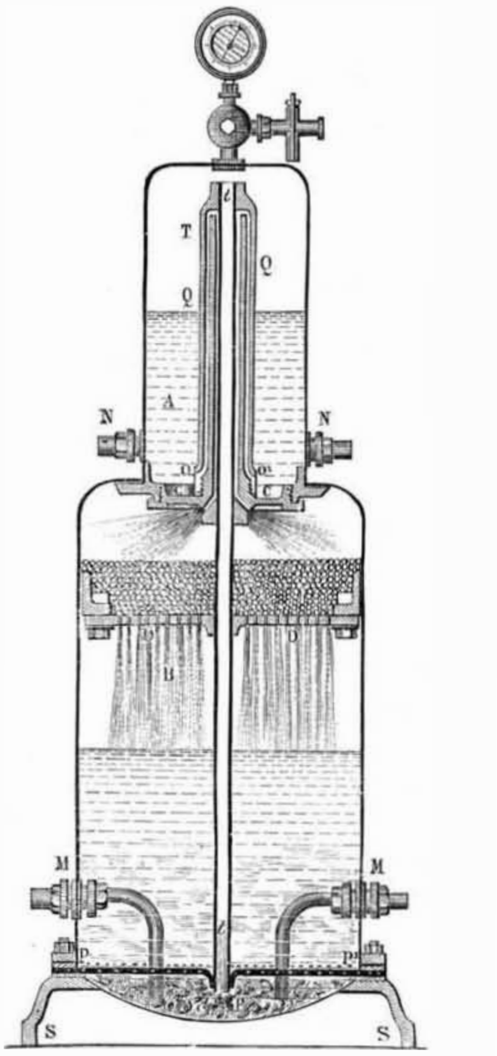
MIXER FOR CARBONIC GAS AND WATER.

The engravings show an apparatus invented by M. Mondollot for intimately mixing carbonic gas and water without a mechanical agitator, to which there are serious objections. The means for charging water with an effervescing gas by this device are very simple and said to be effective. Friction is avoided, leakage is prevented, and the bottling is unattended by violent spurts and ebullition.



THE CASCADE SATURATOR.

The apparatus consists of two vessels, or chambers, A and B, separated by the partition, C. The smaller one, at the top, is the distributer, and the other the accumulator. The gas and water are forced by a pump through the pipes, N, into the distributer, where they separate in consequence of difference in weight. As the pressure increases by the action of the pump the water rises in the tubes, O, and descends to the diverging annular space in the top of the accumulator, where it is forced in spray through the apertures, *i*, on a mass of broken marble, or other carbonate of lime material, through which it passes and descends through the perforated diaphragm, D, in a fine mist.

The water during this process is in contact with the carbonic acid gas at a high pressure, and becomes thoroughly charged. The gas escapes from the distributer by the central tube, *t*, into the bottom of the accumulator, where it passes through the perforated plate in little bubbles. Bottles, or other vessels, are filled at the pipes, M.

It will be seen that as the pressure in the lower cylinder decreases by drawing from it, and increases in the upper cylinder by the action of the pump, there is a constant tendency to equilibrium, the water under pressure falling in a cascade into the gas, and the gas, under pressure, rising through the water, giving the largest amount of contact surface.

* Translated from *Bulletin du Musee de l'Industrie.*

Ensilage.

Mr. Atkinson, of Boston, recently sent a cask of maize fodder and a cask of rye to Professor Voelcker, the well-known agricultural chemist of England, with the view of showing the sort of ensilage prepared in America. Having analyzed the samples, the Professor reported the maize fodder to be perfectly sound and the rye very slightly mouldy; but both were wholesome food for cattle. A little cotton-seed meal having been added to the fodder, it was given to cows on an experimental farm. They took to the ensilage at once, and evidently enjoyed it. With careful management, Mr. Atkinson calculates that four cows can be maintained in good condition to one acre of ensilage.

