Stratton (T.)

REMARKS

ON

DEODORIZATION

AND

DISINFECTION,

AND ON

DR. SIR WILLIAM BURNETT'S

DISINFECTING FLUID,

THE

SOLUTION OF THE CHLORIDE OF ZINC.

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REMARKS

ON

DISINFECTION, &c.

Having during the last nine months, since August, 1847, made extensive and varied use, in various emigrant fever hospitals and elsewhere, of Dr. Sir Wm. Burnett's Disinfecting Fluid, the Solution of the Chloride of Zinc, I beg to offer a few remarks on some of its effects and uses. I shall consider, first, its antiseptic; secondly, its deodorizing; and thirdly, its disinfecting properties.

I. As an antiseptic it is exceedingly useful for preserving dead bodies for the purpose of dissection. The strength is one part of the fluid to forty parts of water; with this the blood-vessels are injected before using the common paint injection; afterwards, while the dissection proceeds, the parts may be occasionally spunged with the diluted fluid, or the body may be immersed in it for an hour or so every four or five days. Some other antiseptic agents have the effect of blunting the knives used in dissection, which is not the case with this fluid. Other solutions are apt, when the parts become dry, to leave gritty particles. The Chloride of Zinc is so deliquescent that this cannot happen with it.

For preserving anatomical preparations, the diluted fluid may be used instead of spirits of wine.

Besides preventing further decomposition, the fluid destroys any disagreeable odour from decomposition that has already commenced. It is needless to enlarge on the beneficial consequences of using this fluid in dissecting-rooms, where students breathing the contaminated air for several hours a-day, have their digestion impaired, their general health injured, and are thus made, more than others, liable to suffer from exposure to infectious diseases. A great obstacle to making post-mortem examinations in private houses, is the disagreeable odour

attendant thereon, and which is only questionably remedied by the odour from chloride of lime; but as the Burnett fluid is odorless, it is consequently greatly superior to this last, and it also perfectly overcomes the autopsic odour. When one has made an autopsy, there is generally some odour attaching to his hands for several hours, but by dipping them for a minute or two in the fluid, this odour disappears. In Montreal the Burnett fluid has been successfully used for anatomical purposes by Dr. G. Campbell, Dr. Arnoldi, jr., Dr. Wright, Dr. Baker, and others, and has come up to the recommendations* given of it by Professor Sharpey, Mr. Partridge, Mr. Bowman, and Mr. Pettigrew, of London, Sir James Murray, of Dublin, and others concerned in the teaching of anatomy. In Quebec the fluid was employed by Dr. Racey, while making post-mortem preparations, and I showed to several medical men there the difference between a portion of subject treated with the fluid and another part left untouched.

II.—*Of the Deodorizing properties of the Burnett Fluid.*

I. With regard to its action on feculent odours, we may observe that feculent matter contains—1, ammonia; 2, sulphuretted hydrogen; 3, decomposing animal matter, combined with ammonia; 4, occasionally fresh animal matter (as in some diseases where there is a motion soon after taking food). When the fluid is added to the above matter, the chloride of zinc acts on the fresh animal matter, prevents decomposition, and the consequent evolution of disodour; also, on the decomposing animal matter, presenting further decomposition: part of the chloride of zinc gives its chlorine, and the sulphuretted hydrogen gives its hydrogen to the ammonia to form odorless muriate of ammonia; the sulphur combining with the zinc to form sulphuret of zinc. As the ammonia is the vehicle of the feculent odour, feculent mat-

* In a publication entitled "Reports on the Solution of Chloride of Zinc, (Sir Wm. Burnett's Disinfecting Fluid.) London: Printed for her Majesty Stationery Office, 1847." Reviewed in Dr. Hall's Journal for March, 1848.

ter ceases to have any effluvium as soon as the ammonia becomes muriate of ammonia.

2. With respect to the action of the fluid on urinous odours; among the ingredients of the urine are—1, ammonia; 2, decomposing animal matter (mucus); 3, according to Prout, phosphuretted hydrogen is occasionally present; 4, water.

The solution instantly and permanently removes the odour of fetid urine by their being formed muriate of ammonia and phosphuret of zinc; while part of the chloride of zinc, or oxid of zinc, acts on the decomposing animal matter.

