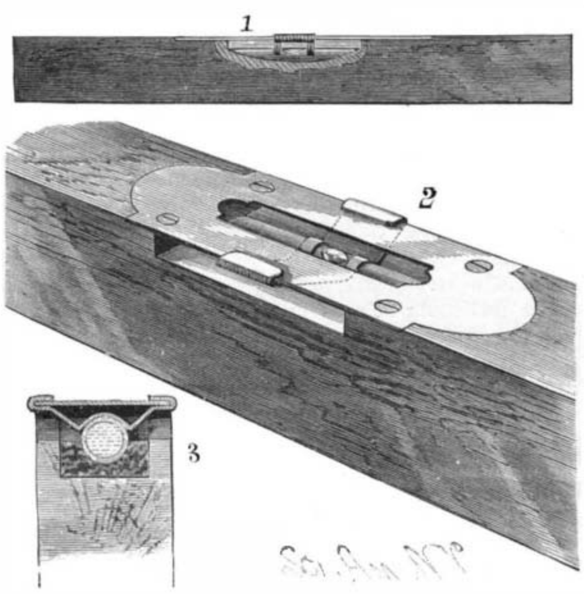
SPIRIT LEVEL.

Secured on the level bar over the spirit tube is a guard plate, on which is held a slide that extends partly or entirely over the spirit tube, which it approaches very closely. The width of the slide is equal to the length of the bubble, or the slide can be formed with a slot equal to the bubble. The slide can be so adjusted that the ends of the slot will coincide with the ends of the bubble when the level is perfectly horizontal, thus facilitating the taking of true levels. If two inclined surfaces are to be arranged precisely parallel, the level



TYLER'S SPIRIT LEVEL.

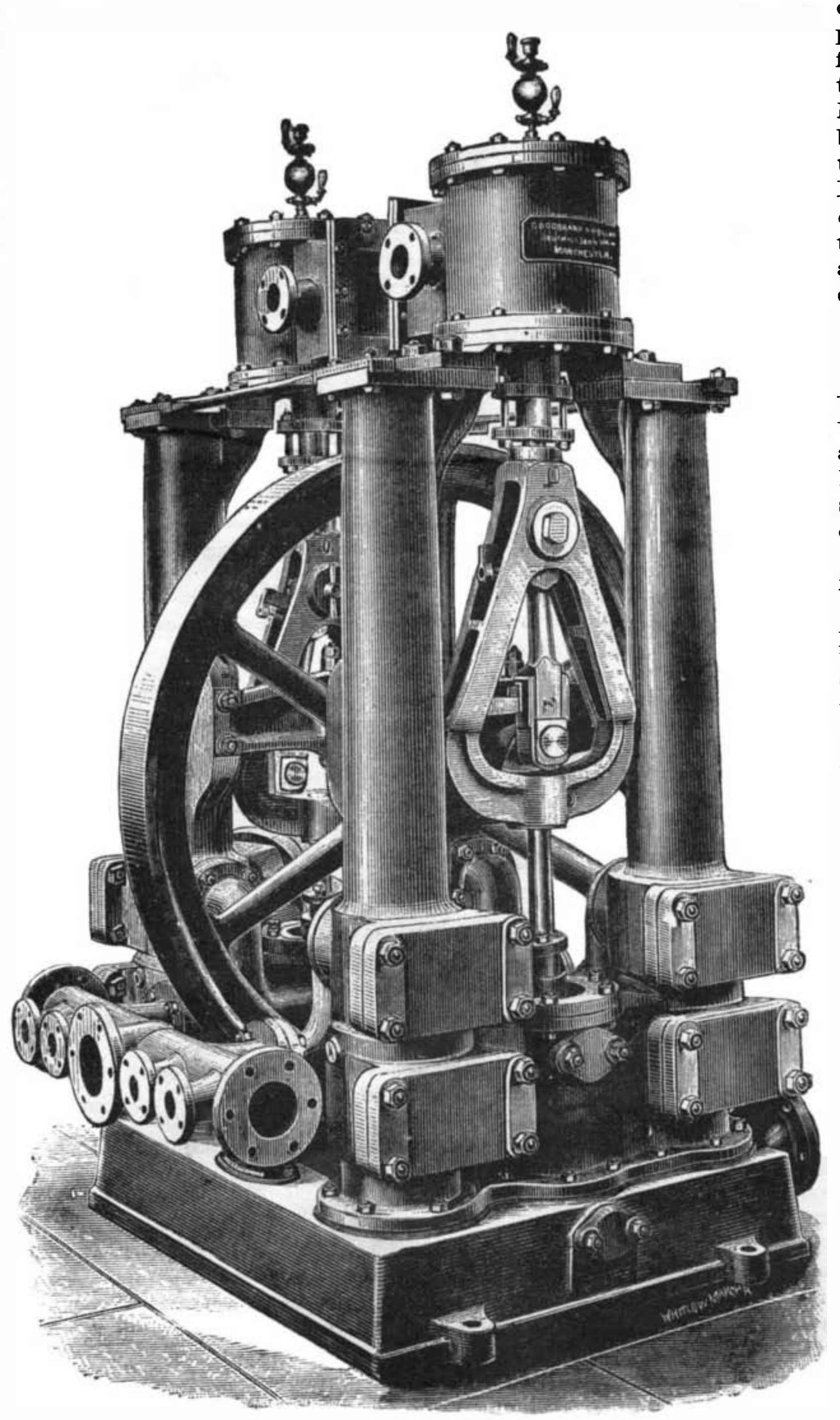
is placed on one of them, and the slide so adjusted that it will be over the bubble. The slide remains in this position, and the second surface can be adjusted until the bubble is below the slide. The uses to which surveyors and civil engineers can apply this instrument will be apparent.

