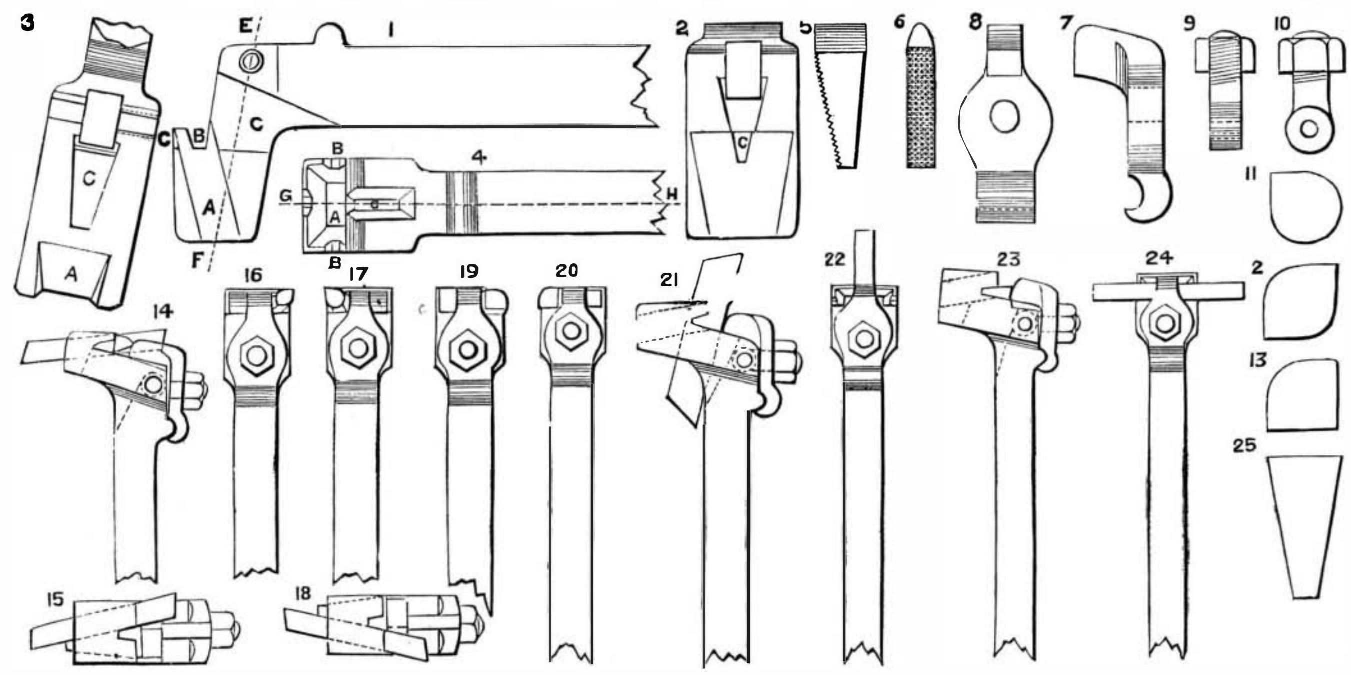
IMPROVED TOOL HOLDERS AND CUTTERS.

The forms of tool holders and cutting tools shown in the annexed illustration are the subject of a patent to Messrs. New and Matthews, of Nottingham, England, and Mr. W. H. Berry, of the same place. They speak for themselves, says the *English Mechanic*, and require but little description. The tool holder is adapted for holding securely in a rectangular tapered slot a right hand or left hand cutting tool at suitable and fixed cutting angles (such tools being secured firmly by a serrated wedge and clamps held down by a swivel bolt and nut), also for holding in suitable tapered slots a straight tool and a cross tool cutting on either side at right angles. These tools are secured firmly by clamps held down by swivel bolt and nut. This holder is adapted for using the patentees' special sections or round or square steel. The invention further consists of three special sections of steel, and may be made to any size required. These sections of steel can be formed into uniform, angular, or round-nosed tools for right or left hand cutting. From these special sections a variety of tools suitable for various cutting purposes can be produced, which are particularly adapted for the rectangular tapered slot in the holder. From the same uniform bar of steel, tools can be cut in suitable lengths, and then, without being forged, ground to a proper cutting angle for the several purposes required. Further, the novel shape of these special sections, when placed in the new holder, gives a positive and fixed angle for cutting.

