

EARTHQUAKE MAY OCCUR IN UTAH.

Such Movements to be Expected in Valleys West of the Wasatch Range.

SO SAYS DOCTOR TALMAGE

In An Article Written for the Desert News on Recent Disaster in California.

How Earthquakes Come and How Mountain Ranges Are Born—"Slips" And "Faults" of Earth.

(Specially written for the Desert News by Dr. James Edward Talmage, professor of geology in the University of Utah.)

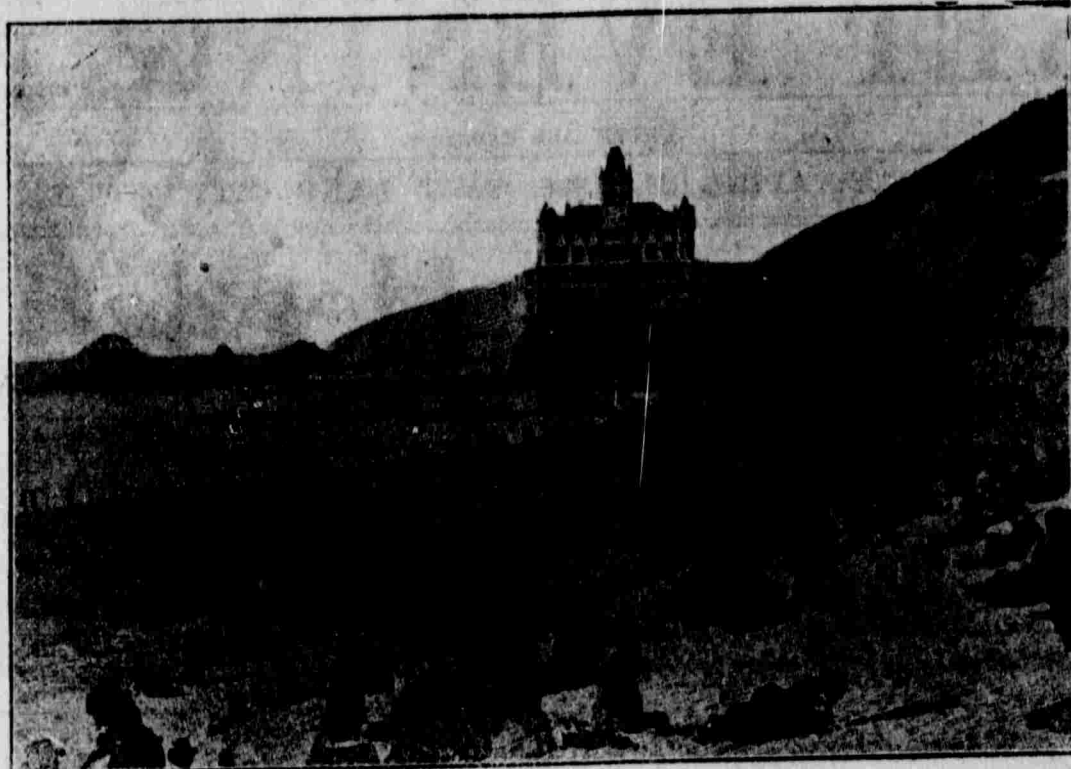
The earthquake occurrence of April 18, affecting the middle section of the California coast and resulting in appalling destruction of both life and property, has naturally led to many inquiries as to the origin and nature of earthquakes in general, and as to the cause of this particular disaster. The excitement and terror incident

overflow of molten lava—are usually accompanied by local earthquakes. The quakes may precede or be simultaneous with the actual eruption. In this respect at least volcanic outbursts and earthquakes appear to be related—that both are manifestations of internal strain, and that both subside when relief is found.

ACTUAL OSCILLATION.

The actual movement, or oscillation, of the rock particles affected by an earthquake wave is usually slight, seldom exceeding an inch and averaging less than half an inch. This statement may appear inconsistent with the great destruction wrought by the surface arrival of an earthquake jar. The actual movement of the rock particles—the amplitude of the wave vibration—is very different from the movement of loose or unstable bodies on the surface as caused by the arrival of the earth wave. The suddenness of vibration is an important factor determining surface disturbance. Even more important is the extent of horizontal movement as compared with vertical movement in any case supporting the underground disturbance to originate at a particular point, that point becomes the focus or center of the earthquake wave; the surface point vertically above is the epicenter. At the epicenter the wave breaks or outcrops with vertical motion; on either side outward from the epicenter the wave outcrops in a direction inclined from the vertical, that is, with a defined angle of emergence.

