

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico. \$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN.

MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

NEW YORK, SATURDAY, OCTOBER 1, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions, recent. 218
Antimony, electrolytic process. 217
Baku, town and harbor of. 210
Balloon apparatus. German military. 207
Beer seed, California. 217
Bitumen oil and gas in France. 210

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 874.

For the Week Ending October 1, 1892.

Price 10 cents. For sale by all newsdealers.

I. ARCHAEOLOGY.—New Discoveries at Pompeii.—Interesting remains just discovered at Pompeii, including two human cadavers. 3 illustrations. 13959
II. BIOGRAPHY.—Pliny Earle, A.M., M.D.—A distinguished alienist, recently deceased.—His life work and his views concerning the treatment of the insane.—1 illustration. 13970
III. CIVIL ENGINEERING.—New Method for Foundations.—A recently patented method of producing foundations in quicksand by operating from the surface through pipes.—11 illustrations. 13962

PROGRESS OF THE CHOLERA.

In Asia and Russia the cholera has carried off many thousands of poor people, chiefly by reason of the filth in which the victims lived and the lack of proper medical treatment. In Europe the disease made no alarming progress, except in Hamburg, where it was brought from Russia, and, owing to the dirty condition of the town and the supineness of the authorities in adopting proper sanitary measures, the advance of the disease became rapid and ominous.

As soon as the disease appeared in Hamburg prompt precautions were taken at nearly all other European seaports and principal cities to prevent the spread of the disease. These efforts were successful, and the progress of the pest appears to have been effectually stopped. Such great cities as London, Paris, Berlin, Vienna, although in direct communication with Hamburg and Antwerp, suffered but little. The few cases that occurred were immediately isolated, and suitable preventives extensively used.

It is a peculiarity of this disease that its spread may be readily checked and controlled by the early adoption of intelligent precautionary means and regulations. In New York due notice was received of the probable approach of the pest, and vessels arriving from infected ports were promptly quarantined. Steamers from Hamburg were rigidly guarded; the passengers were transferred to salubrious landing places, and wherever any sign of the disease appeared the case was at once isolated and skillfully treated.

CHOLERA AND SOME INDICATIONS FOR ITS MANAGEMENT.

Considered in detail, the chief symptoms of this malady may be outlined as follows:

- (1) Purging of a peculiar flocculent, rice water kind.
(2) Copious vomiting, at first with tinges of bile, perhaps, but later of thin, colorless and odorless fluid.
(3) Severe cramps in the lower extremities and abdomen, rendering the muscles hard and tense.
(4) Sometimes, in the early stage, albuminuria followed by complete suppression of urine.
(5) Diminished circulation and impeded respiration, causing intense prostration, with icy coldness of surface of the body, of the hands, the tongue and even the breath; perhaps, also, oppression and pain in the region of the heart.
(6) Frequently, noises in the ears, dimness of sight, and deafness.
(7) Marked depression of temperature, notwithstanding which the sufferer usually complains of oppression and prefers to lie uncovered; generally, too, both during collapse and reaction, the thermometer in rectum registers three or four degrees higher than in the axilla, and the latter is at least one degree lower than in the mouth.

The lividity and blueness of the lips and surface of the body generally is remarkable; at the same time the skin becomes shriveled and bedewed with deathlike dampness. The sharp pinched appearance of the features, the muddy complexion, and the sinking of the eyeballs, with flattening of the cornea, are so characteristic as to give rise to the designation facies choleraica. There is also alteration of the voice, which becomes whispering, hollow, and unnatural, owing to diminished volume of air in the lungs.

As the malady progresses, there is a gradual lessening of respiration, and, coincidentally (or nearly so), diminution or absolute disappearance of the pulse, the action of the heart being almost or quite inaudible. Finally, there is complete arrest of circulation. Death may occur any time from three to twenty-four hours after the first inception of the malady, depending upon the nature and severity of the attack, etc. But those that survive to the latter period frequently recover, often mending with wonderful rapidity.