This invention has been patented by Mr. B. F. Tyler, of Bridgeton, N. J.

IMPROVED QUADRUPLE PUMP.

We have lately examined a very powerful p mp made by Messrs. Goodbrand & Holland, of the Southall Street Works, Manchester, and give herewith a perspective view of it. This p mp has several novel features which tend to increase its efficiency and durability, in both of which respects very satisfactory evidence was submitted to us. The pump is described as quadruple acting, that is to say, it has two double acting cylinders, as shown in the engraving. It is provided with two separate suction pipes, which may draw their water from one source or from two sources, as may be desired, the change being rapidly effected while the pump is at work. A very useful adjunct is found in the provision of air valves to each end of the water cylinders. The suction is led to a hollow base plate which forms the foundation for the p mp. The internal arrangement of this suction chamber, as we may be allowed to call it, is somewhat peculiar. The inlets to the upper and lower sides of the pump are in the form of nozzles projecting some distance into the chamber. Between each pair of nozzles is a kind of inverted flattened dome, carrying the pump barrel above, and supported below by a web connecting it to the bottom plate of the base. The result of this arrangement is the formation of a chamber on the suction side, securing a steady flow of water, while the comparatively contracted ways prevent oscillation of water from one p mp to the other. All the water passages have large areas, and especial care has been taken to avoid air traps. The valves are of the circular grid type, the ways being arranged at an angle in such a manner as to give a whirling motion to the water.

Two purposes are effected by this simple contrivance: first, a larger volume of water is delivered in a given time than when the usual straight ways are used; and second, the rubber valve cover is slightly advanced or turned at each beat, and therefore presents a fresh surface at every stroke, and wears more uniformly, and for a greater length of time. Another advantage resulting from the use of this modified form of valve is that the pump maybe run at greater speed than when the ordinary brass valves are used; 250 feet per minute being the ordinary rate of working. The delivery pipe, as will be seen, has seven outlets, the central one being prepared as a main discharge. As usual in pumps of this description, the columns are utilized as air chambers. The steam cylinders are inverted, 14 inches in diameter, the stroke is 10 inches, and the two engines are connected to the crank shaft at a right angle, so that the pump may be instantly started from any position. The water cylinders are each 8 inches in diameter, and are capable of delivering 224 tons of water per hour. The working parts are all nusually easy of access, and an idea of the compactness of the p mp may be gained when it is stated that the floor space occupied is only 6 feet by 5 feet 6 inches.—*Textile Manufacturer.*



IMPROVED QUADRUPLE PUMP.

Chlorine as a Disinfectant.