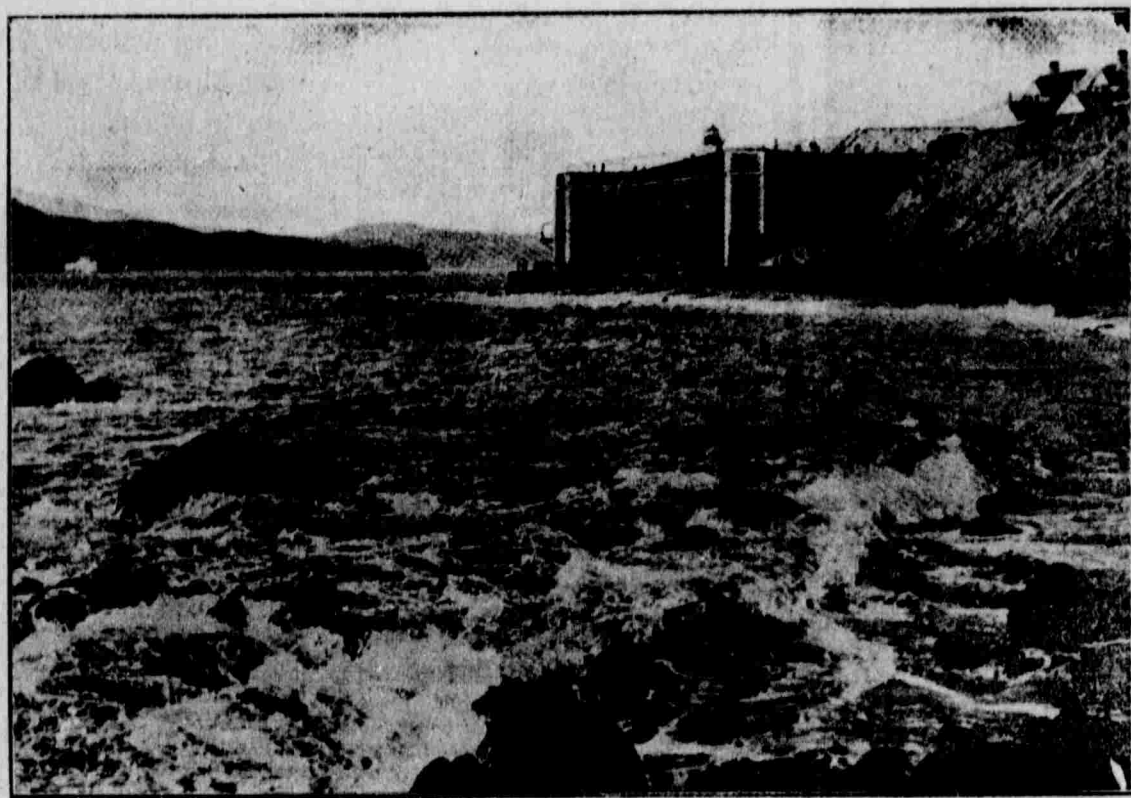
Within the area of predominant horizontal motion at the surface, destruction of buildings is most pronounced. Vertical lifting with subsequent settling is less effective in wrecking surface structures. This difference as to the relation of horizontal and vertical components of the earthquake movement at the surface has led to the recognition of a circle of principal destruction in most areas affected by disturbances of the kind. Inasmuch as the scene of earthquake origin is more frequently a place of slip rather than a point, or even a spot of small dimensions, the location of center and epicenter



WAS THE CLIFF HOUSE ALSO RUINED?

This Entrancing Spot Has Been Visited by Thousands of Utah Visitors to the Pacific Coast.

For many years one of the chief attractions of San Francisco has been the famous Cliff house, situated on Point Lobos at the entrance of the Golden Gate. Californians have been pardonably proud over the many magnificent, romantic and beautiful scenes provided by nature and themselves, and of these there has been none that called forth more universal admiration than the scene afforded from the balcony of the matchless edifice shown in this picture, and built on a cliff at the edge of the ocean about 100 feet above the water. Only a few hundred yards seaward on the left are the Seal Pools, protruding in abrupt outlines from the waves, upon which almost constantly are hundreds of sea lions, varying in size from the baby to the grizzled old head of the family, whose weight would tip the scales at 3,000 pounds. The many Utah people who have visited this beautiful spot read with regret the dispatches announcing its ruin, but were made glad again by reading further that the report has not been confirmed, and that it may yet be standing.