An attack may be ushered in or preceded by a slight attack of diarrhoea; consequently, during an epidemic any looseness of the bowels is sure to be regarded with suspicion. Nevertheless, the disease not infrequently asserts itself without any form of premonition or warning. It may be borne in mind, however, that all diarrheic or dysenteric discharges that occur during an epidemic are not necessarily choleraic. At such time there is always prevalent an intestinal flux that is distinct from cholera, and presents characteristics varied from simple diarrhoea up to choleric; and it is of importance to discriminate between the two. The less formidable complaint presents alvine evacuations possessed of more or less consistency and tendency to formation, and, moreover, have in greater or less degree the characteristic odor of fecal matter; the discharges of cholera, on the contrary, are odorless and colorless, chiefly made up of large quantities of watery fluid holding in suspension flocculent matters (flakes of mucus), hence the likening to rice water—water in

which rice has been boiled, colorless, with shreds of albuminous matter derived from the cereal.

What the poison of cholera may be is still a moot question, and Koch's assertion it depends upon or resides in the comma bacillus is far from being conclusive. The symptoms that usher in a seizure indicate a form of poisoning so obviously, that the chief upholders of the bacillar theory have been compelled to hesitate and even inquire whether, after all, some ptomaine or other alkaloid may not be the specific virus. Finally, Drs. Lewis and Cunningham, of the army medical school at Netley, England, have shown the bacillus of Koch is constant in the mouth and throat of healthy persons; and though Koch rejoined his bacillus differed in size and shape, the accurate measurements undertaken by these gentlemen, in conjunction with Arthur E. Brown (and verified by Sir William Aitkin), and the reaction of the same to staining fluids, prove the precise contrary; again, though cholera fluid may be boiled and disinfected to the complete extermination of all bacilli, yet it fails to lose its characteristic infectious and toxic properties (Aitkin, Lewis, Cantani, Klebs). It is evident, then, the bacillus of Koch is not per se a cause; and time has only confirmed the utterance of Trichum, a propos of this microbe, that the purported discovery no more definitely settled the question of cholera than knowledge of the bacillus of tuberculosis will terminate pulmonary consumption.

It is certainly folly to prate of curing cholera when the very principles which should be a guide to treatment are undecided, antagonistic, and devoid of physiological basis. To this hour, among many—the majority, in fact—the question is mooted whether recovery depends upon persistence of the intestinal evacuation, or upon its suppression. That patients have recovered and do recover, under all kinds of treatment, often widely different and aggressively antagonistic, must be universally acknowledged. In nineteen cases out of twenty the remedies prescribed by mouth or by enema are returned unaltered in the vomit or the stool, else mingle with the fluids in stomach or bowels without being absorbed until the crisis is over, when they are very apt to prove mischievous.

Prior to the last epidemic in England, there were few practitioners who did not believe it a duty to check the so-called premonitory diarrhoea with astringents and opiates, and reports of thousands of cases might be collected wherein medical men believed that by this method they prevented the development of the stage of collapse, though it is plainly apparent the theory upon which such practice is based is very far from infallible. Further, the whole subject has been so complicated by the publication of immature hypotheses and extravagant conceits, and the views held by different individuals seeing the same class of cases in the same institution are so opposite, it seems difficult to form any trustworthy opinion. Physicians only after each epidemic learn the lessons they taught and the principles they inculcated with so great care and energy were possessed of no real value—in reality had a mischievous tendency. Taking these circumstances into consideration, the bewildered practitioner may well ask, "What shall be done?"

It is strongly advised to scout all extravagant plans of treatment and not worry the sufferer with nauseous remedies that, to say the least, have time and again proved utterly useless. First, isolate him, as far as possible, securing at the same time a plentiful supply of fresh air. Next, see that his drinking water is pure, particularly that it has not been drawn from or polluted by any sewer, or sink, or river that is or has been used as a cesspool. For obvious reasons, the rain barrel is safer than the well. Empty the sick room of all superfluous furniture, of curtains, carpets, etc., covering the floor and neighboring passages with sawdust or sand, wet with some disinfectant fluid, such as dilute solution of aluminum acetate or Labarraque's solution; and when removed, the same should be wholly burned or purified by fire. Sulphurous acid gas may also be used for fumigation purposes. All excreta invariably must be received in earthen pans containing strong disinfectant fluid, and at once cremated or buried—certainly not thrown into drains, sewers or stream. Finally, the soiled body and bed linen should be soaked in an antiseptic solution (solution of corrosive sublimate, if desired), or in boiling water containing some disinfecting powder and afterward washed with carbolic soap. Better if they, too, should be burned.

It need scarcely be added, the importance to the community of the preventive methods just outlined against infection can scarcely be exaggerated.