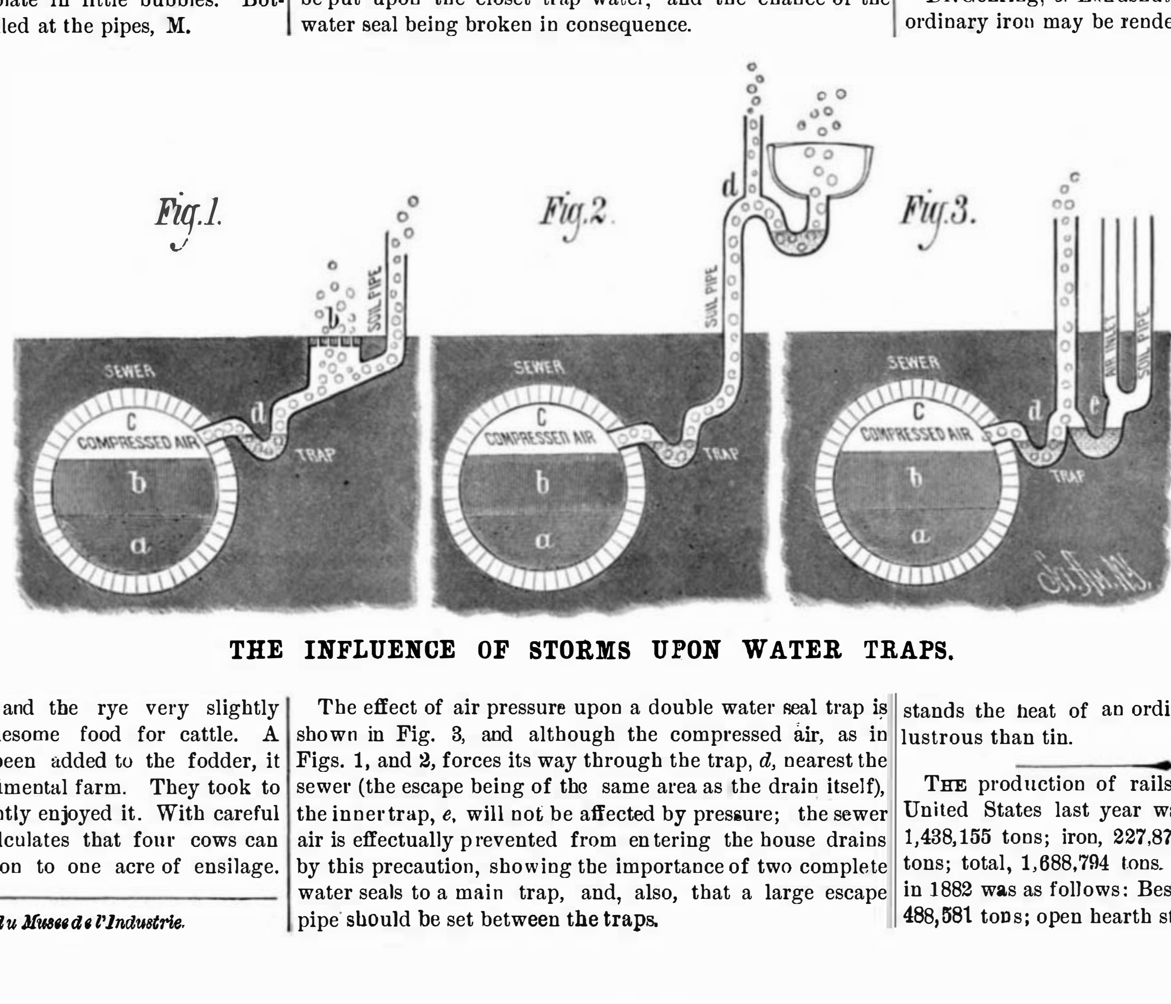
THE INFLUENCE OF STORMS UPON WATER TRAPS.

