

## DISINFECTING APPARATUS.

Whatever be the theory admitted in regard to the mode of transmission of epidemic or contagious diseases, it is apparent that they do not arise spontaneously within us, but enter from the exterior. Whether the germ peculiar to such or such a disease be demonstrated or not, whether such germ be the cause or the effect of the complaint, it is none the less certain that most transmissible affections are, as Prof. Arnould says, propagated by direct contact of the healthy individual with the sick one, or with some object impregnated with pathologic products, or by an indirect impression upon the healthful economy of the center in which the sick person has lived, or by both methods at once.

Among the means that may be employed to bar the way to such transmission, the best, most assuredly, consists in disinfecting the objects that have been in direct or indirect contact with the sick person. In certain cases, these are the linen that has touched him and the bedding that he has soiled, which may contain the germs of transmission and carry them to a distance. In other cases, the products expelled by him may, after becoming dry, fly off into the surrounding atmosphere and fix themselves upon near-by micro-organisms, which, on being taken into the lungs or mouth, may contaminate other persons. In other words, it is in the matter ejected by a person having a transmissible complaint, and in the fabrics and objects surrounding him, that we find the danger that it is important to provide against.

Is it a question of cholera? The alvine evacuations and the matter vomited up are capable of transmitting the disease with the greatest rapidity. Is it not known that the laundresses who wash linen soiled by cholera patients are almost always the first to catch the disease and have it most severely in any locality?

This disease is transmitted with great facility by water courses when contaminated linen is washed therein, or even when suspected impurities are thrown into them. Among the many modes of transmission, there is an unlooked for one that was observed in Italy in 1884. An individual coming from Toulon, and having the cholera, stopped at an inn upon the way, where he was obliged to vomit upon some straw spread out in front of the door. Shortly afterward, two Italian

How many examples of the transmission of typhoid and yellow fever, small-pox, diphtheria, measles, and so forth, can we not recall! It must be concluded from this that it is very necessary to destroy the causes of the propagation of these diseases as promptly as possible, and, since most of them depend upon the presence or vitality of this or that micro-organism, it

with impunity by any process whatever; so great care must be taken to put them only into apparatus in which the disorganization of their fibers and their power of endurance shall be diminished as little as possible. Moist steam apparatus, under slight pressure, in which the operation is rapid, can alone give such results. At all events, these do fabrics less harm than does disinfection by chemical processes.

As it stands, Messrs. Geneste and Herscher's stove consists of a large, horizontal metallic cylinder, forming a purifying chamber in which the objects treated are directly exposed to the action of steam under pressure. Although the said pressure should normally correspond to  $+110^{\circ}$  C. (only about half an atmosphere), and be regulated by a safety valve to a maximum of  $115^{\circ}$  ( $1\frac{1}{2}$  lb.), the body of the cylinder is constructed of iron plate of a resistance much above such a limit. The cylinder is surrounded by an isolating jacket and provided with entrance and exit doors that are mounted upon pivots and move upon a roller. These are closed by means of bolts, the joint being formed of a circular groove containing an elastic and hermetical packing. The interior of

