300 deg Centigrade.) The quantity of turpentine burnt in the lamp in one hour with the pulverizer is from two to five pounds Russian, which, at three copecks per pound, costs from six to fifteen copecks. Mr. Shpacovski began his experiments by melting a bundle of fine steel wires. This was soon brought to a red heat, and in a few seconds began to melt and then to burn, throwing out sparks. The inventor then applied the flame in a horizontal jet to a piece of copper weighing five zolotniks, which was equally melted (copper melts at about 873 deg. Reaumur, or 1,090 deg. Centigrade). He also exhibited a crucible to melt from five to ten pounds of the same metal. Among other experiments some were made to illustrate the application of the process to the charring of timber used in the construction of ships. The wood was not destroyed, being only carbonized to the depth of $\frac{1}{120}$th. of an inch. After exhibiting a lamp with four pulverizers, giving a flame of $3\frac{1}{2}$ feet in hight, and 4 inches diameter, Mr. Shpacovski described his steamboat, the boilers of which are heated by pulverized turpentine. This boat, about 24 feet long by 3 feet beam, with an engine of 2-horse power, runs six knots per hour; her boilers are heated by four pulverizers, fed by pipes from a reservoir placed in the bows. The consumption was 3 lbs. per horse power per hour; but Mr. Shpacovski is now building a boat of 6-horse power, with an improved boiler, and expects to reduce the consumption of turpentine to 1 $\frac{1}{2}$ lb. or 2 lbs. per horse power per hour. He has orders for twenty similar steamboats for St. Petersburg and neighborhood; most of them are intended for the passenger traffic on the canals. It is needless to state that the new fuel is more expensive, weight for weight, than coal; but it is claimed that this will be more than compensated by the saving which will be effected on the quantity consumed by means of the new process. Suppose, for instance, a frigate anchored in the roads off Cronstadt; a boat is sent ashore for provisions. The ordinary coal boilers must be fired two hours before hand, and when the boat is alongside the wharf the fires must be kept up till she returns; so that for a trip of half an hour's going and coming, fuel must be burned during four hours. If the boat be fitted with the pulverizer it need only be ignited ten minutes before starting, and altogether fuel will be required for fifty minutes, the expense for a steamboat of 12-horse power being about sixty copecks. Mr. Shpacovski also exhibited a new signal apparatus, giving a very strong light. —*London Engineer.*

## Copper Photographs.

A. M. Mialerlt-Becknell, who writes from St. John the Baptist, in Louisiana, communicates to *Cosmos*, a very simple process for producing photographs on copper plate. The author takes a smooth and perfectly clean copper plate and dips it for 30 seconds into a bath composed of sulphate of copper 125 grains, common salt 75 grains, water 2 ounces, acidulated with a few drops of acid, any acid whatever. As soon as withdrawn the plate is well washed, and then dried with a soft clean cloth. The plate is then ready for exposure in a frame under a glass negative. In good sunlight five or ten minutes' exposure is sufficient, but in cloudy weather a longer time is required. To fix the picture it is only necessary to dip the plate into a solution of hypo containing a little chloride of silver A bath which has been used for paper proofs will do, but it must be filtered clear. After a few seconds' immersion the parts of the picture that were reddish whiten, and at the same time the shadows take a violet tint, passing away to black. As soon as this occurs the plate must be taken out, well washed, and dried over a spirit lamp. As the blacks are formed of a very fine powder the plate must be varnished to preserve the picture. The author supposes that a layer of protochloride of copper formed in the bath constitutes the sensitive surface, and he thinks that in the hypo and chloride of silver bath the unacted-on protochloride is dissolved, and silver is deposited on the bare copper.—*Chemical News.*

## Pumping Ships by Force of Wind.

In 1862, in reviewing the nautical models at the International Exhibition, we noticed a plan for giving motion to cranks of pumps by the medium of a screw, dragging in the water, turning a long rod, and by bevil gearing working pumps in-board. We stated at the time, that the wind that drove the ship to gain this motion would also turn the sails of an improvised windmill, which would answer the purpose sought to be attained in a more simple manner.

The master of the *Providence* caught at our suggestion, rigged two wings, and fixed them to a deck pump. It succeeded admirably. Captain Kerr, of the *White Star*, it is stated in the *Shipping and Mercantile Gazette* of Monday last, kept his pumps going from shortly after leaving Melbourne to his arrival in the Channel, and by this contrivance the leak of upwards of one foot per hour was kept under. A leak of this description would have worn out his crew, whereas the sails of the windmill would actually help to propel the ship.—*Mitchell's Journal.*

[Just so, and a man can lift himself up by his pantloons if he is only able.—Eds.

A GENERAL convention of all the railroad presidents, chief engineers and general superintendents in the United States is to be held in Philadelphia on the 4th of July next, for an interchange of views in regard to railroad construction, management, and operation. The chief officers of the British Provinces have been invited to attend and participate in the deliberations.