The last issue of the *Sanitary Record* (London) contains a valuable article on "The Influence of Storms upon Water Traps," by Henry Masters. The points he makes have application in cities in which the sewers are not ventilated. Strangely, there is considerable opposition to sewer ventilation, or, at the least, indifference to it; the result is indicated below.

There are three influences which affect the water seal of a trap, viz., the diffusion of gases, the absorption of gases by the trap water, and pressure by storm water; it is the latter influence which I propose in this paper to describe. I will suppose a common sewer to be cylindrical, and in dry weather the quantity of sewage passing through it is shown by the horizontal lines at *a*, Figs. 1, 2, and 3, and the space, *b* and *c*, above the average sewage contains sewer air; so long as the sewage does not rise above the average height, *a*, no pressure exists (except by the diffusion of gases, with which at present we have nothing to do). But suppose a storm occurs, and sufficient water passes into the sewer by way of the street gullies and house drains to raise the water in the sewer to the perpendicular lines, *b*, a certain amount of pressure will be the result, and the air, *b* and *c*, will be compressed into the smaller space, *c*, and in the proportion of *b* to *c*. The condition of the sewer air will now be much more dense and elastic, and press equally upon the intrados of the sewer and on the surface of the sewage, and if there were no escape for the compressed air, and the storm water rose higher and higher, the air would become denser and denser, until the pressure of the imprisoned air became equal to the entrance supply column of storm water, and then the water would cease rising; in our unventilated sewers this condition of things would exist, if it were not that a large number of house drains join the common sewer somewhat in the manner shown in my diagrams.

I have shown upon Fig. 1 an open disconnecting trap, *d*, and what would be influence of water rising (as I have described) upon such trap. The compressed sewer air is being forced into the house drains, as shown by a series of circles; in the first place, the air will force the trap at *d*, and then may escape into the open air through the perforated cover, *b*. But if the soil pipe, *c*, be open at its top, or there be any defect in it or in the house drains, there is a possibility of an up or inward current being established, and a portion of such sewer air be drawn into the house drains and escape by way of the soil pipe, or into the house; thus, to a large extent, the house drains will not be effectually cut off from the common sewers, for sewer air by entering the house drains neutralizes to a considerable extent the value of the disconnecting trap.

Fig. 2 shows a common arrangement of trapping drains, and, also, a common arrangement of four inch soil pipe ventilation by the extension of the soil pipe less in capacity than the soil pipe itself; it is not an uncommon thing to find such extension pipes varying from three-eighths of an inch to three inches in size. The effect of pressure in such cases is as I have again shown by circles (see Fig. 2). It will be seen that the compressed air ascends freely until it reaches the bend of the soil pipe at *d*, and at this point a portion escapes up by the small soil pipe extension and into the open air, as shown by small circles, but the major part forces the closet trap, and, of course, enters the house, thus showing for effective ventilation the absolute importance of soil pipes being extended their full size, and, if terminals of any kind be fixed upon their upper ends, the openings of such terminals must be at least of the same area as the soil pipe, for any less size would check the ascension of the air, and an undue pressure be put upon the closet trap water, and the chance of the water seal being broken in consequence.



THE INFLUENCE OF STORMS UPON WATER TRAPS.

The effect of air pressure upon a double water seal trap is shown in Fig. 3, and although the compressed air, as in Figs. 1, and 2, forces its way through the trap, *d*, nearest the sewer (the escape being of the same area as the drain itself), the inner trap, *e*, will not be affected by pressure; the sewer air is effectually prevented from entering the house drains by this precaution, showing the importance of two complete water seals to a main trap, and, also, that a large escape pipe should be set between the traps.

In dealing with large soil pipe drains, great difficulties exist in effectually arranging the drainage of a house so as to exclude sewer gas, and to exclude this no one will doubt to be of primary importance. If a disconnecting chamber, or an escape pipe, be the safeguard adopted, the perforated grating, or pipe, should be of equal area to the drains it has to relieve; thus, a nine inch drain must be provided with perforations or pipe equal to about sixty-three superficial inches, a six inch drain twenty-eight inches, and a four inch drain thirteen inches. Perfect safety cannot be obtained unless this rule is made absolute.