FORT POINT AND GOLDEN GATE ENTRANCE TO SAN FRANCISCO BAY.

to such a catastrophe as that of the date mentioned have delayed the all systematic investigation of natural conditions and specifications of the earthquake itself. Burial of the dead and help for the survivors have been of first importance since the dread occurrence. At some later time details may be determined and important facts ascertained concerning the scientific aspects of the occurrence.

THE EARTHQUAKE ITSELF.

As to earthquakes in general, however, some facts are known—learned in part by observation of past phenomena, some of which have been no less disastrous than the calamity of the current week. Excepting the insignificantly thin covering of soil and rock waste, the outer and cool portion of the earth, commonly called the crust, is a fairly rigid mass, somewhat elastic yet practically a solid body of rock. Putting aside all theory and speculation as to earth origin, we know that the interior of our globe is much hotter than the surface, and that, as a heated mass, it is slowly cooling. As a cooling body the interior is necessarily contracting. Now, as the outer shell has already cooled, and is therefore, no longer shrinking through loss of heat, this upper or outer crust cannot adapt itself to the still contracting interior except by fracture, and by down slip of the blocks so formed. But this downward slipping of parts of the crust necessitates an up-slip of other parts, since the rigid crust is larger than the contracting interior. The result is a crumpling or folding of the upper crust, and in this way folded mountain ranges are formed.

THE SLIPPING OF ROCKS.

The slipping of one crust block upon another—such movement taking place along a plane of fracture or breakage—constitutes a fault. The slip-plane may be vertical or inclined; commonly the plane is inclined between the horizontal and the vertical. Whenever such a slide or slip of crust blocks occurs, an earthquake results. The disturbance thus created is propagated outward through the elastic rock masses as a wave of translation. Such a wave may travel through a homogeneous medium with but little internal disturbance, but, as it reaches the surface, with no elastic solid to convey the oscillation farther, it dislodges and hurls all objects and bodies not sufficiently stable to withstand its force.

The surface arrival of an earth-jar, however caused, constitutes an earthquake.

If the earth wave be weak the disturbance may manifest itself as a faint earth tremor only. All gradations between feeble tremors and destructive earthquakes are recognized. It is probably true that most earthquakes of great intensity are due to faulting, or slipping and readjustment of crust-blocks as described above. Doubtless other causes produce earthquakes, such as volcanic eruptions, collapse of subterranean cavern roofs, and in fact, any underground disturbance capable of starting an earth-jar or wave.

RELATION TO OTHER MANIFESTATIONS.

As to the relation between earthquakes and other manifestations of igneous agency, many diverse opinions have been expressed. The claim that earthquakes and volcanic outbursts are but modified exhibitions of one and the same phenomenon cannot be conceded. Nevertheless, facts of record show certain and significant connection between the two. Thus, volcanic eruptions, particularly those of the explosive class—characterized by violent ejection of so-called volcanic ashes and cinders with abundance of steam rather than by quiet

may be impossible. However, from the many observations of record it is evident that the intensity of earthquake movement follows the general law of wave transit—decreasing in proportion as the square of the increasing distance from the focus.

CRACKS AND CREVICES.

One effect of earthquake disturbance is the formation of cracks, crevices and yawning fissures from the surface to varying depths. An instance is reported as resulting from an earthquake in the south island of New Zealand about the middle of the last century; here appears a fissure traceable for 60 miles, and averaging 18 inches in width. In 1891 an earthquake fissure opened in Japan, the line of fracture extending through 49 miles. Earthquake fissures and fault scarps are noted as now existing in Arizona, California and elsewhere, as the results of disturbances within the last few years. In 1872 the Inyo earthquake produced a fissure 40 miles long.

Another effect of great earthquakes is that of elevation or subsidence of the land within the affected area. The "Sunk Country" of the Mississippi valley is an area of subsidence dating

from the great earthquake of 1811. In 1855 an earthquake occurred in Chili and Patagonia, resulting in a permanent elevation of the coast line. In India a region embracing over 600 square miles was raised, and this is still known as the Mound of God; at the same time a contiguous area embracing 2,000 square miles subsided.

THE CALIFORNIA DISASTER.

As to the destructive earthquake in California during the present week, definite data must be awaited. From the few seemingly reliable reports already received it appears that the origin of the disturbance was inland, and that the direction of transit was in general parallel to the main trend of the coast range and secondary mountain ridges. The once magnificent but now devastated city of San Francisco was included within the area of pronounced horizontal motion, and therefore within the zone of great destruction. As a terrifying after-effect of the earth shock, fire started in many places and the flames have literally devoured the city. Other populous centers appear to have been wrecked by the same catastrophe.

