WHY DO SPRINGS AND WELLS OVERFLOW?

A new theory in answer to the above question is broached by Nelson W. Green in the *Popular Science Monthly* for November. Mr. Green says the overflow is caused by "the resultant of the earth's centripetal and centrifugal forces acting impulsively upon the subterranean water deposits, and tending to force them into and through the natural channels of the earth's crust." It is claimed that while the overflowing of wells and springs has been accounted for by scientists upon the supposed existence of hydrostatic pressure, a more careful investigation justifies the conclusion that such a proposition is fallacious, although exceptional cases may occur. Aristotle and Seneca suggested the central heat of the earth as the force which operated to compel the water to seek an overflow, but this is not borne out by experiment, neither is capillary attraction a satisfactory explanation. The controversy, if any there be, is confined to those subterranean waters of the earth which are not influenced by rains.

Among the many examples cited against the hydrostatic theory, and in support of the centrifugal and centripetal forces, Chautauqua lake is mentioned as being situated on the highest land in the State of New York west of the Catskill mountains, without any adequate feeder. Yet a large mill stream issues from it; in fact, the lake is 20 miles long by two miles wide, the whole body of which is fed by springs bubbling up from the bottom of the lake. The whole mountain region of northern Pennsylvania is referred to as another good illustrations of high springs, which are claimed to be beyond the reach of hydrostatic pressure. The White and Adirondack mountains are also full of similar cases.

It is generally held, according to M. Garnier, that "unless there be a reservoir higher than the surface whence we intend to bore, we cannot hope to obtain an overflowing fountain." Instances may be multiplied to show the fallacy of this assumption. The Himalayas, the highest mountains in the world, pour continually out of their highest points great cataracts and streams, with an abundance that would exhaust any possible reservoirs at their extreme tops. Now since this is the highest land of the world, no higher source is possible, and hence the conclusion is inevitable that these great overflows are due to some other force than hydrostatic pressure. That gases may force water up may be shown to be erroneous, for the reason that gases do force water down when both are enclosed by a common receiver. This, says Mr. Green, may be seen any day at the gas-works. But he omits to explain the action of carbonic acid gas, etc., in soda fountains, fire extinguishers, etc., which invariably throw the water in any direction in which the nozzle may be pointed. Mr. G. supposes in the case of water imprisoned in the rocks, that the resultant of the two natural forces, centripetal and centrifugal, are duplicated upon every point of the inside surface of the rock prisms, and tends to force the water out when the cavity is perforated. The direction of this force is placed at 45° from the direction of the force of gravity, but it remains unimpaired should the opening lead in a contrary direction. Hence, if fissures exist in rocks that lead to imprisoned waters, it would happen that through these outlets the waters must certainly flow, and, if by any artificial means, as by boring, an opening should be made between a body of confined water and the surface of the earth, a flowing well would result. "Of course," says the writer, "it must not be understood that this would happen if the body of water supposed were an isolated one and completely unconnected with other bodies of water through channels and intercommunications known to exist in the various ramifications of the earth's surface." Why should it not if the theory be correct? If the two natural forces referred to are continuous upon a string of subterranean reservoirs, why should they cease to operate upon an isolated one? If it be necessary in support of the centripetal and centrifugal theory to create a vast series of subterranean reservoirs connected with each other, there can be no necessity for the theory, since hydrostatic pressure can explain the phenomena of water flowing from the tops of the highest mountains under a similar arrangement. Nay, a common force pump in the hands of a man can overcome the Garnier theory, and why not the immense forces of nature?

It is true that the centrifugal force tends to throw particles from the earth, but the centripetal force tends to the opposite, and both being equal, the effect is the same as if neither existed. Otherwise, it would seem as if the resultant of the two forces, being more powerful than either one alone, would affect other things in or upon the earth. There may, however, be reasonable grounds for suspending the operation of gravity or centripetal force, to a certain degree, to explain the overflow of springs and wells, which cannot easily be explained by hydrostatic pressure, for it is certainly true that strong and abundant overflows occur at the tops of mountains and on high plateaus; and admitting that hydrostatic pressure causes the overflow of springs and wells in particular localities, it would still be necessary to explain how water gets to these highest points. Mr. Green says this can best be done by his theory, in which the force is always acting upon partially confined water-beds and water-channels forming the internal water-structure of the earth's crust. The conditions necessary to the realization of the best results are that these water-deposits shall be more or less imprisoned and the outlets comparatively limited. The overflow will be continued and upward until the resultant is overcome by friction. We are hardly prepared to accept this theory without further investigation, for one reason of many, because friction does not overcome the resultant in very deep *flowing* wells, while in shallower wells the water, although abundant, does not rise to the surface, whereas the contrary would seem to be the case, the resultant having less friction to contend against.—*Mining and Scientific Press.*

WHAT IS DEMANDED.