PORTABLE MEAT SAFE.

This is a very simple invention which will prove exceedingly useful in summer to protect joints of meat from flies

PORTABLE MEAT SAFE.

or insects. The hook is intended to hold the joint, and the hoop prevents the gauze from coming in contact with the meat. As the joint is completely surrounded by the gauze it is impossible for the flies to effect an entrance.

Silico-fluoride of Ammonia as Test for Boric Acid.

Prof. Stolba says that many boron salts, especially those soluble in water, impart a fine green color to the alcohol or colorless gas flame when mixed with silico fluoride of ammonia.

Owing to the intensity of the color, this reaction can be made use of for testing for boron in substances that are totally insoluble in water and acids, as, for example, in glass, enamels, tourmaline, axinite, etc. He proceeds as follows: The substance to be tested is pulverized and mixed with an excess of carbonate of soda and fused. When the fused mass is cool, it is ground to a very fine powder and mixed with an equal part of the silico-fluoride.

When this mixture is brought into the flame on a platinum or even an iron wire, the smallest trace of boron will be indicated by a very distinct and persistent green color.—*Listy Chemicke.*

Aluminum-coated Iron.

Dr. Gehring, of Landshut, has invented a process by which ordinary iron may be rendered highly ornamental. The invention—of which, however, we have heard very little lately—of obtaining aluminum very cheaply led Dr. Gehring to coat iron with aluminum, in the same way as iron plates are now tinned, and converted into tin-plates. The inventor states that his process is inexpensive. He uses a Bunsen burner with a blast or a muffle, and is thus able to manufacture various objects of the durable metal for daily use, the coating of aluminum giving them a silver white luster. He also produces a gold luster or any other color, and even an enamel coating, all of which substances are said to adhere very firmly to aluminum. Aluminum, like tin, does not oxidize under normal conditions, and even stands the heat of an ordinary fire, while it is much more lustrous than tin.

THE production of rails of various descriptions in the United States last year was as follows: Bessemer steel, 1,438,155 tons; iron, 227,874 tons; open hearth steel, 22,765 tons; total, 1,688,794 tons. The corresponding production in 1882 was as follows: Bessemer steel, 1,330,302 tons; iron, 488,581 tons; open hearth steel, 25,217 tons; total, 1,844,100.

Fire-proof Passenger Cars.

The *New York Herald* says that there is no good reason why all passenger cars on steam roads should not be thoroughly fire-proof, and that it is high time that a new departure in this respect should be taken, as it seems easy and entirely practicable to construct passenger cars of metal or other incombustible material.

By way of comment on the above, remarks *The National Car-Builder*, it may be said that the traveling public will be provided with fire-proof cars at some future time, perhaps, but not until there is a more urgent demand for them than exists at present. Just now the demand is light, because the great mass of people are very well satisfied with what they have, or would be, if cars were a trifle more luxurious, stylish, and exquisite than they are. The vast majority of travelers will take the chances when they journey in winter, rather than dispense with the hot stoves to which they have been so long accustomed; and as for any new-fangled incombustible wood finish, they will continue to prefer the elegant cabinet work and gilded and varnished surfaces to anything plainer and safer.