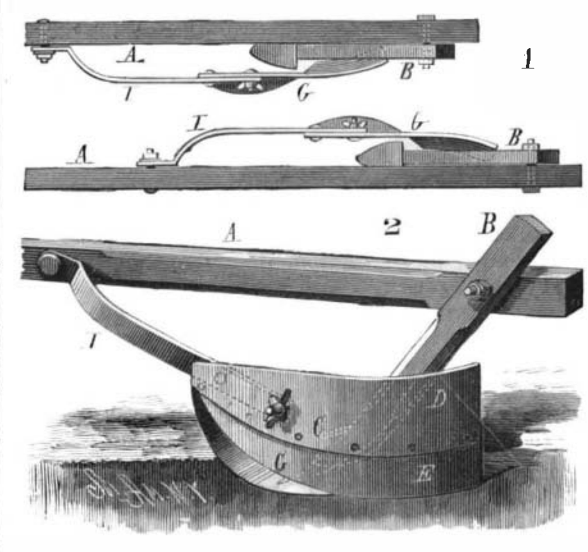
An investigation reported upon by Dr. Klein is the application of chlorine as an air disinfectant, especially in respect to swine disease. It has been shown that this disease is highly infectious, and that the infection is easily conveyed by the air, which is the usual manner of the communication of the disease. It was therefore considered by Dr. Klein to be specially suited for ascertaining experimentally the gaseous substance by which it could best combated. It is known that a healthy pig placed in the same stable with a diseased one is sure to take the disease, though the animals are carefully kept apart from each other. Dr. Klein therefore experimented as to the extent to which this atmospheric communicability obtained in an atmosphere impregnated with as much chlorine as the animals could endure without evincing discomfort. It was found that a healthy animal could with safety be placed in the same compartment with a diseased pig, even for so long a time as six hours, for five successive days, provided the air in the compartment was maintained well fumigated with chlorine gas, two good f migations up to a marked pungency in the six hours being req ired. It was also found that one good f migation with chlorine neutralized effectually the virus in a compartment from which a diseased pig had been removed, so that another animal could be placed in it without danger of infection.

Four Engines in Collision.

Two heavy freight trains on the Nickel Plate road, each drawn by two engines, collided near Grand Crossing on Jan. 20, badly damaging the four engines; and killing an engineer named Charles Ellis. The loss is $20,000.

COMBINED GUARD AND WEEDER.

The accompanying cuts (Fig. 1 is a plan view of the device as applied to the right and left hand beams of a cultivator, and Fig. 2 is a side elevation) show a combined guard and weeder, lately patented by Mr. Oscar Elce, of Parker, Dakota, the object of which is to protect small plants from clods thrown by the forward shovels, and to destroy weeds and grass that may be growing near. Attached to the beams, A, of an ordinary cultivator are the forward standards, B, and the forward shovels, C. The forward end of the plate, D,



ELCE'S COMBINED GUARD AND WEEDER.

which is about 8 inches high and of any s itable length, is straight, and has its lower edge rounded, as shown in Fig. 2. To its lower edge is riveted a narrow steel plate, E, the forward part of the lower edge of which is rounded, and its lower forward part is inclined inward toward the plants. The middle part, G, of the plate is vertical, and its rear part has an outwardly projecting horizontal flange, as shown in Fig. 1.

When the cultivator is drawn forward, the inclined part of the plate, E, runs close to the plants, from which the weeds are pushed back, while the flange cuts off the roots of the weeds. The curved rear parts of the plates push the weeds below the forward shovels, forming a low ridge, which the rear shovels (not shown in the drawings) level down. The weeder is drawn by the bar, I, the forward end of which is bolted to the beam, and the rear end to the plate, D. At the extreme lower end of the bar is a clamping bolt that passes through a slot in the plate, and by means of which the guard and weeder can be adjusted to work at any desired depth in the ground.

Cleaning Clock and Watch Movements.

A bath can be prepared as follows, which will cleanse the movements of clocks and watches to perfection: One quart of water, about one teaspoonful or five grains of liq id ammonia or alkali; into this liquid should be grated or scraped fine, five grains of common soap.

These proportions can be varied as desired, if the following remarks are kept in view:

The articles to be cleaned should be plunged into this bath, where they should be allowed to remain at least ten minutes. Twenty or thirty minutes is better, especially for clocks. The articles should be wiped dry when removed from the bath, or polished up with a brush dipped in some polishing powder. The articles ought then to look like new; if this is not the case, they should be placed again in the bath, to which a small quantity of alkali must be added, as it may have lost some of its strength in the bath.

Remark.—The alkali has the great advantage of not attacking the pieces of steel; when pure, it leaves the temper in all its purity. If the quantity of alkali is increased, the copper will become black, but the steel will not suffer in the slightest. When pure, if used very quickly, the alkali will clean instantaneously gold and silver watch cases, a brush dipped in polishing powder being used to dry the article and brighten the polish.