Fig. 1 is a side elevation of tool holder in section (on line, G H, 4). A is a rectangular tapered slot; B is a tapered slot at right angles to the lengthway of the holder; C is a tapered slot parallel with the lengthway of the holder; 2 is an elevation of the tool holder; 3 is an elevation in section (on line E F, 1), showing the tapered slot, C; 4 is a plan of tool holder, showing the rectangular tapered slot, A, and tapered slots, B B and C; 5 is a front elevation of serrated wedge, and 6 is a side elevation of it; 7 is a front elevation of clamp, and 8 is a plan of it; 9 is a front elevation of swivel bolt and nut, and 10 is a side elevation of the same; 11, 12, and 13 are the special sections of steel particularly adapted for the tool holder to be held in the rectangular tapered slot, A, 1; 14 is a side elevation of the right hand tool for cutting out corners, 15 is a front elevation, and 16 is a plan of it; 17 is a plan of a left hand tool for cutting out corners, and 18 is a front elevation of it; 19 is a plan of a right hand round-nosed tool; 20 is a plan of a left hand round-nosed tool; 21 is a side elevation of a straight tool, and 22 a plan of it; 23 is a side elevation of a cross tool; and 24 a plan of it. The tapered slots, B and C, in 1, are adapted for holding cutters severed from a bar of steel of uniform section, but thicker upon one edge than the other, as shown in section in 25. The patentees claim the constructions of the tool holder, as described and illustrated, and the three special sections of steel, particularly adapted for the rectangular tapered slot of the new tool holder. 11, 12, 13, and 25 are full size, as shown; the others are half size.



MESSRS. NEW, MATTHEWS, & BERRY'S TOOL HOLDERS AND CUTTERS.

PHARMACEUTICAL APPARATUS.

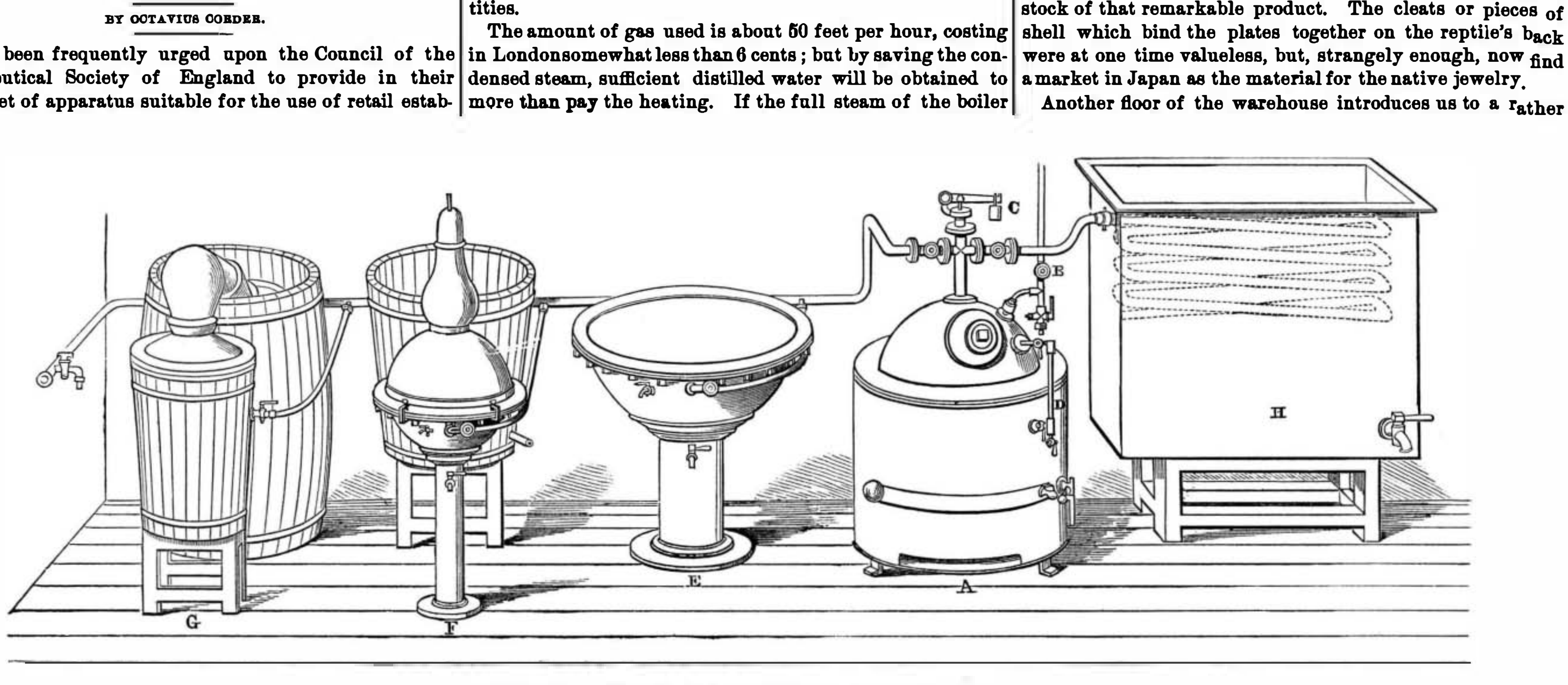
BY OCTAVIUS CORDER.