Metallic car bodies are no new idea. They have been built of iron tubes and steel rods framed together, with an outside covering of sheet iron, and have done fair service as freight cars. It has been proposed to construct passenger cars on the same plan, the inside finish being wood, of course; but we are not aware that any such cars have yet been built and put in service. There is evidently but one way to make a fire-proof car or a fire-proof building, and that is to construct it throughout of materials that will not burn under any circumstances. The best of the so-called fire-proof buildings are not entirely so. They always contain some wood-work as well as furniture and other property, more or less, that will readily take fire, and the same may be said with respect to railway passenger cars. The framing and floors may be made of metal and the outside paneling of iron or of wood well covered with metallic fire-proof paint. The inside can also be of sheet metal or of wood saturated with chemical ingredients that are said to render it incombustible, or nearly so. The seat frames can also be made of iron, and the cushions and backs with the least possible upholstering necessary for the comfort of the sitter. But would such cars be pleasant to ride in? Would the great traveling public, after being pampered so excessively during all these years with luxurious and palatial finery in car decoration, be willing to dispense with mahogany, rosewood, and varnish (all of which will ignite about as quickly as petroleum) for plain surfaces of fire-proof paint, just for the satisfaction of knowing that however cruelly they might be transfixed or crushed in a collision by fragments of iron or incombustible wood, they would not be burned alive or cremated? Some people, doubtless, would be willing to do so, but the great majority would not. The mass of people would, and do, prefer to take the chances, just as they do when they put up at six story tinder-box hotels, feeling in all their bones that after *us* comes the midnight conflagration with its horrors unspeakable.

When the demand for safety, as against fire, in railway cars shall become so pressing and universal as to make some effective provision for it indispensable, it will probably be found that there is another way of cornering the problem without resorting to the difficult and even questionable expedient of making cars fire-proof, and that is, not to carry any fire in them. This would not, of course, prevent the burning of cars from outside contact with fire, but it would prevent conflagrations from originating inside—a class of accidents which are the most to be dreaded, and which have hitherto in our railway history been fearfully destructive of human life. The warming of cars with steam or hot water, conveyed from the locomotive or supplied by a special apparatus in baggage cars, is barely practicable, perhaps; but thus far the unsuccessful efforts of inventors to devise a good practicable working plan is an evidence of the difficulties which lie in the way of the general adoption of these methods.

Pneumatic Transmission of Power.

The transmission of power to long distances and its economic distribution over wide areas by a special agency is a thing greatly to be desired, and is, morever, more easily conceived than accomplished. Water has been laid largely and successfully under contribution in this respect. Air has also been utilized, and the principle finds an exponent in the gas engine. It has further been demonstrated of late that, other things being equal, electricity in a secondary form is well adapted for this purpose. Compressed air is now largely employed in Paris for the transmission of time by mechanical means—the pneumatic clock system—and it has also for long past been used for other mechanical purposes, as in mining and tunneling operations.

In regard to the distribution of hydraulic power from a given center over a large area, Hull presents a notable example, that town having been the first to adopt the system through the Hull Hydraulic Power Works, of which Mr. Henry Robinson was the engineer. What has been done in Hull and what is now being effected in other towns with respect to the distribution of power by means of water, it is now proposed to do in Birmingham by means of compressed air. The proposition is to compress the air on a large scale at a central depot or station, and to distribute it throughout the manufacturing portion of the town by means of mains and supply pipes, just as gas and water are now supplied. One great advantage of compressed air is that it can be used to drive existing engines without involving any change of plant. Moreover, steam users would be enabled to dispense with their boilers and utilize the space for other purposes, the services of the stoker also being dispensed with. There are also some other collateral advantages to be secured, to which we shall presently refer.

The requirements of the district to be supplied have been carefully considered, and in order to determine the position and extent of the proposed works, the number of steam users in the proposed district were ascertained. The wards selected were those of St. Bartholomew, Deritend, and St. Martin, and the following is an analysis of the results. It was found that there are—

164	engines varying from	½ to 10 h.p.,	with total of 710	h.p. nom.
59	" "	" 11 to 20 "	" " 843½	" "
15	" "	" 21 to 30 "	" " 393	" "
6	" "	" 32 to 50 "	" " 220	" "
10	" "	" 52 to 100 "	" " 574	" "
4	" "	" 102 to 289 "	" " 818	" "
		Total	3,558½	

It is assumed that of the above only engines up to 30 horse power nominal would be likely to use compressed air. Upon this assumption, then, we have—