This bath can be corked and set aside for future use, as it keeps very well. If it loses its strength all that is necessary is to add more alkali.

A PIANOFORTE railroad car is being built in Birmingham, England, for the London and Northwestern Railway. "Appliances will be provided by which the sound of the carriage wheels will be deadened, so as to preserve the harmony of the music."

How Rubber Boots and Shoes are Made.*

Did you ever see any crude rubber, and have you any idea how it is gathered and worked? There are twenty or thirty varieties of crude rubber, varying greatly in quality, and of all these the best is known as Para, a South American product, obtained in Brazil, about 1,800 miles above the mouth of the Amazon. It is called Para from the city of that name from which it is shipped to foreign parts. The gum is gathered by tapping the rubber trees, as we tap maple trees for sap for maple sugar. The sap is gathered into a large pot into which the native dips a flat wooden paddle, to which gum adheres. He withdraws the paddle and holds it in a smoke made by burning palm nuts, which dries and cures the film of rubber on the paddle. He then dips again, and smokes again, repeating the process until he has on the paddle a bunch of gum weighing several pounds. Then he splits the ball or roll to get the paddle out, and it is ready for market.

These native are not models of honesty, however, as these chunks of gum frequently contain palm nuts, rubber nuts, pieces of iron, or are freely mixed with sand to add weight, which often causes the manufacturer great trouble. The public, or a large share of the public, have an idea that crude rubber gum comes something like tamarac, and that it is melted and cast into whatever form is desired, but this is not true. A rubber shoe factory is not a foundry; it comes nearer being a printing office.

These chunks of rubber are sliced into steaks, you might say, by sharp knives revolving rapidly and kept constantly wetted. When one of these knives strikes an iron spike, there is apt to be "music in the air." The operators are on the lookout, however, and accidents are so thoroughly guarded against that they are very rare. These steaks are then put into a chopping machine, where they are made into an article closely resembling boarding house hash, only that this hash is the straight goods, except that it needs cleaning. The small pieces thus formed are then put through a machine which makes mince meat of them, and at the same time washes out all the dirt and sand. This (not the dirt and sand) is now shoveled into a rolling machine which compresses the mass into rough sheets. This is the first process. These sheets are then taken to another building and put into a steam drying room, where they remain about three months to free them from all moisture.

By the drying process they lose from 15 to 30 per cent of their weight. If the least moisture remains in the rubber when made up into shoes, the heat of vulcanization causes its expansion, and consequently causes blisters in the stock. The dry gum is then run between heavy iron rolls, heated by steam, and called grinders, by which it is softened to permit the admixture of the vulcanizing material.

Rubber in its natural state is unfit for use, and Goodyear's process of vulcanization by the aid of sulphur is necessary to utilize it. This mixing is done by running the ground rubber through still another series of rollers, which press the rubber and sulphur together in one soft, fine body, which is finally run through a calender, between great steel cylinders; the mass is pressed out into long smooth sheets of any desired width or thickness. Then comes the printing process. These sheets are fed through steel cylinders on the face of which is engraved the pattern for sole, heel, and upper desired to be produced, and these impressions are as clearly printed on the rubber as this type impression is on this paper.

Then the sheets go to the cutters, who cut out the different parts and send them to their respective departments. The lasting is done similarly to that of other shoes, except that the parts are all put together by rubber cement, and, before removal from the last, they are placed in the vulcanizing ovens, where they are subjected to a degree of heat that transforms the various parts into a homogeneous mass in the shape of a boot or shoe with a seam, nail, or peg. Then, if a dull finish is desired, the last is removed, and the goods are ready for market. Otherwise they are varnished to give the bright finish, and dried, when they are ready.

Electric Lights for Dwellings.

Several different systems of electric lighting are in vogue in French private houses, but, says *La Nature*, they are all somewhat costly. One of the best systems is that of Gaston Menier, in which 150 Swan lamps are used, supplied by a series of 22 accumulators. These nominally yield from 40 to 50 amperes, which are sufficient to supply 60 lamps at a time—a number more than sufficient for any ordinary purpose. The accumulators are charged each day by a continuous current Gramme machine, regulated by resistances introduced into the circuit. The machine is driven by a 5 horse power "Otto" gas engine. With a little practice, the servant who has charge of the lighting can, it is said, estimate the consumption pretty accurately, and recharge the accumulators; allowing an excess of 10 or 12 per cent for loss—possible errors. When it is necessary to use all the lamps, the direct supply from the machine is added to that of the accumulators.