It has been frequently urged upon the Council of the Pharmaceutical Society of England to provide in their rooms a set of apparatus suitable for the use of retail establishments for the making of all such pharmaceutical preparations as may reasonably be expected by a chemist of the present day. Whether it is the duty of the Council to act the part of an educating body, either for students or mature pharmacists, I leave for the present (although I have a very decided opinion on the subject), my object on the present occasion being to assist those who may be in the same difficulty which I have felt. Having no set of apparatus to guide me, I should have been glad of information. I therefore send a short description of what I have found to answer my purpose, with a drawing of the apparatus.

A is a copper boiler holding about 12 gallons, fixed in a wrought iron jacket and heated by a ring gas burner. I used copper for the boiler, because, being made thinner than iron, the water is brought to a boil much more rapidly; it does not foul so soon, and is altogether better adapted for the purpose. I chose gas as a heating power, not that it was so cheap as coal, but from its being clean, free from smoke, and at once lighted, lowered, or put out, as occasion may require.

The boiler is supplied with water direct from the main by merely turning on the tap, B. The boiler is provided with steam gage, C, which blows off at 5 lbs. pressure, also with a water gage, D, and with a suitable arrangement for blowing out the boiler whenever it becomes foul by deposit of lime, etc. H is a galvanized iron tank, provided with a tin worm, so that all waste steam may be condensed as distilled water; those who are accustomed to use distilled water for all dispensing purposes, making tinctures, infusions, decoctions, indeed all pharmaceutical preparations, will fully appreciate this part of the arrangement. The whole of the pans, etc., being copper tinned, all the condensed steam is available as distilled water. The pan, E, holds 16 gallons, and is adapted for decoctions, etc.; its evaporating power is about 2 gallons per hour. The pan, F, holds 6 gallons, and being fitted with a suitable head and worm, is used for all the distilled medicated waters, such as dill, cinnamon, peppermint, etc., also for recovering the spirit from extract of colocynth and such like preparations. It distils about 1 gallon per hour. G is fitted with an earthenware still (holding about 3 gallons) with head and worm of the same material, fixed in an oval jacket. This is only used for aromatic spirit of ammonia, for which purpose it is well adapted; being the furthest from the boiler the steam power is less, and there is but little risk of the luting being displaced, especially if the carbonate of ammonia is added at several times in small quantities.

The amount of gas used is about 50 feet per hour, costing in London somewhat less than 6 cents; but by saving the condensed steam, sufficient distilled water will be obtained to more than pay the heating. If the full steam of the boiler is turned into the worm, H, about 4 gallons of water per hour are obtained. Two gallons of aromatic spirit of ammonia may be run over during the day, in conjunction with other preparations. I would add that it is well to cover the top of the boiler, and the sides of the pans and pipes, with felt, which effectually prevents a considerable loss of heat by radiation.