For 10 h.p. and under,	710 h.p. nom.	yielding say	2,130 h.p. ind.
" 20 " "	843½ " "	" "	2,529 " "
" 30 " "	393 " "	" "	1,179 " "
Total indicated horse power of engines of a size to work with most advantage by compressed air			5,838 " "

These figures, however, only represent the engines now actually in use, but it is to be presumed that the existence of such a convenient and cheap power would attract other manufacturers requiring motive power to the district in which the mains would be laid. Besides this, there are many additional purposes, such as for driving small machinery and for ventilation, for which compressed air is specially applicable. In view, however, of the existing requirements of the districts proposed to be first dealt with, it is proposed to provide machinery and plant capable of delivering 5,000 indicated horse power in compressed air, and at the same time to provide room for extension to double that amount.

The site selected for the works is a piece of land belonging to the Birmingham and Warwick Canal Company situated on the canal side and facing Sampson Road North and Henley Street. Upon half of this site it is proposed to erect four air compressing engines driven by compound condensing steam engines, giving a total of 8,400 indicated horse power (which it is calculated will be sufficient to produce the 5,000 horse power required to be delivered) and forty-four Cornish or Lancashire boilers, together with air purifying apparatus, and the necessary buildings and offices. Before entering the air compressing cylinders the outer air will be passed through an air filtering and purifying apparatus, by which it will be cleared of soot, dust, and other impurities, in order that it may reach the consumers in a thoroughly pure state.

The air pressure to be delivered has been fixed at a minimum of 45 pounds effective, or 59·7 pounds absolute, as being sufficient to cover the majority of cases, and more economical of production than a higher pressure. In the few exceptional cases, however, where the existing engines work at a higher steam pressure, a slight alteration in the gearing or pulleys connecting to the main driving shaft, so as to run the engine at a higher speed, would enable the lower air pressure to carry the load. Where such alteration is not possible or convenient, the bore of the cylinder may be increased, or even a new cylinder introduced of larger bore, at very slight cost. The maximum pressure in the mains would be 50 pounds per square inch, and on reaching the consumer's premises the air would be heated wherever practicable. Before entering the engine the quantity of air supplied would be measured by a meter, or otherwise in the engine itself by a counter registering the speed and average point of cut-off and expansion.

It is unnecessary here to enumerate the many purposes for which compressed air can be utilized; to do so would be to extend the length of this article inordinately. Suffice it to say that there are some special applications in which this power is very desirable, and would prove most convenient. Let us turn, then, in conclusion, to the advantages compressed air presents apart from its use as a source of motive power. Foremost stands its hygienic advantages, and first among these would evidently be an important abatement of the smoke nuisance, by the abolition of a number of small factory chimneys which deliver their smoke at a comparatively low level.

There would then be, *per contra*, the introduction into the manufacturing parts of the town of large volumes of pure air instead of noxious vapors from the chimneys. An improved ventilation of workshops would also result from the exhaust air from the executive engines. There would likewise be the diminished risk of boiler explosions and of the consequent damage to life and property from that cause, while the public health generally would be improved by means of the purer atmosphere of the town. On the whole, there would appear to be nothing but advantage attending the working of such a scheme, and we hope in the public interest to see it carried out.—*Iron*.

IT is sagaciously noted that to determine the value of building stone a ramble among the tombs is wise. In far fewer years than most imagine monuments are in decay.

The Salmon Trade of Oregon.

There are now on the Columbia River alone not less than thirty-five canneries, which produced in 1882 about 540,000 cases of canned salmon, and including the other rivers from the Sacramento to the south of Alaska. On the north the product of canned salmon for 1882 was not far from 1,000,000 cases, with a value of about $5,000,000.