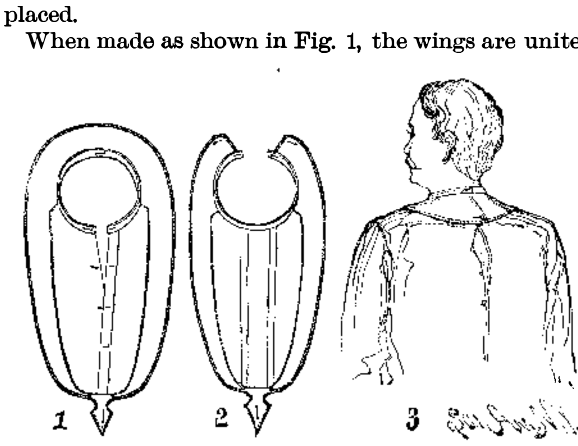
* "Cincinnatus," in Chicago *Shoe and Leather Review*.

DETACHABLE SHIRT BOSOM.

The accompanying cuts represent an invention patented by Mr. George W. Lee, of Ridgewood, N. Y., which relates to that class of bosoms which are worn on woolen or other shirts, or over ordinary dress shirts in case the bosom fixed in the shirt is soiled. The bosom is made of muslin, or other material, and is secured on a backing provided at its top with two wings, forming a cape at its upper corners. A neck band is secured to the upper end of the bosom and along the inner edges of the wings or cape. In the lower corner of one wing is a buttonhole, and on the other wing is a button. In wearing the bosoms, the wings, of uniform or nearly uniform depth, where attached to the neck band and forming a pendent cape hugging the sides and back of the neck but not extending out to the shoulders, are adjusted to their place in such a way that their ends come together on the back directly below the neck.

The front collar button or stud is passed through the shirt, the buttonhole in the neck-band of the bosom, and through the holes in the ends of the independent collar to be attached. The rear collar button is passed through the hole in the band of the shirt, through the holes in the ends of the neck-band, and through the rear buttonhole in the collar. The button on one wing of the bosom is passed through the hole in the other wing, thus holding the ends of the wings at the lower corners, the upper corners being held together by the rear collar button. The lower attached cape formed by the wings, by hugging the sides and back of the neck only, gives an excellent fit, and the bosom is not liable to be shifted or the independent collar to be displaced.

When made as shown in Fig. 1, the wings are united



LEE'S DETACHABLE SHIRT BOSOM.

at the rear, and the collar band is opened at the front. In this case the bosom is held by means of the front collar button, which is passed through the shirt, through the holes in the neck-band of the bosom, and through the two holes of the collar, and by the rear button passing through the neck-band of the shirt, the neck-band of the bosom, and then through the outer collar.

Draught of Boiler Furnaces.

The question frequently arises, What is the proper way to regulate the draught of a steam boiler furnace—by opening and closing the ashpit and furnace doors, or by means of a damper in the flue leading from boiler to chimney?

There is some difference of opinion and practice regarding this matter, which probably arises from differences or peculiarities in the constructive details of various boiler plants, which might make it desirable or even necessary to regulate one way in one case and the other way in another case.

Our own preference is decidedly in favor of regulating the draught by means of a damper placed in the uptake or pipe leading from the front end of the boiler, smoke box, or front connection to the main flue. This uptake should be made of wrought iron, and riveted securely to the boiler shell, and the damper should be fitted as close to its lower end or the tube openings as possible, and be provided with a convenient hand attachment whereby it may be set at any desired point and secured there.

There is much less liability of burning out the grates in a boiler furnace when the draught is regulated by a damper than there is when it is regulated by the ashpit door. For, let the ashpit door be closed tightly, and all circulation of air in the ashpit is stopped; there is nothing to prevent the heat from the layer of incandescent fuel being transmitted downward and overheating the grates, and overheating means warping, twisting, and cracking of the bars, and we have known them to be melted from this cause.

When, on the contrary, the ashpit doors are fully open, there is nothing to prevent the free circulation of air throughout the pit, and the bars are kept cool. We recommend omitting altogether doors to the ashpit, and making the opening through front nearly the full width of the grate, and making a water cavity or trough at least 6 inches deep in the bottom of the ashpit. This should be kept full of water, as it has a great effect upon the temperature below the grates.