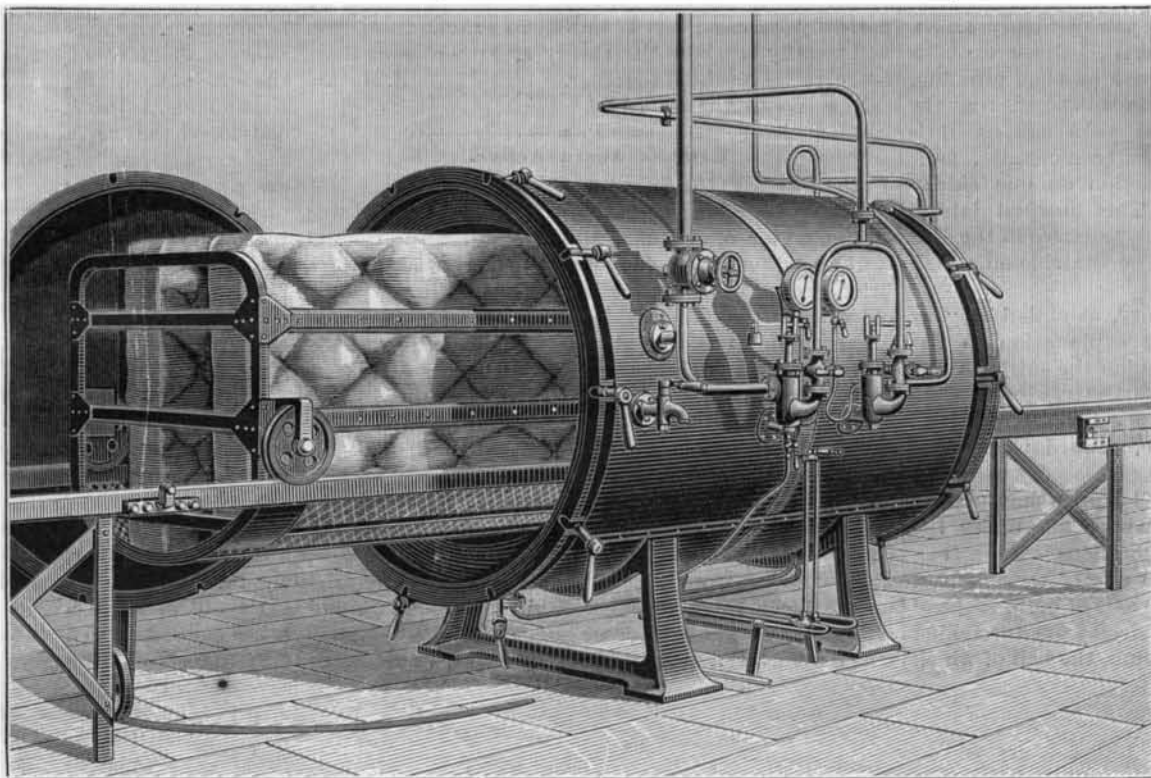


Fig. 1.—DISINFECTING STOVE.

is against the latter that we must fight with most vigor.

Processes capable of destroying the most obstinate microbes, either by the use of varying quantities of chemical agents or of mechanical means, have been sought for a long time. In former times, products from foreign countries were subjected to a lengthy quarantine, in order to expose objects brought by travelers, ships, or cars to a sort of destructive oxidation by the atmosphere; but the exigencies of trade obliged us to seek more expeditious processes, and it was soon found that a high temperature destroyed microbes or prevented their injurious action. Fire doubtless purifies everything, but it is often impossible to use so heroic a remedy; and although General Melikoff in 1879 saved Europe from the pest by burning the houses and clothing of the Wetlianka fishermen, such a *modus operandi* could not be adopted without great inconveniences in a city or in a seaport with the cargo of a ship. It was then that it was found that disinfection by heat could be effected with clothing, bedding, and merchandise in appropriate boxes, whose interior was so arranged that it could be raised to a determinate temperature. Hence the apparatus called "disinfecting stoves," the object of which is to secure an absolute destruction of such pathogenetic micro-organisms as may be contained in the objects that are put into them.

These apparatus were first experimented with in Germany and England. Some are hot-air stoves, and others operate through air and steam under pressure. It is unnecessary to say that in such cases we must, in the very first place, take into consideration the necessity of causing the destruction of the microbes, then the rapidity of the operation, and finally the preservation of the fabrics, all of which is equivalent to saying that a disinfecting stove must, in a very short time, possess a temperature which can permeate all fabrics without harming them, and which may yet be sufficiently elevated to destroy every germ. Now, the very numerous researches that have been made on this subject have soon shown that disinfection by moist steam under pressure is much more effective and much more certain than that by dry steam. In Fig. 1 we show a steam stove constructed by Messrs. Geneste and Herscher, which has recently been experimented with, both from a physiological and physical stand-

the stove is provided at the right and left with a track upon which runs a carriage designed to receive the objects to be disinfected. In front of and behind the cylindrical body, a double track permits the carriage to put itself into position to be loaded or unloaded—these two operations having to be performed in two separate parts of the disinfecting establishment, in order to prevent disinfected objects from getting mixed with infected ones.

In the interior of the stove there are two sets of heaters, each consisting of a row of iron tubes of small diameter. One of these is at the top, is covered with a screen, and is designed to prevent spotting and wetting through the dropping of water of condensation from the inner surface of the stove. The other, which fills the space below the carriage, is so arranged as to effect a rapid drying of the objects after disinfection.