SIMPLE PHARMACEUTICAL APPARATUS.

In the Dock Warehouses of London.

A writer in the *British Trade Journal* has been exploring the vast warehouses of the East and West India Docks of London, where the cargoes of whole fleets of vessels are stored, pending the sale of the goods to wholesale merchants. One particular building examined was set apart for the most valuable articles of importation, such as drugs, ivory, feathers, etc., and about which a large variety of curious and interesting information was gathered.

In the drug department one sees such costly articles as vanilla, musk, ambergris, and the various kinds of essential oils undergoing manipulation. Each package of musk is carefully sorted, and every individual pod subjected to close scrutiny, for Ah Sing has a peculiar knack of deftly introducing different foreign substances into the pods and closing them up again. Some mysterious compound, known as Chinaman's earth, is a favorite adulterant of this highly priced natural perfume. Ambergris, a peculiar secretion of the sperm whale and the base of many scents, was not a great number of years ago accounted worthless, but as much as five guineas an ounce has since been paid for it. Essential oils occupy an important place in the drug warehouse.

We noticed a large vat for the reception of cassia oil, capable of holding 200 gallons. This oil has to be turned out of its original packages and bulked, or mixed together, buyers being chary of investing in an article which exhibits very unequal quality. Proceeding from the drug warehouse, we ascend to the department devoted to ivory and tortoiseshell. The greater proportion of the former produce which reaches the London market finds its ways to this warehouse. Every separate tusk is examined here at the hands of men whose long familarity with the business enables them to detect the slightest imperfection. Each tooth bears on its surface a record of its own defects, which are expressed by certain cabalistic characters well understood by the trade. The dealer is able to place perfect reliance on these descriptive marks, and they, perhaps more than his own judgment, determine his biddings. Of the ivory of commerce, that hailing from the Gaboon is considered the best. It has a peculiar transparency, and, keeping its color well, is used for carving articles of a superior description. The largest tusks are those from Egypt and Zanzibar. One was pointed out to us from the latter place which weighed 128 lbs., this being, however, a tooth of quite exceptional size. Its defunct possessor would no doubt have proved an immense acquisition to a menagerie, for he must have been a very giant among giants. Every now and then a parcel of antediluvian ivory is forwarded from Siberia for sale. A passing glance at the tortoiseshell department reveals a good stock of that remarkable product. The cleats or pieces of shell which bind the plates together on the reptile's back were at one time valueless, but, strangely enough, now find a market in Japan as the material for the native jewelry.

Another floor of the warehouse introduces us to a rather novel show, that of birds, birdskins, and feathers. Here are cases upon cases and piles innumerable of feathered victims, from the magnificent Impian pheasant off the Himalayas to the tiny humming bird of tropical America. The birds and birdskins are carefully sorted, and particulars taken for the transmission to the brokers, who are thus able to prepare their sale catalogues. One of the latter is before us, and although it is only a supplementary one the following are among the goods it specifies: 3,297 jays, 1,073 kingfishers, 1,047 ospreys, 649 red and orangetanagers, 394 parrots, 98 red ibis, 1,095 bee eaters, 653 bronze merles, 1,416 humming birds, and 2,023 various. Coming to the feathers, ostrich, of course, occupy the place of honor, both as regards quantity and relative value. Among other feathers are those of the osprey and the marabout or paddy bird of India. The latter are very pluffy and graceful in appearance, and in color are either a snow white or gray. The whole of the feather and bird business of London is concentrated in this warehouse, and the value of the peculiar merchandise here on show monthly is something about $250,000.

The storage room, devoted to silk, is very considerable; and as far as possible, the different varieties, of which the principal are Bengal, China, and Japan, are kept distinct. Each skein has to pass muster, the inferior or damaged ones being thrown out; and the merchantable bulk of every bale is then enclosed in a hessian covering, which, when sewed up, constitutes a company's package. Bengal silk is in skeins, that from China in flattened bundles or books, and the Japanese skeins are tied up in grape-like bundles. The twine used by the Japanese silk packers is made of paper, but nevertheless wonderfully strong and of beautiful regularity. They are very liberal in the use of paper bands, which enclose the skeins in all directions; but as this paper is carefully preserved by the sorters and weighed off against the bale, the not over scrupulous "Japs" are defeated in their object, which is to get credit for paper as if it were silk. In the storerooms are between five and six thousand bales of silks. The facts of blinds being fitted to all the windows is calculated to puzzle the uninitiated, but this is a precautionary measure of some importance, it being found that the exposure of silk to light and warmth results in appreciable loss of weight.