3. The odour of bilge-water depends on sulphuretted hydrogen; and this gas is produced on board ship from the wood decomposing and resolving itself into carbon, hydrogen, and oxygen, and these acting on the sulphates of lime and magnesia, in sea-water. I find that the fluid instantly destroys the odour of bilge-water; there being formed sulphuret of zinc and muriatic acid. Any remaining chloride of zinc which has no sulphuretted hydrogen on which to act, has a preservative effect on the wood, and contributes to prevent the further formation of sulphuretted hydrogen.

4. In crowded transports and emigrant ships, and especially in bad weather, the air becomes very foul; also in crowded barracks, badly constructed as regards ventilation, the use of the diluted fluid (1 to 40) is highly conducive to comfort and health.

5. The plan of many jails is so faulty, that there are many cells which it is nearly impossible to ventilate, and which (even after removing all the bedding, &c. in them) retain a peculiar and disagreeable odour. I found that this odour was removed by waving, for a minute or two, a flannel cloth wet with the diluted fluid; as in the case of ships and barracks, or any other crowded places, there may also be some of the fluid sprinkled over the floor.*

6. When the diluted fluid (one part to sixty parts of

* Where the fluid is applied to wood work, the use of soap, soda, or potash, should be avoided immediately before or after its application.

water) is applied by sponging to the persons of typhus-patients, it removes the peculiar odour emitted by them. Except where cold sponging is indicated, the fluid ought to be used of the temperature of the patient.

7. In hospital-wards full of typhus and dysentery cases, the air becomes exceedingly impure, and in cold weather, and at night, ventilation often cannot be had recourse to. In such cases the disagreeable odour is removed by waving flannel cloths wet with the diluted fluid (1 to 40) two or three times a day for a few minutes at a time, and by sprinkling some fluid on the floor. Where there is dysentery, a small quantity of fluid may be poured into the utensils over night. The odour emitted from the surface of the body of a dysentery patient is much lessened by sponging him with tepid diluted fluid (1 to 60). I found that having the fluid used in the way of waving and sprinkling once a day, when the same process was repeated next morning, there was no disagreeable odour, or almost none, perceptible; this, too, was in badly ventilated wards crowded with fever and dysentery patients. I found that the proportion of one ounce of the strong fluid (making 41 ounces of the diluted fluid) was sufficient for every ten persons: the price of the fluid, (as at present advertised,) is three shillings sterling a quart, or about a penny an ounce; so that, to give the sick the daily benefit of having the fluid used, it would cost an hospital tenpence a day for a hundred sick, and eight shillings and fourpence for a thousand sick. The expense of any article for hospital use on the large scale is an important consideration, and besides the great superiority of the Burnett fluid in other respects, it is much cheaper than chloride of lime, and other agents used for similar purposes, as these are usually sold, and considering the comparative quantities of them that are requisite. As for the Ledoyen fluid, (not to speak at present of the radical error its proposer made in taking such a poisonous substance as lead for a base,) I believe it is advertised for sale at sixpence sterling for a bottle containing about 18 ounces, while the same sum will purchase about 246 ounces of the diluted Burnett fluid.

Nearly all the medical practitioners of Montreal and Quebec have made trial of, and are completely satisfied with, the antibromic powers of the Burnett fluid.

III.—*Of the Disinfecting Properties of the Burnett Fluid.*

Some of our best medical authorities* do not agree in the meaning they appear to attach to the word *disinfect*, some restricting it to an action on infectious miasm, and others, apparently extending it to an action on offensive odours not in any way connected with infectious miasmata. By a disinfecting substance, I mean one which either, 1—destroys infection, or, 2—greatly lessens its intensity.

The question of infection is one of the most subtle and difficult in medicine, and has called forth the most decided and opposite opinions from writers on the subject of fever. As infection is known only by its effects, and eludes any attempt to subject it to experiment, it is, in consequence, allowable to call in the aid of theory, as long as this is reasonable, and not at variance with facts.

As Professor Alison† observes,—"If hypotheses are introduced sparingly, and the grounds on which they rest fairly stated, they are admitted to be part of the process by which the knowledge of the truth is attained, even in the most strictly inductive sciences; and those who profess to reject and despise them, are not those whose opinions are the most exempt from their influence."

According to Liebig,‡ ammonia is always generated in sick-rooms, and particularly so where the disease is infectious; he also considers that this ammonia is the vehicle of the infectious principle, and what renders it volatile, so that if the ammonia be removed, the infectious essence ceases to act. By freely using the chloride of zinc solution in a sick room, the ammonia becomes muriate of ammonia, and the air of the apartment is,

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* See Copland's Dictionary of Medicine; Brown in Cyclopædia of Medicine; Dunglison's General Therapeutics.