In Mr. Hittel's "Commerce and Industries of the Pacific Coast," we find the following information concerning the canning interest of the Columbia: The salmon fishery of the Columbia gives employment in the season to 5,600 men, 3,100 Chinamen being employed in the canneries, while 2,500 whites take charge of the boats and nets. The cannery proprietors own 1,200 boats, and lease them with nets and all the necessary tools and supplies to the fishermen, a large proportion of whom are Scandinavians, Italians, and Finns, who, as rent, must give one-third of the catch, and must sell the other two-thirds at a stipulated price. Each boat has two men, a captain and a helper. The former hires the latter, boards him, and gives him ten cents for every fish caught. The fishermen who own their boats and nets sell where they please, but usually receive the same price as is paid to the men using the cannery boats. It is expected that the captain of a boat will make at least $100, and his helper $70 a month for their labor. The average catch of a boat for a season may be 2,000 fish, worth $1,200, equivalent to $300 a month, of which $100 is allowed for the use of the boat and net and other material. The price on the Columbia was sixty to sixty-two and a half cents a fish in 1881, the price having increased gradually since 1866 (and is still increasing). In the canneries about 850 white men are employed as superintendents, clerks, foremen, etc., earning from $50 to $175 a month, averaging $62. White men make the nets, cans, boats, and cases, and have all the capital used in the business. The 3,100 Chinamen receive $372,000 for their work of four months; the 850 white laborers in the canneries receive $210,000; the 2,500 fishermen, $850,000. The wages in the fishing season, and cost of fish paid by the canneries amount to $1,433,000; and of this 4,000 Chinamen get less than a third, while the 3,500 whites divide the other two thirds among themselves. The proprietors get $2,750,000 for the product, leaving them $1,316,400 above the cost of the fish and wages in the fishing season to pay other cannery expenses, interest on the investment, and profits.

Manufacture of Gossamer Rubber Goods.

A recent number of the *American Exchange and Review* says: "There is now largely used a very light description of waterproof goods, which, we believe, receives only one coat or layer of rubber mixture." In one rubber factory in Boston the rubber itself is ground up with a mixture of sulphur, whiting, and litharge, and is then rolled out into a delicate sheet, which passes under immense steel cylinders, and by them is pressed into the surface of cotton cloth, forming the material for men's waterproof overcoats. This process does not materially increase the hazard incident to the business, while the reverse is the case in the "very light description of waterproof goods," known to the trade as gossamer. Here the solution of rubber in naphtha is still further reduced by the addition of larger quantities of this dangerous product of petroleum, and in one of the gossamer factories most recently built the fluid is poured into an inking trough, from which it flows upon the spreading cylinders. As the cotton cloth passes under the cylinder in an endless roll, it receives a mere film of rubber, from which the naphtha evaporates before the web returns from the winding machine at the opposite end of the long hall. The proprietors report that the goods receive from five to seventeen spreadings, according to the grade of goods manufactured.

Necessarily, the air is impregnated with the fumes of naphtha, and the proprietors dread the lack of humidity in the atmosphere. To counteract this, steam is allowed to escape beneath the spreading machine, and live steam is also sent into the room from a perforated pipe, whenever the coldness of their doors does not allow opening of the doors and windows. The saturation of the whole structure with naphtha vapor furnishes sufficient cause for the instantaneous spread of a mere spark through all portions of the structure. As an experienced manufacturer of caoutchouc goods has said: "You may select the best examples of rubber factories, and perhaps you will escape a fire; but no premium will pay for the risk where gossamer cloth is made." The manufacture of gossamer material into clothing does not seem very hazardous, but the careful agent will often find that the seams are made by the use of rubber cement, where again naphtha is the solvent, and even open pans of this volatile and dangerous fluid are in constant use by women and girls to "freshen" the edges of their work. The underwriter will find many risks of fine appearance offered to him, but he cannot afford to lose sight of the naphtha, or his underwriting will descend to gambling.

AT the Chicago Railway Exposition is an engine just built for the Southern Pacific Railroad, which weighs, with coal and water, 96 tons, and is designed for heavy service on unusual grades. On a level track it can draw all the freight cars that can be made to hold together by ordinary methods. Steam is required to work its reverse lever, and the locomotive itself is a mountain of strength and mechanical construction.