The objects to be disinfected, having been placed upon the carriage, are introduced into the stove. In fifteen minutes the disinfection will be complete, and it will then only be necessary to partially open one of the doors in order to free the articles from the small amount of dampness that they possess. Moreover, thanks to a depression of 30 or 60 seconds after the first five minutes of direct exposure to the steam, the peculiar state of the steam at the surface of the fibers becomes modified in such a way as to secure a complete drying of even the

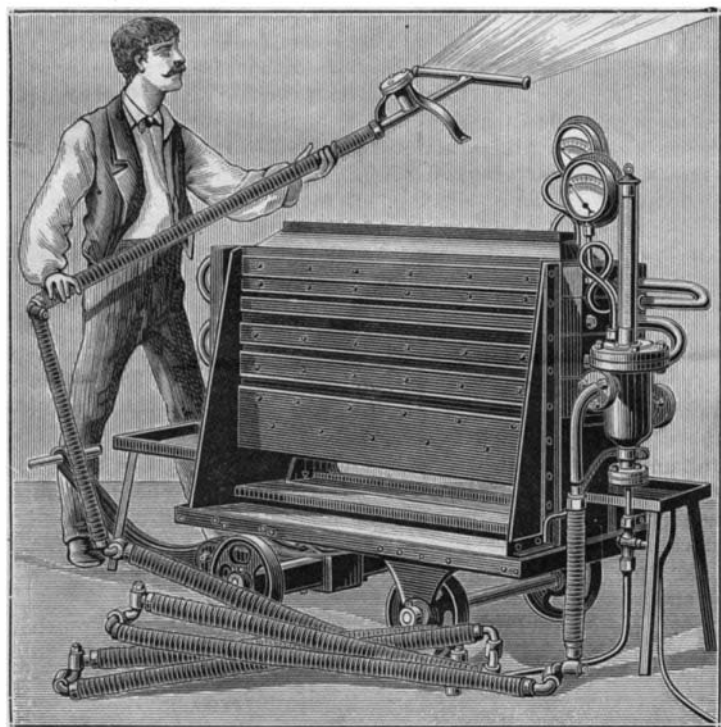


Fig. 2.—STEAM DISINFECTING APPARATUS.

teamsters, passing by, went into the inn to take a drink. On reaching their own country, they gave the village cobbler their shoes to be repaired, these being all oily and still impregnated in the cracks of the leather with dirt from the road and particularly with impurities derived from the yard of the above mentioned inn. The cobbler, whose hands were excoerated by tools, immediately took the cholera and transmitted it from one locality to another in the village.

point, by Drs. Grancher and Gariel and some pupils of Mr. Pasteur, and which, upon their report, has been approved by the Consulting Committee on Public Hygiene of France.

According to the words of the report, it suffices to raise the temperature to  $+106^{\circ}$  C. to surely kill, even in the center of a mattress, every pathogenetic microbe. But fabrics cannot be submitted to so high a temperature, nor their fibers be permeated with moist steam

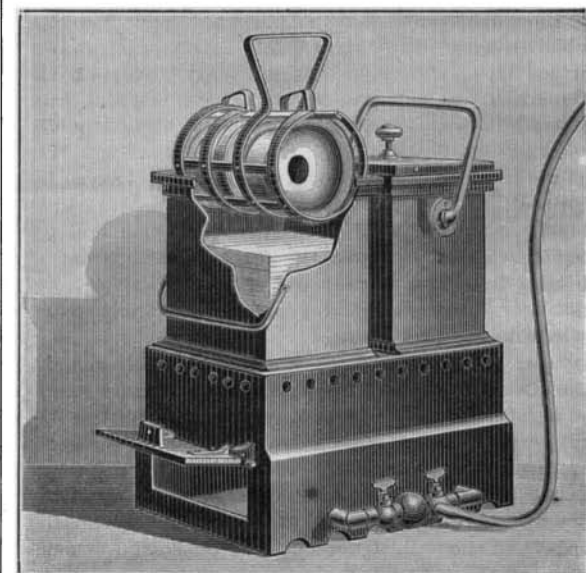


Fig. 3.—STOVE FOR STERILIZING THE SALIVA OF CONSUMPTIVES.

most tenuous cells, and, consequently of the micro-organisms that have introduced themselves therein.