† Physiology, page 1.

‡ Chemistry applied to Agriculture and Physiology, chap. 13.

according to this theory, completely disinfected: this is presuming, that all the air in the room has been brought under the action of the chloride of zinc solution.

If the chloride of zinc has not been sufficiently used, there may still remain some infectious principle, but in a degree much less intense, so that—to take a crowded typhus-ward—instead of many visitors to it being attacked, and this with a severe form of the disease, only a few are attacked, and that slightly.

We may also theorize on the effect of the fluid on the patients themselves. We suppose, for example, a person has received one dose of infection, giving him typhus fever; he then comes into a crowded typhus ward, where he and the others are constantly emitting infectious miasm from their lungs and the surface of their bodies; this is respired by them over and over again, so that instead of there being one, there are two chances against them; instead of the original quantity of infection to which they were exposed, they continue to inhale additional doses of it during their illness; now, if by using the fluid we wholly, or even only partly, remove the typhous principle in the air, we are giving them a better chance of recovery.* Likewise, during convalescence, if the air in the ward be tolerably pure, the digestion and appetite of the patients improve much more rapidly than if the atmosphere be foul; their strength returns more quickly, and their convalescence is much shorter; they run less chance of a relapse, and the hospital gains their beds to accommodate new patients.

By using the fluid, the medical attendants, students, and nurses, are either protected from infection, or at least run much less risk of being taken ill.

If we had a fever hospital, throughout the whole of which the fluid was daily used, and if physicians, students, and nurses, who had not had typhus, continued for four or five months to visit without being taken ill, this

* In different hospitals in Ireland, it was found by Mr. Cronin, Dr. Lindsay, and Mr. Drummond, that the mortality became less after they began to use the chloride of zinc solution. See *Report on the Solution of Chloride of Zinc*, page 20, 21, and 23.

might be considered a proof that the fluid perfectly destroyed infection. To use the fluid in part of the hospital only, would not be sufficient, as air from non-fluidized wards might be admitted, or the nurses might be visiting these, and be there infected. In the past season I had not an opportunity of making a trial like the above, as, generally speaking, the physicians and nurses had already had fever.

In the autumn of 1847, in the Quebec Marine and Emigrant Hospital, I had the fluid used (latterly) in seventeen wards and sheds containing 317 patients, (being about a third of the whole number in the hospital,) of whom about two-thirds were ill of typhus, and the remainder of dysentery. When I began visiting them, these wards were the worst in the hospital for ventilation, &c.; half of them were in the stone building; in other respects they were situated similarly to the other wards and sheds. I had the fluid used once a-day, in the way of waving and sprinkling, and I daily noted the number of deaths in those wards, and compared this, and the number of inmates, with the total mortality and total sick of the hospital as published weekly in the newspapers. Thus, for the week ending 4th September, in the wards where the fluid was not used, there was one death in about every nine patients; and in the wards where the fluid was employed, there was one death in about every fourteen sick.

On account of having to be occasionally absent from Quebec for a day or two, I was unable to note daily for any great length of time continuously, the mortality in the fluidized wards; but I have no reason to doubt that while the fluid was used, there was a difference in the comparative mortality somewhat like what is stated above. The difference is one too great to have depended on accidental circumstances, and I do not see to what it can be attributed, except to using the chloride of zinc solution. It was not till the middle of January that I compared the deaths in the fluidized wards with the total mortality as published in the newspapers, when I was greatly delighted to find that my exertions had had

such beneficial results. If we suppose the case of a fever-hospital, throughout the whole of which the fluid had been used, and that after this, the mortality became less, some might say that this arose from the disease becoming milder; but, in the instance given above, the experiment is more decided, the trial is clearer, and the mortality in fluidized wards, is compared with that in non-fluidized wards, between the same dates.

IV. Chloride of zinc has been given inwardly in the dose of a grain or less, two or three times a day, in chorea, epilepsy, &c.*

V. In Surgery, chloride of zinc is occasionally used. I lately saw a case of lupus, where the Burnett fluid (undiluted) was found to be as effectual and a more convenient form than the solid chloride of zinc.