The chief source of the indigo supply is India, but of late years the Central American States have been sending increasing quantities to this market. Bengal indigo, especially that classed by importers as Bengal blue, is most highly esteemed. Then follow Bengal violet and copper indigoes, and after these rank Oudes and Madras. The culture of the indigo plant is very precarious; and it thus happens that, although the consumption is tolerably uniform, the price is liable to violent fluctuations.

Inside the indigo warehouse there is but one universal color, and that is blue. The atmosphere is of a cerulean haziness, and the men, as they move about, give one the impression of having been in a dye bath. Certainly the blueness of Gainsborough's blue boy would have been doubly intensified by a brief sojourn in this region. The cases of indigo are weighed, tared, and samples drawn for display in the show rooms on the fifth floor. The skylights of these fine rooms are so arranged as to throw the light from the north on the samples of indigo arranged in long lines of trays below. Color is, of course, the chief guide to quality, lightness being also a characteristic of good indigo.

Correspondence.

A Colossal Fortune Undeveloped.

To the Editor of the Scientific American:

For many years the subject of limiting the production of cotton, to bull the price to a more remunerative figure, has engaged the attention of many cotton planters in the South. If but a tithe of the mental labor which has been fruitlessly expended in this direction could be devoted to the invention of means by which the cost of production of cotton could be diminished 1 cent per lb., we might well look for most important results.

In the great Northwest, there has grown up within a few years a gigantic empire, teeming with its millions of thrifty farmers, who are able, by the aid of improved agricultural machinery, to produce the grain crops which feed a notable part of the civilized world. It is well known that this great result would not have been possible without the labor-saving machinery which has enabled them to compete in the markets of the world. But if we look at the cotton culture of the South, it is matter of great surprise that the production of so important a staple, involving so much constant manual labor, should have received so little assistance from inventors. There cannot be a more inviting field for mechanical ingenuity than this; and having given this subject much thought for ten years, I wish to direct the attention of mechanics to the nature of the demand and the probable means by which the supply can be achieved.

A given number of hands, in the rich cotton belt, can plant and cultivate double the quantity of cotton during the spring and summer that they can gather and prepare for the market in the fall and winter. Here, then, is a limit to the production of cotton which compels the culture of other crops in connection with cotton, crops which do not require labor in the season of cotton picking. Machinery for harvesting the cotton crop will enable the planter to double the quantity of cotton which can be produced by a given number of laborers. Here, then, is the first great want of the cotton grower.

I believe the man who successfully supplies this great want, by inventing machinery which will do for the cotton crop what the improved reapers are doing for the wheat crop of the Northwest, will require a sewing machine to make his money bags. Then application of the buggy plow to the cultivation of the cotton plant will naturally follow, and still further diminish the cost of production.

Shortly after the late war, an ingenious Yankee exhibited in the South a device for picking cotton, which did the work, it is true; but it required to be brought to bear upon the cotton boll with something of the precision which points a gun at a bird. A southern negro would easily gather ten locks of cotton in the time required by the inventor to bring this cotton picker in contact with a single boll.