Such an apparatus, stationary or upon wheels, and near a small steam engine, may be used in lazarettes, hospitals, ships, and so forth, and in public disinfecting stations such as now exist in England to the number of seventeen, and such as it has for a long time been a question of getting up in Paris.



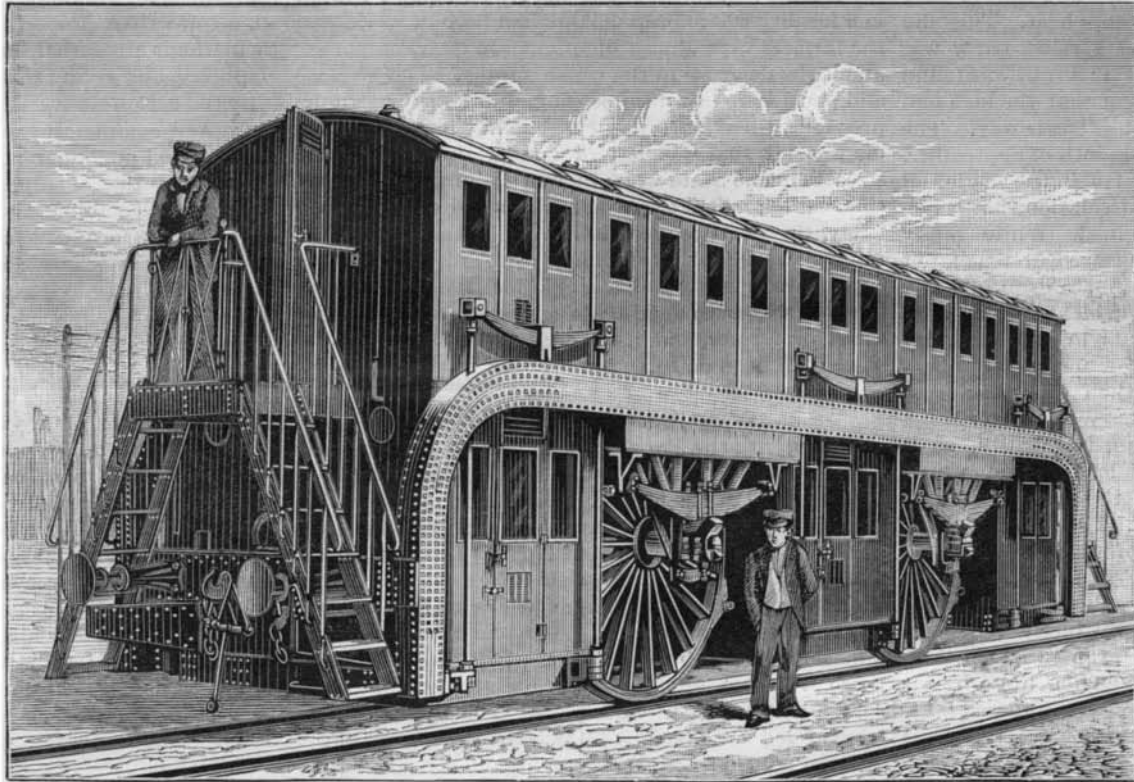
In case of an epidemic, in fact, there would be no establishment of the kind at the disposal of the capital's inhabitants, and, as for the hospital stoves, they are far from offering the proper guarantees that they will operate well, judging from the numerous negative experiments that have been made with them. Now, it is of importance that the disinfecting of soiled and contaminated articles shall not be left at the disposal of the public, for the operation is a nice one and requires apparatus that has been constructed with both a technical and scientific understanding of the question. In 1884, Mr. Siegfried, then Mayor of Havre, prompted by the example of England, decided that every time a case of cholera should be reported to the authorities, two cast iron closed vessels should be carried to the dwelling of the patient, and that in the smaller of these the evacuations should be deposited, and in the larger the soiled linen should be placed. Twice a day these vessels were carried by a wagon to a disinfecting station, and two empty vessels were left in their stead. This was a very wise measure, and one that should be adopted at all times and for all contagious diseases.