An attack of diarrhoea must on no account be neglected. The sufferer should at once be sent to bed, kept quiet, carefully nursed, and allowed to drink freely of soda water, plain, pure ice water, cold coffee, or milk and water, as often as thirsty; either cold or warm tea is quite prone to provoke or increase nausea when there is a choleraic tendency. Farinaceous foods, with well salted beef or mutton broth, may be taken as demanded or desired. Poultices may be ap-

plied to abdomen for relief of pain, or, better still, half a dozen thicknesses of flannels saturated with a mixture of chloroform and alcohol (one to twelve) and covered by oiled silk or rubber cloth to prevent evaporation.

Any suggestion of sinking or faintness may be controlled by gentle stimulation, but all drugs having a tendency to either encourage or repress looseness of bowels are best avoided. In the stage of collapse efforts are to be directed toward the restoration of animal heat; friction, turpentine stupes, sinapisms, dry and hot flannels and blankets, hot bottles to feet and sides, etc., here may find useful places; likewise recourse may be had to enemata of hot water containing small quantities of potassium chlorate or of common salt. While there seems to be a prejudice on the part of medical men against warm baths, Dr. Tanner states as a fact that in 1866, at the London Hospital, prolonged immersion at temperature from 98 to 104 degrees Fah. certainly did no harm, while it "frequently proved so grateful it was difficult to get the patient out of the water."

To relieve the thirst, weak saline lemonade containing chlorate of potash and other salts has often been preferred to plain water, and if the arguments which at first sight seem strong in favor of allowing such drinks are unsound, still nothing can be alleged against the practice. During the whole of the third stage, the recumbent posture is strictly to be maintained, the patient being lifted on a sheet and blanket into the bath, if one be given.

With reference to other medication, it may be fairly said that the chances of recovery are probably lessened by the use of astringents, opiates and alcoholic drinks in general, and the evidence in favor of the opposite course—use of emetics, purgatives, etc.—is very far from being satisfactory.

Be the origin of cholera what it may, miasmatic, ptomainic, bacillar, telluric or meteorologic, its neurotic character is most plainly manifest. As far back as the time of Cullen, the malady was classed in the "order Neuroses, class Spasms." Sir Henry Macormac, who had extended experience in the epidemic of 1834 in Ireland, regarded it as provoked by a lesion of the abdominal sympathetic system, a view ably corroborated by Charles Lever, and subsequently upheld by Sedgwick, Johnson, Claude Bernard, D'Arsonval, the elder Chirmac, Pisani, Cannatacci, Michael Foster, and especially Alexander Hackin. The influence of the nervous system is most clear, both in subjective and objective symptoms. The vomitings and numerous stools evidently result from either a paralyzed or hyperæsthetic abdominal sympathetic, two conditions that, apparently antagonistic, are physiologically the same, differing only in degree, the latter depending upon the intensity of the poisoning; the crises, cramps, vertigo, anxiety, spasms and tremblings, also are of neural origin. Further, the entire series of symptoms are precisely parallel in the toxic manifestations of certain cadaveric alkaloids, and also of muscarin (both a cadaveric and vegetable derivative), one of the most powerful nerve poisons known. Finally, the rapid deaths due to so-called cholera sicca (dry cholera), which are observed during epidemics and in patients which have previously enjoyed good health, can only result from powerful influences brought to bear upon certain nerve centers, since they are for the most part preventable by the use of remedies that have direct influence upon the solar plexus, notably hydrocyanic acid, alone or in combination with chloroform.

The practical application of an admitted physiological and pathological principle, and the discovery of the constant relation of cause and effect, suggest the idea of a well defined law in this affection. It is, moreover, to the sympathetic system that must be referred the depression of the functions of respiration and circulation, which constitute the gravest factors in cholera; therefore, in antagonism of the sympathetic is afforded a key to rational, physiological treatment.

The fact may be recalled that the pneumogastric (vagus) is an inhibitory nerve, and possesses an action antagonistic to that of the sympathetic on the heart; that it unites with the latter in forming three plexuses—pharyngeal, cardiac, and solar. By stimulating the sympathetic part of the heart, its contractions are augmented, but by acting thus on the vagus, it is possible to arrest the heart in full diastole. The stimulation of the vagus then gives rise to an important indication, namely, the re-establishment of the cardio-inhibitory functions of this nerve, which are evidently absent in cholera. By so doing, the violent contractions and palpitations will cease; the energies of the heart cavities, especially those of the left side, are restored, and the congestion of the pulmonary and cutaneous systems disappears. Simon and others have shown that in cholera the left side of the heart is generally emptied, while the right side is distended and filled with blood; Sieluna and Bruce, performing autopsies on patients who succumbed at Malta during the epidemic of 1877, always discovered the cavities of the left heart empty, and those of the right filled with blood; and George Budd (in *Medical Chronicle*, vol. xxi.) notes concentric hypertrophy in all cases of sudden death from cholera, and, moreover, cites the expe-

rience of M. Jackson, who, in 1832, observed the hearts of persons who succumbed to this disease often presented hypertrophy of the left ventricle.