If I could be permitted to advise the would-be inventor of a cotton-picking machine, I would say: Take your first lesson in a cockleburr patch, as it is here called; pass through it, and note how tenaciously the numerous barbed points upon the burrs catch and hold your clothing. Thus you will find the first elementary principle of the cotton picker. Pass through the patch again upon a windy day, and note how your coat tail flies about in the wind, hunting, as it were, for the burrs that so readily seize it; and note also the increased number of burrs you bring away with you. Here you have a second lesson in the elements. Expand the cockle burr into a drum or cylinder covered with card clothing, such as is used in treating cotton or wool, but with teeth so fine as to exclude the limbs and leaves of the plant, seizing only the lint. Let there be two of these card cylinders, revolving in opposite directions, one upon either side of the row of plants; let them be placed nearly upright, leaning obliquely towards each other like the opposing rafters of a roof, so as to conform somewhat to the pyramidal form of the plant; let them be geared so that they can be raised or lowered by a lever to suit the bight of the plant, and so that they can be approximated or separated to suit the breadth of the plant. Let each cylinder be provided with a comb or counter card, to remove the accumulated cotton from the card teeth, and drop it into a proper receptacle upon the machine. Let the whole be mounted upon broad-tired wheels and drawn by two horses, one upon each side of the row of plants. Let a suitable rotary fan be attached below, to send a strong draft of air up through the cotton plant to put the long, loose locks of lint in active agitation, so that they shall industriously search for the card teeth, and also to blow away sand and dust from the lint, and thus improve its quality. Do this, and you have the dry bones of a cotton picker, to be carefully studied, elaborated, and clothed in suitable habiliments, such as this writer has neither skill nor time to devise.

It is not necessary that the cotton picker shall do its work cleanly; if it can but garner two thirds or three fourths of of the crop, manual labor will take care of the remainder. The customary price for picking cotton by hand is 75 cents per 100 lbs. of seed cotton, the average yield of which, in marketable lint, is 33 lbs. The cost of hand picking, therefore, is $2\frac{1}{4}$ cents per lb., a very large item, which ought to be reduced, by appropriate machinery, by more than one half. A successful inventor who should exact as his royalty only $\frac{1}{8}$ of 1 cent per lb. upon the cotton crop of the United States might fairly figure his annual income at more than $3,000,000, a sum worth striving for by any mechanic who has the gift of invention.

If these suggestions should drop a germinating seed into the fertile brain of the coming man who is destined to immortalize himself by the invention of a successful cotton-picking machine, I shall be most happily rewarded for my own part in the matter. ROBERT BATTEY, M. D.

Rome, Ga.

Boiler Explosions.--A Suggestion to Experts.

To the Editor of the Scientific American:

The importance of the subject emboldens me, although not an engineer, to ask for a little space in your valuable journal, to allow me to rejoin to a communication from L. B. Davies, as to the cause of boiler explosions, which appears in your issue of November 18. I beg to be understood in advance that I have no intention of opening a controversy with an expert such as Mr. Davies seems to be, and that what I shall say is to be taken merely as a suggestion to practical engineers that, possibly, there may be a cause for such accidents which has been overlooked. The experiments as to the action of water under repeated heating, that I shall presently detail, were instituted three years ago in consequence of a series of investigations described, if I rightly remember, in the *Journal des Débats*, of Paris. The point was not directly raised by the article, but some collateral statements led me to question whether water, such as is ordinarily used for motive purposes, might not possibly acquire an explosive property by frequent heating. Although water is a protoxide of hydrogen, as a matter of fact, as found in its natural state in rivers and reservoirs, it contains a considerable percentage of nitrogenous admixture, partly in the form of animal and vegetable life containing nitrogen, and partly in compounds resulting from the decomposition of animal and vegetable tissues. The sedimentary coating it deposits in boilers, and the column of sediment that settles in a test tube after protracted boiling, are sufficient evidence as to the importance of the compounds held in solution to any careful and accurate investigation of the causes of explosion, in instances where inspection has failed to reveal any defects in the boiler itself. Again, under protracted jar, iron columns often acquire molecular properties that render them extremely brittle, and it is very possible that boiler iron under frequent heating and tension, saying nothing of inequality as respects both, may suffer molecular changes that cannot readily be detected even by an expert.