Messrs. Geneste and Herscher's disinfecting stoves are now in use in the Hyera Islands, at Port Cros and Bagau, as well as at Sidi Ferruch, in Algeria, where they are permitting the baggage and clothing of the troops coming from Tonkin to be very quickly purged; moreover, the state transports are soon to be provided with them, in order that disinfection may be effected on board during the trip. Profs. Brouardel and Proust have rightly got the government to adopt arrangements by the terms of which every large ship on which, under the guarantee of a duly commissioned physician on board, precautions of this nature have been taken, shall be admitted to practice after a simple inspection, and when no case of suspicious sickness has been found. Besides, such disinfecting arrangements would allow of passengers being detained in lazarettes but a few hours only, without danger.

It is often of importance to destroy the micro-organisms which may have settled upon the walls of a house or the sides of a car, ship, stable, and so forth, and which would render a long stay in such structures dangerous. The vapors of certain chemical compounds are here again usually inefficacious, and cause unsightly defacements that are costly to remove. It would be necessary to have a means of placing the walls of rooms and the furniture that the latter contain under the same conditions as the objects purged in a steam stove. But steam, by condensing, soon loses its temperature at the extremity of a conduit unless it can be superheated on its passage from the boiler to the nozzle, and this has led Dr. Redard to devise a method by which this can be done on cars; and Messrs. Geneste and Herscher, taking up the subject, have invented an apparatus for the more general application of the Doctor's process. Let us suppose a movable engine or a boiler placed in the yard of the house, or near the car or other object to be disinfected. A pipe leads the steam from the boiler into a peculiar superheater (Fig. 2) consisting of several transportable parts, from whence it enters a series of conduits analogous to those used by street sprinklers. A perforated tube placed at right angles with the extremity of the conduit allows the operator to project steam of 110° C., with the greatest ease, all along the surface to be disinfected.

Finally, Messrs. Geneste and Herscher's disinfecting apparatus are completed by a stove for sterilizing the spittle of consumptives. This (Fig. 3) consists of two

rectangular copper boxes placed upon a brazier or a gas or charcoal stove, according to circumstances. One of these contains a saline solution whose boiling point may be higher than the temperature necessary to destroy the tuberculous bacillus, while the other contains an appropriate lixivium designed for disintegrating the glutinous envelope of the spittle and for washing spit-



ESTRADE'S PASSENGER CAR.

toons. These latter are placed in a metallic cage which is passed into the boxes alternately. After an ebullition of a few minutes, the disinfection and cleansing are complete.—*La Nature*.

#### Diseased Eggs.

Dr. D. F. Wright, in the *Bulletin of the Tennessee State Board of Health*, says that soon after it became the practice to transport eggs in large quantities and to long distances by railway trains, it was found on their arrival that adhesion had taken place between the membranes of the yolk and those of the shell, so that the yolk could not be turned out of the shell unbroken. On examination by experienced pathologists, this was found to be the result of true inflammation; the material of the adhesion was found to be precisely the same as that of the plastic exudation in inflammation of the lungs or bowels. It will at first seem absurd to speak of inflammation in such an unformed mass as an

arrangement recalls that of the Vidard type, with central passageway, which is met with on a few lines in the suburbs.

Mr. Estrade's cars (see accompanying engraving from *La Nature*) are mounted in the same way.

The adoption of wheels of so large a diameter has led to the necessity of giving these cars quite a peculiar form, and one very different from that of the ordinary type.

As it was necessary to raise the flooring above the axles, an endeavor has been made to utilize the space left free between the latter by the adoption of a two-story car. The upper of these stories is on a level with the top of the wheels, which are inside of the frame. In the lower portion we thus have three distinct compartments, isolated by the wheels and prolonged toward the axles by narrow passages that may be used for water closets or for the storage of luggage, and, in the upper portion, a single saloon with central passage, to which access is had by stairways at the ends of the car. In certain respects, this general ar-

All the vehicles of the same train will be connected at the level of the central passage by coupled platforms provided with hand rails, so that access may be had to all parts of the train, as in American railway practice. The car thus arranged, with its two stories, contains 54 first-class seats in a total length of 43½ feet between buffers.

The double mode of suspension of the body forms one of the most interesting peculiarities of the car. The two axles, which are 16 feet apart, support, through the intermedium of elliptic springs resting upon the grease boxes, a large iron girder, which runs the entire length of the car, and is curved toward the ground at the extremities.