The Burnett fluid, diluted, (1 to 130 parts of water) has been found very beneficial as an application to chronic and scrofulous ulcers, (by Mr. Erasmus Wilson, Dr. Allan, and others)†; and in mercurial sore mouth, (by Mr. Flynn.) The fluid diluted (1 to 60 or 80) is useful as a lotion in erysipelas, and as a bath in psora, prurigo, pruritus, and other cutaneous diseases. It has also been used as an injection in gonorrhœa. I have no doubt it will be found an excellent remedy, much diluted (as 1 to 120) as an injection in fœtid otorrhœa, and as a gargle in some throat diseases. Diluted, 1 to 140, it removes the fœtor from mortification taking place as after frost-bite. The fluid undiluted, or with an equal part of water, and introduced on the point of a pen into the cavity of a tooth, is a good application in some cases of tooth-ache. The action of the diluted fluid on ulcers is two-fold—it removes the fœtor, and also it improves the action of the sore in some alterative manner.

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* See Periera's Materia Medica, London, 1842, page 820. Dunglison's New Remedies, Philadelphia, 1846, page 600. And Wood and Bache's U. S. Dispensatory, Philadelphia, 1847, page 1215,

† Reports on the Solution of Chloride of Zinc, London, 1847.

VI.—*Of the Burnett Fluid, as compared with some other Agents employed or recommended for similar purposes.*

1. Burning sulphur in the air, and so producing sulphurous acid, has been employed for purifying the atmosphere, but the odour is unpleasant, and the vapour is sometimes irritant to the air-passages.

2. Dr. Johnstone proposed, and Dr. Carmichael Smith obtained £5000 from Parliament, for suggesting the employment of nitrous gas, (made with nitrate of potass and sulphuric acid) ; but this gas is disagreeable to most persons, and in some diseases its inhalation is injurious.

3. Producing chlorine gas with common salt, manganese, and sulphuric acid, is troublesome and disagreeable, and making it with oxymuriate of potass is the same.

The use of the chloride of lime is attended with the inconvenience of making white spots on floors, carpets, furniture, or any other surfaces to which it is applied ; it likewise changes colours, and is corrosive. The inhalation of chlorine gas is disagreeable to most persons, and in some chest diseases it is injurious, so that among the mixed cases in a large hospital, its general employment is inadmissable.

The diluted Burnett fluid is preferable to the above agents, as while it destroys odours, it is itself odorless, and it does not injure the colour or texture of cloth ; on the contrary, it is largely used for the preservation from decay of cloth and wood. In Her Majesty's dock-yards, canvass and timber are immersed in it, and these articles are found to last much longer than others.

4. *Of the Burnett Fluid as compared with Ledoyen's Disinfecting Fluid.*

As the Ledoyen fluid is a solution of the nitrate of lead, it is, like the other preparations of lead, liable to produce some one or other of their long-known bad effects,* such as colic, palsy, pain in the course of the spine, giddiness, coma, apoplexy, constipation, indiges-

* Alluded to by me, in a paper on Emigration, in Dr. Hall's British American Medical Journal, for April, 1848.

tion, wasting of the muscles and of the body generally, and permanent decrepitude: likewise, employed in typhus, according to the Ledoyen method (by means of wet cloths over the person), it is apt to produce a sedative and depressing effect, which is exactly the opposite of what is required in that disease. In Dr. Hall's *British American Medical Journal*, for March, 1848, there are two cases mentioned of lead-colic arising from Ledoyen's fluid being applied to ulcers. In a case lately, near Montreal, of sloughing of the hands after frostbite, Ledoyen's fluid was applied to the hands on account of the fœtor, and this was followed by frequent, painful, and nearly ineffectual efforts to have a stool, and by other signs of intestinal disorder. At Quebec there were three cases of typhus, in which the proprietors of Ledoyen's fluid used it largely, cloths wet with it were kept applied to nearly the whole surface of the body, and other wet cloths were hung over the bed, and in the room; these three cases were, I believe, the only instances in Canada, where the fluid was much applied to individual patients ill of typhus, and in them it was considered that the lead had a depressing effect: the three cases terminated fatally.

The two proprietors of Ledoyen's fluid asserted, that their fluid prevented one from taking typhus, and also, that it certainly cured one already ill of that disease. The fact of both of them being seized with typhus is, so far, a contradiction of their first assertion; and the fact of one of them unfortunately dying of typhus is, so far, a contradiction of the second assertion. This last case is one of the three alluded to above, where the Ledoyen fluid not only did no good, but where it probably contributed not a little to the fatal event. Some may say that this case ended fatally because the patient was 70 years of age, but this could not be the reason of the death of the other two patients treated with Ledoyen's fluid, as their ages were, I believe, 35 and 38.