The experiments I have to detail were conducted in test tubes, with Croton water first, and afterwards with water obtained from the Hudson river. The degree of heat employed was uniform. The tubes used were two ounce, tightly corked with rubber stoppers, through each of which was passed longitudinally the refuse spout of a subcutaneous syringe, for the escape of steam. For the experiment I used seven tubes, each loaded with half an ounce of water. Six of the tubes were employed in this manner, namely, five of the six as a reservoir with which to replenish the sixth, thus eliminating one after another until only the sixth should remain: the seventh to be replenished with fresh water as often as the exhaust reduced its contents to one third of an ounce. That is to say, heating each in succession for five minutes: as often as the contents of any one of the first six was less than one third of an ounce, it was brought back to the original volume of water by replenishing from out its fellows, and so on until five of the six were empty; while, when the seventh had lost one third of its contents, the deficiency was supplied with fresh water from two and a half ounces reserved. The tubes were of average thickness. The interval allowed between boilings was one hour, during forty minutes of which the tubes were suspended in cold water to insure the necessary lowness of temperature. The thermometrical tests in each case were made with a very correct medical thermometer; and the external surface of each tube after cooling was carefully cleaned with a strong solution of caustic potash. The heating instrument was an alcohol lamp, filled after each series of heatings and carefully trimmed; and previous to each series I took the precaution to heat four ounces of fresh water in a tin cup for seven minutes, and then to test the heated water with the medical thermometer, in order to prevent any appreciable variation of temperature. Under these conditions, the test tubes being suspended by a wire loop always at the same distance from the tip of the wick, each time I found that there was a fixed diminution in the time required for perceptible boiling, after each experiment, and that the loss in volume by conversion into steam increased a trifle at each heating. The average first term with all the tubes was 3 minutes and 41 seconds. The last half ounce of the three ounces allotted to the six tubes replenished from each other boiled in 2 minutes and 47 seconds. The same quantity in the seventh tube, constantly replenished with fresh water, boiled in 3 minutes and 5 seconds, the diminution in time being 54 seconds in the one case, and only 36 in the other. Using three ounces of water from the Hudson river, in six tubes, under the same conditions, the average time of boiling at the first series of heatings was 3 minutes and 38 seconds, while the last half ounce boiled in 2 minutes and 27 seconds, a diminution of 71 seconds. Using three ounces of filtered Croton water, under the same conditions, the first term was 3 minutes and 49 seconds, and the second 3 minutes and 13 seconds, a difference of only 36 seconds.

I have carefully repeated these experiments a sufficient number of times to convince me that these phenomena are pretty constant; and, from the difference between filtered and unfiltered water in respect to them, it must be concluded, I think, that the presence of organic compounds has considerable influence in bringing them about. There is also a phenomenon, not readily described, but one readily appreciable by the eye—a manner of boiling, so to speak—which would enable an expert to guess pretty accurately whether a volume of water had been frequently heated, or was merely undergoing that process as virginal. It consists principally in the fact that water that has been persistently boiled and cooled breaks suddenly and violently into ebullition, as compared with fresh water under the same degree of heat. The experiments seem to indicate that nitrogenous compounds are responsible for this phenomenon, which in the last half ounce of a three ounce reduction pretty broadly suggests that the liquid under experiment has acquired an explosive property that, under such conditions of high heat as occur in using steam as a motive power, might prove very dangerous and destructive. I will not presume to say that experiments conducted on such a small scale are conclusive, save as establishing the fact that ordinary water acquires the property of yielding to heat the more readily in proportion to the number of times that it is heated, and that an increased rapidity of conversion into steam accompanies each increment of this change in molecular properties. I believe that nitrogenous compounds are responsible for this change and for the sudden violence of ebullition that accompanies it; but this point I have not been able to verify with the facilities at my command.

New York city. F. G. F.

Suspended Animation as a Preserving Agent.

To the Editor of the Scientific American:

On page 225 of volume XXXIII of the SCIENTIFIC AMERICAN, you have an article on the above named subject in which you give three different lines of investigation for future experiment. These are: 1. The power some animals have of rendering their natural prey utterly insensible for an indefinite period. 2. The peculiar effect of cold on some of the lower animals, which reduces them to a state, not death, nor yet the ordinary torpidity caused by low temperature in other organisms. 3. Hibernation. In considering each in turn, you give as an instance of the first the complete torpor or anæsthesia produced by the sting of the female of the "digger" wasp upon its prey; of the second, the well known torpor produced by cold in the case of serpents and certain fish, with subsequent return to activity on the application of heat: and lastly, hibernation is explained by the fact that "the muscular irritability of the left ventricle of the heart, highly increased, permits it to contract under the weak stimulus of