In all attacks of cholera, then, regardless of stage, the first indications are to stimulate the vaso-inhibitory apparatus and antagonize the sympathetic, especially its solar plexus, by sedation, by reflex, or both. The remedies most available for such purposes are, in order: 1, hydrocyanic acid; 2, chloroform; 3, Indian hemp; 4, morphine. Happily we have these all, with capsicum added, in the combination entitled chlor-anodyne, a preparation that is not alone an improvement upon the old proprietary chlorodyne, but by the dropping of certain inert and nauseous ingredients is likewise far less antagonistic to a sensitive or irritated stomach. The action of this fluid is in a measure dual, in that it allays the irritation induced by poisoning of the sympathetic, and at the same time stimulates the vaso-inhibitory apparatus, thereby relieving the spasmodic congestion of the arterioles that leads to oppression and depression of both cardiac and pulmonary functions. The preparation is still further available, in that it is intensified by the powerful revulsive effect of the contained capsicum.

Next, if chlor-anodyne is insufficient, the sympathetic may be further and more powerfully antagonized by stimulation of the pneumogastric as advocated by Dr. Alexander Hackin, and so successfully employed in Malta during the epidemic of 1887. Three preparations are available for this purpose: one, an essence of mustard oil; another, equal parts of saturated tinctures of ginger and capsicum; finally, the epispastic liquor of the British Pharmacopœia (percolation of five parts cantharides with twenty parts acetic ether); and these should be applied freely over the branches of the pneumogastric in the neck—in front, beneath and behind the ear, covering three inches of surface, preferably on the right side (Coleman having demonstrated the right vagus commands the smaller intestines). If the case be one of extreme urgency, the liquid may be applied underneath the eye, and, if desired, both right and left vagi excited. The effect is almost instantaneous, and all morbid phenomena, if mitigated at all, are usually annihilated before vesication can take place. With the first two preparations vesication may generally be avoided; but in cases of extreme collapse the epispastic liquid should receive entire preference, chlor-anodyne being at the same time given by the mouth in sirup or on sugar, in full doses of 30 minims. By developing the inhibitory power of the vagus, vomiting, purging, and cramps are rapidly arrested, the pulse regains its power, bodily temperature is increased, and the patient speedily falls asleep.

According to Prof. Pisani, Chief of the Health Service of Malta, cholera made its appearance in that island on the 25th of July, 1887, and the mode of treatment outlined above was begun on the 31st of the following August. In his report to the government he remarks: "The amelioration was very rapid."

Dr. Inglott, Surgeon of Zabbor Hospital, says: "It has often succeeded in the gravest cases where other treatment had proved futile, not only in my hands but also in those of my friend Dr. Cannatacci, of Zeitum Hospital. We worked together, and every day exchanged observations on this important subject. This treatment often gave us astonishing results, and my sincere conviction is that thereby we were enabled to save many patients from death. I recall, among others, that of a poor child of eight years, who was so cold there seemed to be no hope; all tried remedies had proved useless, and when I saw him in the morning he was dying; in the afternoon he was convalescent, and all this had been accomplished by profound antagonism of the sympathetic."

These observations require no special comment, and it would be useless to dwell on the importance of rapidity of treatment in an affection where moments are so precious. The sleep which the revulsive fluid (externally) secures in connection with chlor-anodyne (internally) and the re-establishment of a balance between circulation and respiration, tend not only rapidly to abort the malady, but also to oppose the typhic condition or secondary fever that frequently is a convalescent sequel.

After all, the treatment of maladies is part of their pathology; the nature, the power of the remedy, and the modifications that follow its action are the surest guarantees of the character and tendency of the disease.

Novel Geological Ideas.