The Ledoyen fluid acts as a corrosive of metals, and I heard of two instances where water closets were injured, and made leaky, in consequence of a quantity of it having been thrown down there. I saw some tin-

vessels full of holes, in consequence of the fluid having been left in them for some time. It was found also to injure the texture of cloth, so that sheets, pillow-cases, and towels that had been wet with it, were rendered nearly useless.

I witnessed several comparative trials of the two fluids with regard to their power over feculent odours, and in all of them, I considered, that the Burnett fluid had much more effect than Ledoyen's. In Montreal, some of each fluid was added to a quantity of feculent matter in a couple of vessels: a few minutes after, feculent odour had a good deal disappeared from the L. vessel, and almost entirely from the B. vessel. The vessels were kept, and, a week after, I looked at them: on the B. vessel being stirred, there was no odour; on the L. vessel being stirred, the odour was nearly the same as it was before the fluid was added.

In Quebec, Dr. Painchaud, sen.,* of the Marine and Emigrant Hospital, wrote out an excellent plan for testing the comparative deodorizing powers of the Burnett and Ledoyen fluids, by which the judges were to give their opinions, unconscious of whose fluid it was, in favour of which they were voting. The result of this trial† was in favour of the Burnett fluid, and it afforded no little amusement to the other umpires, and caused no small vexation to himself, that Mr. Ledoyen's zealous and enthusiastic colleague was found to have voted (of course, unconsciously) against *their* fluid: Mr. Ledoyen himself conducted his own part of the trial, while I experimented with the other fluid, and neither of us voted.

Pereira,‡ after enumerating the various medicinal and the poisonous effects of the preparations of lead, de-

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* Whom I take this opportunity of thanking, for the obliging disposition he showed while I was making trials of the fluid in the Hospital.

† Detailed in the *Montreal Courier* of 20th October, and other papers, and in the *London Medical Gazette* of 26th November, and *Dublin Medical Press* of 8th December. One or two periodicals erroneously supposed that the judges in this trial considered they were experimenting on something more than the deodorizing properties of the fluids.

‡ Materia Medica, Lond, 1842, p. 805.

scribes each preparation separately, and of the nitrate of lead, he observes, that "its general effects are similar to those of the other soluble salts of lead."

A non-professional reader glancing at these pages might think that, as he has heard of lead preparations being employed as internal medicines, Ledoyen's solution cannot be very objectionable; but he may be informed that, when a lead preparation is prescribed internally, it is in small doses, in some diseased state, such as internal hæmorrhage, &c., where a sedative and astringent remedy is peculiarly suitable; where its effect is daily watched by the medical attendant, and new directions, if necessary, given for its use, and where also it is combined with opium, or some other medicine, to prevent its producing its objectionable effects, which, however, sometimes appear, notwithstandtng all possible precautions.

Far different, however, is the method which the proprietors of Ledoyen's fluid recommend for using their solution of the nitrate of lead; they think that it ought to be used indiscriminately, and without any precautions, by the public generally; nor would it be a sufficient defence of its use, to say that the nitrate of lead, acting on the ammonia in the feculent matter or in the air, and so becoming nitrate of ammonia, would prevent any bad consequences: as any remaining nitrate of lead not decomposed by the ammonia, might go on to produce one or other of its poisonous effects.

While Mr. Ledoyen's fluid is so objectionable, on account of being a solution of a poisonous salt, Sir Wm. Burnett's fluid, the solution of the chlorlde of zinc, is formed of a base which is perfectly innocuous. Wood & Bache* say of the chloride of zinc, that "it has the advantage of not giving rise to constitutional disorder from absorption." In conclusion, there appear to be just grounds for stating that the general use of Ledoyen's fluid is unsafe, and that if employed by the public indiscriminately, it, most likely, would very frequently do much harm.

* United States Dispensatory, 1847, p. 1215.

Next to perfect ventilation, I would place the use of Sir Wm. Burnett's solution of the chloride of zinc, which, for improving the quality of vitiated air, is greatly superior to all the other artificial methods of doing so, including Mr. Ledoyen's solution of the nitrate of lead.