For ease and certainty of regulation, a damper placed in the uptake, as described above, possesses great and obvious advantages over any manipulation of ashpit or furnace doors. Any one who has had charge of boilers fitted up in this manner can readily appreciate the truth of this statement.

There is, also, in our opinion, decidedly less loss of heat by infiltration of air through cracks in the setting walls when the draught is governed by a damper in flue than there is when the doors are used for same purpose; for, when ashpit doors are tightly closed, the draught of the chimney will draw air in through every crack and crevice in the walls, and this air entering the furnace at all points has a cooling tendency which it is most desirable to avoid. If the ashpit doors are opened, however, any leakage past the damper will readily be supplied by air passing through the fire, which is always the way air should go into a boiler furnace.

The damper should always be so fitted and adapted to the boiler that, when it is tightly closed as far as it can be by the apparatus provided for operating it, it will allow sufficient draught to just keep the fires going, and carry off any coal gas which may be generated in the furnace.

The foregoing relates more particularly to boilers used for power purposes, and those plants of such size as to require the constant supervision of an engineer or fireman. With many of the small house heating boilers where the draught is automatically regulated, it is deemed expedient by most steam fitters to regulate the draught by the ashpit door. For boilers of this type, this is undoubtedly a good plan in many cases; with the attention this class of boilers receives, there is probably less danger of filling up a house with coal gas.—*The Locomotive.*

Ballooning a Hundred Years Ago.

The 7th of January marked the centennial of the first aerial voyage—on record—ever made across the English Channel; and it was made by an American, not an Englishman, Dr. John Jeffries, of Boston. He was a successful surgeon in London, and was scientifically interested in air voyaging. He paid a hundred guineas for a balloon trip from London, to Kent, in 1784, with the French aeronaut Blanchard. This was so successful that he agreed to pay some $3,500 or more for a voyage across the channel. There were no gasometers for illuminating gas in those days, so ballooning was not an easy matter for long distances—or even short ones.

Blanchard, like some other aeronauts since, tried hard to escape his contract; even *a vest lined with lead*, sent home by the tailor to the wrong address, and which it was supposed would make their ascent difficult if not impossible, fell into Jeffries' hands. Finally they got off from Dover at a quarter past one o'clock, "the *little* hero," as Jeffries called him, "the little heroic captain," being absolutely driven to start by his scientific employer. Jeffries had studied the wind, and was more decided than the pilots were, who said it would not extend (fair) beyond mid-channel. They "had risen considerably" by half past one, and could count thirty-seven towns and villages, with "a formidable view" of the breakers on Goodwin Sands. The same formidable view of the waves continued to enliven the proceedings. They seem to have seesawed most of the way, throwing "overbasket" in their rise and fall, first, their ballast, then books, and even the brandy bottle.

They finally landed about twelve miles from the sea, in the wood of Guines, and not so far from Calais but that they reached there (after frequent hospitalities by the way) at one o'clock that night. Dr. Jeffries was made quite a hero at the French Court, and was on the best of terms apparently with Dr. Franklin, at Passy, and Mr. Jon. Williams; with Com. Paul Jones, Mrs. Bingham, "a very genteel American, from Philadelphia, and Mr. Bingham." His journal, which is given in the *Magazine of American History* for January, is second only to Sterne's in its charming and naive account of the France of that period. He "thanks God" for his safe return by sea to Dover, the end of February. Considering that eighty-six years later M. Naya, in that same Paris, could not guarantee any more than Blanchard where his balloons should land, when sent out from the besieged city during the Franco-German war, and that to-day, in the Jeffries Centennial, balloon voyaging is no more manageable than it was then for precision or utility, there is room yet for invention, and capital too, to be expended in air voyaging inventions.

New Turkish War Ship.

Preparations have been made for launching the ironclad frigate which has been nearly seven years on the stocks at Constantinople. Length amidships, 292 feet; extreme breadth, 55 feet; depth of hold, 39 feet; tonnage, 4,167; nominal horse power, 800; armor, 6 inches, 7 inches, and 9 inches, extending 5 feet below the waterline and 15 feet above it; armament, ten 8 inch Krupps, placed in a central battery arranged for both fore and aft as well as broadside firing. The ship is to carry, in addition, two 6 inch Krupps on the upper deck as ordinary pivot guns.