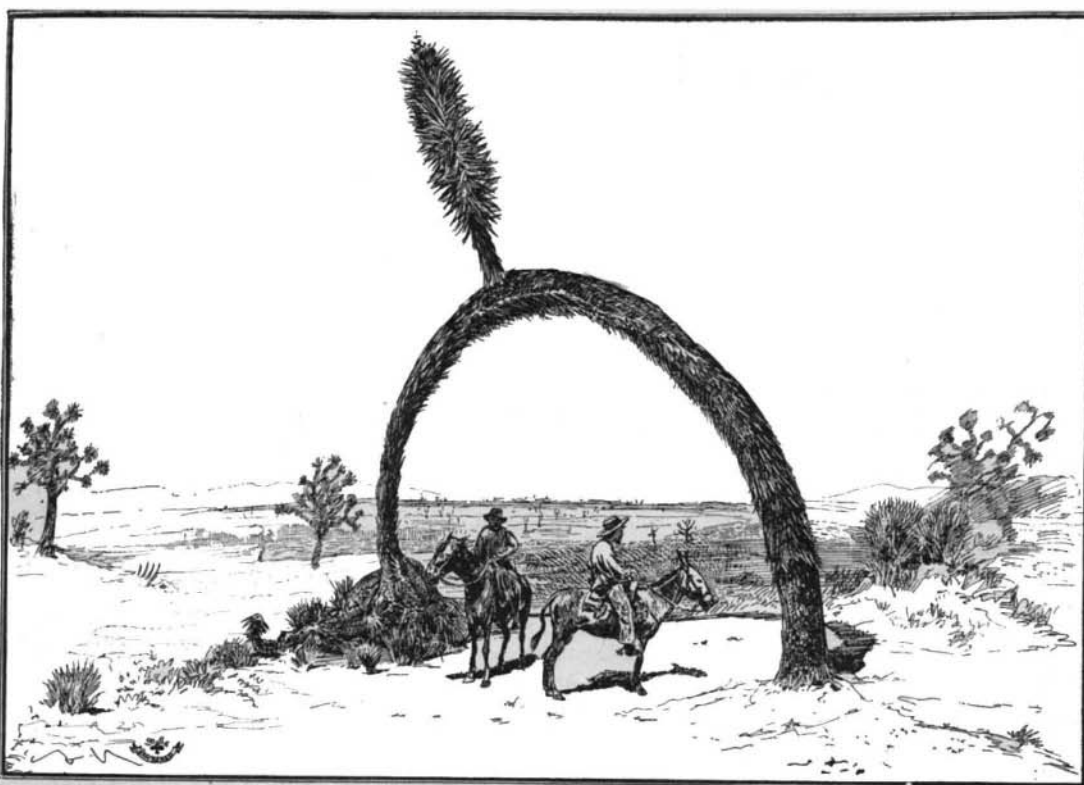
Each of these girders carries three elliptic springs, which support the body of the car through suspension rods connected with a lower frame.

The increase in the size of the wheels, which are 8¼ feet in diameter, will undoubtedly have the effect of reducing the tractive stress; but, with Mr. Roy, who made a judicious observation on this subject in a discussion of the Society of Civil Engineers, we may ask whether such reduction will be very perceptible. It will likely not exceed 1½ kilogramme per ton hauled, that is to say, it will reach nearly a tenth of the mean stress that the locomotive ought to develop during a normal run over an ordinary line, taking into consideration the resistance of the air, of curves, of gradients, and, in a word, of all resistances that are independent of the diameter of the wheels. However this may be, the experiment is, in every respect, of the most remarkable character, and we shall watch it with the greatest interest.

#### THE VALUE OF A DESERT TREE.

In approaching the to be State of Southern California from the east, a region is passed that seems arranged by contrast to intensify the beauties beyond. This tract is best known as the Mojave desert, and an equally sterile region lies to the southeast in Arizona.

Before the days of the railroad, these places had to be crossed by horses and wagons; and as in some localities a temperature of 130° has been recorded, that to pass it is a test of human endurance may well be



REMARKABLE YUCCA TREE.

egg; but this arises from our forgetting that, structureless and unorganized as it seems, the egg, even when fresh laid, is a living being, and capable of disease from external causes. The cause of this inflammation is undoubtedly the shaking and friction from the motion of the cars, and it cannot but render the egg more or less unhealthy, as the products of inflammation can never be as salutary in food as those of healthy growth.