The demands made upon scientific knowledge far exceed the supply. Although we may be said to have arrived at an advanced stage of learning, we undoubtedly possess but a limited amount when comparison is made with the necessities which as yet know no law. There are so many theories broached upon important subjects that fully the major portion of the requirements of manufacturers and miners are the victims of experiment. We want improvements in processes—not experimental improvements, but practical working and satisfactory processes, capable of substantial accomplishment of the theories claimed for them. Employers of steam engines demand more power from the enormous quantity of fuel consumed, waste products are waiting to be utilized, streams and atmospheres are crying out for relief from the pollution that is being thrown into them.

It is true inventors are endeavoring to provide means of supplying these demands, but frequently fail to satisfy the demand for the adaptation of new principles because the knowledge of the latter are incomplete. Discovery is usually the basis of invention, and the greatest utilities have been thence obtained, rather than by the exercise of invention upon old knowledge acquired. A machine for completely converting heat into mechanical force is required, but so far our scientific knowledge of the properties of heat has not led us up to the point of discovery upon which to base an invention of that kind. One invention leads to an innumerable chain of inventions, all of them more or less improvements, but still inventions. The field is immense, with abundance of room for inventors.

HINTS ON SOUPS.

Clara Francis gives the *Prairie Farmer* an essay on soups, from which we extract as follows:

Rules for Stock.—Five pounds lean meat and some cracked bones. Five quarts cold water. It should be at least half an hour in coming to boil. Skim; add a gill of cold water and skim again. Season with salt and vegetables, but be careful to use both sparingly. Cover close and simmer four or five hours. Strain cool, and remove fat. This will make a clear light broth.

Caramel for Coloring Broth.—For the sake of appearance broth is sometimes colored. Put a tablespoonful of butter into a nice bright saucepan, and when melted, add about half a pound of sugar. Stir constantly, over the fire, until it is a very rich dark brown. By no means let it burn. Add a half pint of water and an even teaspoonful of salt. Let the syrup boil until it is very rich and thick, which it will be in a few minutes. Strain and put it in small, close corked bottles; it should be so thick that it will just run from the bottle. A few drops will give the necessary color, and will not impair the flavor unless the sugar has been burnt. Tapioca, sago, macaroni, vermicelli, pearl-barley and rice are nice additions to this amber-colored broth. They should be cooked in water before being added to the soup. Grated cheese is sometimes served with macaroni and vermicelli soups—to be used at discretion.

Noodle Soup.—To one egg add a little salt and as much sifted flour as it will absorb, knead well and roll down very thin. Let it dry for half an hour, then dredge with flour and roll over and over. Shave thin slices from the end of the roll, shake them out and drop them into salted boiling water. Stir with a skimmer and boil for two minutes, then turn into a colander and dash cold water over them. Drain, and put into boiling broth; add a little chopped parsley and serve at once.

White Soup.—If eggs are plenty use the yolks of four, if scarce, take two whole ones instead. Beat them light and add a cup of cream, or use milk, and a teaspoon of melted butter. When these are mixed add to them, *gradually*, a pint of hot broth stirring all the time. Return to the kettle, let it come to a boil and serve immediately. Too long cooking will curdle the eggs. Instead of beating the eggs they can be poached and served in the broth, one egg to each person, adding the cream to the broth.

Potato Soup.—Peel and slice 10 medium-sized potatoes; add one onion, a slice of salt pork, a stalk of celery, a teaspoon of salt, and water enough to cover. Boil until the potatoes are very soft. Press through a colander; add a quart of milk, a tablespoonful of butter, a teaspoonful chopped parsley; boil up once. It should be like thick cream. Serve with *croutons* (dry bread cut into small diamonds, fried in boiling lard and drained). Place in the tureen and pour the soup over them.

Scientific Cooking Association.—In Berlin an association has been formed by housewives of the city. This society initiated last year various useful measures. Thus, it has opened a laboratory for examination of articles of food (now so much adulterated), as, also, of utensils used in cooking. It is directed by a qualified chemist. The nature and quality of the objects analyzed at the Central Bureau are thus guaranteed. The chemist gives the members of the society a course of lectures in practical chemistry, and a cookery school has also been formed. Students are examined in the subjects of study; domestic servants who have remained a certain number of years (five) in one household (of a member of the society) are awarded with prizes. Last year 36 were thus rewarded. Another part of the society's operations consists in procuring places and work for servants with its members.

During the progress of the Grant party through Iowa, the train at one point made 45 miles in 40 minutes.