higher than 212 deg. in proportion to the strenght of the brine. But water may be heated to a much higher degree in closed vessels where the steam is confined so as to exert a pressure upon the surface of the water. Water is so bad a conductor of heat that it was supposed by Count Rumford to be absolutely a non-conductor. And although late experiments have shown that this is not actually the case yet water conducts heat so imperfectly that the Count's conclusion may be taken as true for practice in the greater number of ordinary cases. A vessel of water when put upon the fire is heated by the lower stratum of water expanding, and becoming specifically lighter, hence it ascends through the rest to the top, causing another layer to take its place, this becomes heated in its turn and so the various particles of water transport or carry the heat upwards by their motion. Water becomes solid or is converted into ice when it is cooled down to 32 deg. and the ice begins to be formed, appearing like needles crossing each other. In freezing, the air contained in water is excluded, but the bulk of the ice being expanded is greater than that of the water before being frozen. Ice is specifically lighter than water. The specific gravity of ice is about 0.94 ; that is, it is 6-100 lighter than water. Water assumes the solid form not only when it becomes ice but likewise in many cases where it combines chemically with other bodies ; for instance when salts crystallize from their solutions in water, a certain portion of this fluid becomes fixed, and is called the water of crystallization ; a familiar example of this may be given in the slacking of lime, where the water becomes united to the lime and a dry powder called slacked lime is the result, and which always contains some water in a state of solidity ; this kind of union of a substance with water is called by chemists a hydrate. That all water which has been exposed to the atmosphere contains a portion of air which it has absorbed may be shown by placing this fluid under the receiver of an air pump and exhausting it ; the air will be seen coming out of the water in numerous bubbles, but this air may also be driven out by boiling ; and if such boiled water is again exposed it will absorb the air as before. About 100 cubical inches of spring water afford two cubical inches of air, which consists of 10 per cent. of carbonic acid, and the rest atmospheric air, that is oxygen and hydrogen ; but different springs vary considerably in the quantity of air they contain. Rain water contains usually 3.5 per cent. and one per cent. of carbonic acid gas. Snow water when fresh has no air. Water absorbs various gases in different proportions. Of some of the acid gases it takes up several times its own volume. Water is susceptible of compression though in a very small degree. It was formerly thought to be absolutely incompressable, but it was shown long ago by Mr. Perkins that it can be compressed in a very small degree, by applying great force ; it has been calculated that by a pressure equal to 2.000 atmospheres it may be diminished one-twelfth part of its bulk. Water is the most convenient material to serve as a standard for comparing the weights of other substances. And their weight compared with an equal bulk of water is termed their specific gravity ; therefore in the tables of specific gravity of various substances water stands as 1.000. As water expands with heat, and contracts with cold, the weight of a cubic foot or any other measure of water must be somewhat less in warm weather than in cold ; and on this account when it is spoken of as a standard it is always supposed to be a certain fixed temperature, it has been ascertained that a cubic inch of distilled water at the temperature of 62 degrees barometer 30 inches, weighs 252.458 grains. Any water heavier than this must contain some other substance, and consequently be less pure. Water is 816 times heavier than atmospheric air.

Water is a powerful solvent, hence it is a very important factor, both as natural agent and in a great number of processes. Substances are contra-distinguished, as they are soluble or not in water.

Water, absolutely pure, is, perhaps, never found in nature. It is nearly so in many instances, but in consequence of its being a powerful solvent, it soon becomes contaminated, more or less, by foreign substances. The purest water that can be found in a natural state is obtained by melting snow, that has just fallen, in a clean vessel, at a distance from houses. But the chemist finds that even then the water is not absolutely pure ; it has received some adventitious matter in falling through the atmosphere. All of the varieties of water which are formed on the surface of the earth, or rising in the form of springs are, as we might expect, still more impure, containing various substances which the water has dissolved. It is by art alone that we can obtain the purest water ; to procure it we must employ distillation.

The process of distillation effects no change whatever in the water itself ; it merely separates the pure fluid from its impurities. Water, when distilled, is quite discolorless, beautifully transparent, entirely void of taste and smell, and it is lighter than any other water. It is perfectly soft ; soap dissolves in it completely, presenting an opaline appearance. Notwithstanding its purity, however, it is little used, except for medical purposes, or in experiments, partly on account of the trouble in preparing it, and partly because the process of distillation deprives it of the air which water always has in it in a natural state, and which is essential to its being an agreeable beverage ; for want of this air the taste of distilled water is vapid.

Water in the ordinary state contains, besides common air, a small quantity of another gas, namely, carbonic acid gas. This gas, which assists in giving a brisk taste to spring water, distillation drives off, but it is likewise restored by exposure for a short time to the atmosphere.

The origin of rain water, which is evaporated from the sea and land, by the heat of the sun, this liquid rises in vapor, and after ascending to the higher regions of the atmosphere where constant cold prevails, it is condensed into mist, which appears to us as clouds; these float in the air as long as the temperature remains the same, but when they enter currents of colder air or are effected by electricity, they are further condensed into minute drops of water, which ultimately unite together and descend as rain. One might expect that rain water falling immediately from the clouds should be absolutely pure and entirely free from any other matter. This, however is not the case ; from its purity its solvent powers are greater than those of any other natural water, and also as the atmosphere is burdened with a mass of lifeless particles, pulverised into transparency. The respiration of all animate beings, the combustions of all hearth stones and furnaces, and the decaying dead animals and vegetables, continually evolve acids, chloride and ammonia. These are all soluible in water and the mists and showers absorb them freely. Hence the so-called pure waters of heaven are fouled before they reach the earth with the solids and gases of the earth.

Spring water.—The original source of all spring water is rain, which, falling upon high ground filters through the soil and the strata of the earth so long as they are porous, until it is stopped by some impervious substance, as rock or tough clay ; it will then find its way along the surface of this rock or bed until it arrives at some crevice or opening through which it forces its way out to the surface. From this description of springs it is obvious that the water which they afford would be equally pure with rain water, provided it did not meet with any substances in its passage through the earth which it can dissolve.

If it should come in contact with limestones and chalks, it would impart qualities objectionable to potable waters, and troublesome in the household uses and in processes of art and manufacture.

The salts most frequently found in the waters of springs are sulphate of lime and carbonate of lime ; but besides these there occur occasionally sulphate of magnesia or epsom salts, sulphate of soda or glauber's salt, or common salt, which is chloride of sodium. Alum is sometimes found and salts of iron are extremely common, besides occasionally other substances.

The chief practical distinction in water is its being what is called hard or soft ; what is called the hardness of water is owing to its containing a small quantity of certain neutral salts in solution which have been derived from the passage of the water through the earth. These salts, as have been stated, vary in their nature and proportions according to the nature of the earth through which the water is passed ;