The presidential address before the British Association, Section C, of Prof. C. Lapworth, LL.D., concludes as follows:

The account of the simple rock-fold I have already given you is of the most elementary kind. It presupposes merely the yielding to tangential pressure from front and back, combined with effectual resistance to sliding. But in the layers of the earth crust there is always, in addition, a set of tangential pressures theoretically at right angles to this. The simple fold becomes a *folded fold*, and the compound septum twists not only vertically but laterally. On the surface of

the globe this double set of longitudinal and transverse waves is everywhere apparent. They account for the detailed disposition of our lands and our waters, for our present coastal forms, for the direction, length, and disposition of our mountain ranges, our seas, our plains, and lakes. The compound arch becomes a dome, its complementary trough becomes a basin. The elevations and depressions, major and minor, are usually twinned, like the twins of the mineralogist, the complementary parts being often inverted, and turned through 180° (compare Italy with the Po-Adriatic depression). Every upward swirl and eddy has its answering downward swirl. The whole surface of our globe is thus broken up into fairly continuous and paired masses, divided from each other by moving areas and lines of mountain making and crust movement, so that the surface of the earth of the present day seems to stand midway in its structure and appearance between those of the sun and the moon, its eddies wanting the mobility of those of the one and the symmetry of those of the other. In the geology of the earth crust, also, the intercrossing of the two sets of folds, theoretically at right angles to each other, gives rise to effects equally startling. It lies at the origin of the thrust plane or overfault, where the septal region of contrary motion in the fold becomes reduced to, or is represented by, a *plane* of contrary motion. It allows us to connect together under one set of homologies folds and faults. The downthrow side of the fault answers to the trough, the upthrow side to the arch, of our longitudinal fold; while the fault plane itself represents the septal area reduced to zero. The node of the fault, and the alternation and alteration of throw, are due to the effects of the transverse folding.

These transverse folds of different grades, which affect different layers of the earth crust differentially, account also for the formation of laccolites, of granitic cores, and of petrological provinces; and they enable us also to understand many of the phenomena of metamorphism.

Of the folds of the third order I shall here say nothing; but I must frankly admit that the primal cause of all this tangential movement and folding stress is still as mysterious to me as ever. I incline to think that it is due to many causes—tidal action, sedimentation, and many others. I cannot deny, however, that it may be *mainly* the result of the contraction in diameter of our earth, due to the loss of its original heat into outer space. For everywhere we find evidences of symmetrical crushing of the earth crust by tangential stresses. Everywhere we find proofs that different layers of that crust have been affected differentially, and the outer layers have been folded the most. We seem to be dealing not so much with a solid globe as with a globular shell composed of many layers.

Is it not just possible after all that, as others have suggested, our earth is such a hollow shell, or series of concentric shells, on the surface of which gravity is at a maximum, and in whose deepest interior it is non-existent? May this not be so also in the case of the sun, through whose spot-eddies we possibly look into a hollow interior? If so, perhaps our present nebulae may also be hollow shells formed of meteorites. On the surfaces of these shells the fiery spirals we see would be the swirls which answer to the many twisting crustal septa of the earth. Our comets, too, in this case might be elongated ellipsoids, whose visible parts would be merely interference phenomena or sheets of differential movement.

In this case we have represented before us to-day all the past of our earth as well as its present. Uniformity and evolution are one.

Thus from the microscopic septa of the laminae of the geological formations we pass outward *in fact* to these moving septa of our globe, marked on land by our new mountain chains, and on our shores by our active volcanoes. Thence we sweep, *in imagination*, to the fiery eddies of the sun, and thence to the glowing swirls of the nebulae; and so outward and upward to that most glorious septum of all the visible creation, the radiant ring of the Milky Way.

Snow Sheds Burned.

There were four fires in the Central Pacific snow sheds at Summit on the night of September 9. The Summit fire train while fighting flames became surrounded by fire and had to be abandoned. The engine and water cars were wrecked by the flames. The Blue Cañon water train was hurried to the scene, but a new fire started west of the train, and for a time there was imminent danger that this train would also be destroyed. The water train from Rocklin was sent up early next morning and the flames got under control. Twenty-one hundred feet of sheds and track were destroyed and four passenger trains blocked. The press dispatches reporting these facts state that the fires were incendiary.

A correspondent of the *Confectioners' Journal* says that banana juice makes a first-class indelible ink. A spot on a white shirt from a dead ripe banana is marked forever, and the juice from bananas thoroughly decayed is a bright, clear carmine.