1, Hanover Street, Montreal, 15th May, 1848.

SIR WILLIAM BURNETT'S DISINFECTING FLUID—MODE OF APPLICATION.

One Part Fluid to 40 Parts Water.

To Purify Sick Rooms and the Wards of Hospitals, Workhouses, Prisons, Factories, and Crowded Places, the between decks of Ships, &c.—Moisten, with the diluted solution, a piece of flannel-cloth, attached to a long rod, and wave it through the air of the apartment for ten minutes at a time—in addition to which, the floor should be mopped or sprinkled over with the same, if necessary, several times a day, and a small quantity of the same dilute solution should be put into the close-stools and bed-pans. The Water-closets should also be cleansed with it, and a couple of gallons occasionally thrown down each. N. B. *For use on board ships, between decks, and in places where, from imperfect means of ventilation, it may be inconvenient to wet the floors.*—Moisten with the diluted solution thick pieces of flannel cloth—the thicker the better—and wave them through the air of the apartments for ten minutes; and then suspend them in the most convenient manner to the deck-beams, or across the rooms; and keep other similar pieces of cloth, thoroughly and repeatedly saturated with the same solution, in flat dishes upon the floors.—It is essentially necessary that the Bilge-water in the hold of the vessel should be purified agreeably to the instructions given below.

To purify Fever Wards, in cases of death.—When a patient dies of fever, the body should be sponged over with the dilute solution, and the clothes and bedding should be immersed and kept in a sufficient quantity of it, for forty-eight hours, before being washed. The floor should be well mopped over with the solution. Flannel, moistened with it (as before recommended), should be waved through the room.

To purify the Clothes, Linen, &c., of sick persons.—Immerse the articles in the dilute solution, as directed in sick rooms.

To prevent the communication of Infectious Disease.—Sprinkle the dilute solution over the whole of the floor of the apartment, and very slightly on the coverlid of the patient's bed. The clothes used should be immersed in the solution, and afterwards thoroughly dried. Moisten pieces of flannel cloth, and use them as directed above.

To purify the odour of Night-chairs.—Put half a pint of the

dilute solution into the pan previous to its use, and when emptied, rinse it out with a small quantity.

To disinfect Dead Bodies, and purify Apartments preparatory to the visits of Searchers, Undertakers, and Jurymen, and in cases of Post-mortem Examination.—Wash the body occasionally with the dilute solution, which will remove all unpleasant smell, and retard putrefaction.

To prepare, and arrest the decomposition of, Subjects for Dissection.—Immerse the subject in the dilute solution, and let it remain about two hours; after which time it will be purified. As the dissection proceeds, the parts should be sponged over with the same; and, if they are to be preserved, the blood-vessels should also be injected with the solution.

One Part Fluid to 20 Parts Water.

To disinfect Cesspools, Drains, Water-closets, &c.—Pour in a quantity of the solution in proportion to the capacity of the receptacle. For ordinary water-closets, one gallon of the dilute solution will generally be effectual. For large cesspools the quantity must be increased in proportion to their contents.

To purify Stables.—Sprinkle the floor, and wash all the wood-work, with the dilute solution.

To sweeten Musty Casks, Tubs, &c.—Rinse them well with the dilute solution.

To destroy Canker and Fungus in Trees.—Apply the solution carefully with a brush, to the parts affected only.

To extirpate Bugs and other Vermin.—Wash the floors and all the crevices with the dilute solution.—The joints, &c., of the bedsteads should be moistened by a brush with a solution consisting of *one* part of fluid to *five* parts of water.

To purify Bilge-water, and the Holds of Ships.—The quantity to be used at a time is twenty gallons of the dilute solution for each hundred tons of the ship's measurement. It should be poured into the air-holes of the ship, so that it may find its way by the limber-holes into the well; and it should be thrown by a small engine into places where it may be inconvenient to introduce it by other means. A portion may also be poured down the ship's pumps, the boxes being previously removed to allow of its free passage below. The solution should be allowed to remain in the ship twenty-four hours. At the expiration of that time, the ship should be pumped as dry as possible, the well thoroughly cleansed and washed with the solution, and the operation repeated as occasion may require.

One Part Fluid to 60 Parts Water.

For sponging the person in Fever cases.—Use the solution either cold, or of the temperature of the patient.

N.B.—When floors and other wood-work are washed with the solution, the use of soap, soda, or potash, should be avoided immediately before or after its application.