The low-lying coastal tract west of the coast range is a region of unstable structure. Earthquakes of the first order—those directly due to faulting and readjustment of earth-blocks—are to be expected in regions of young and growing mountain ranges. The geologic history of the western part of our continent is that of successive uplifts whereby mountains have been made—range after range—pushing the coast line to the west. True there have been many local subsidences but the general course of events has been that of folding and crumpling of the strata with surface elevation. The sediments now accumulating on the marginal sea bottoms mark the sites of mountain ranges yet unborn, the land areas forming the coastal zone are particularly liable to disruption through the crumpling and folding still in progress.

REMARKABLE IN EARTHQUAKE ANNALS.

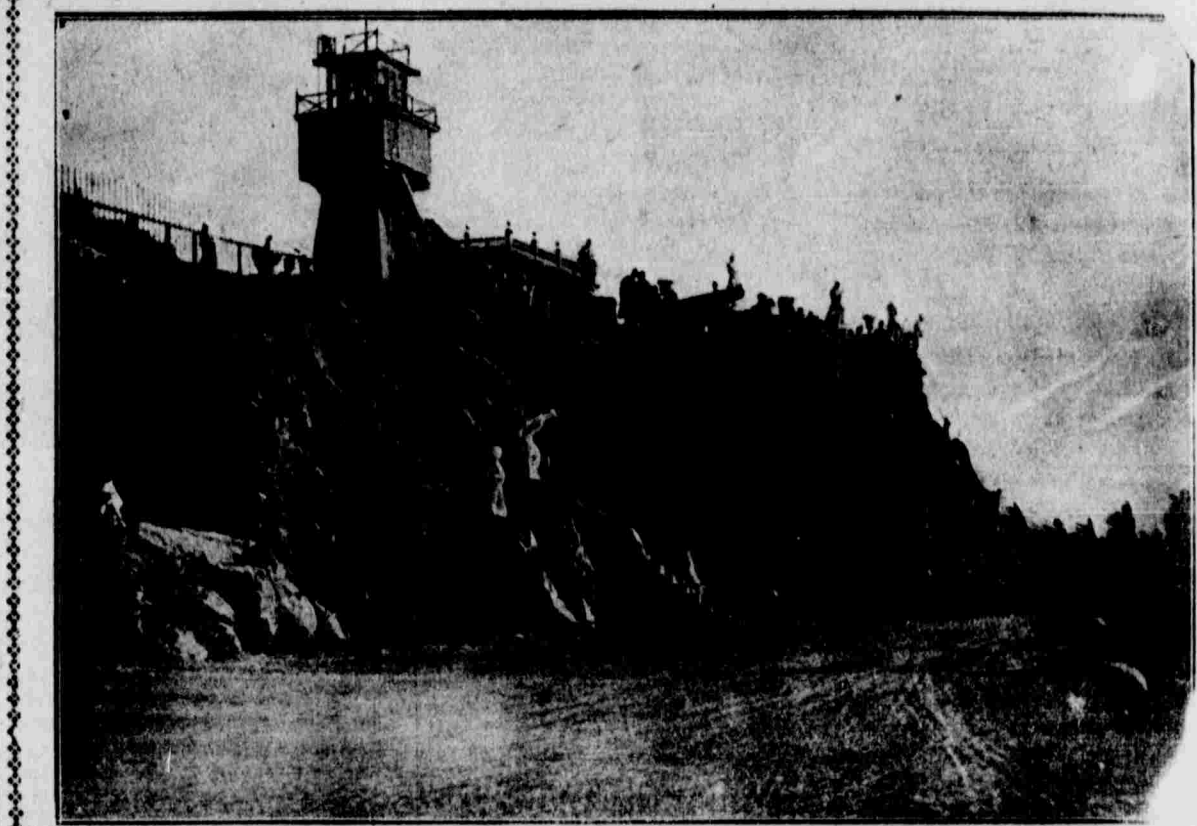
This great earthquake will be recorded in history as remarkable in several particulars. The duration of the first shock appears to have been greater than usual; the amplitude of vibration as indicated by incomplete reports and hand sketches, the terrible earthquake swing; the curving or vortice movement is described as very pronounced; moreover, the absence of all preliminary tremors and the intensity and suddenness of the main shock, if present reports be confirmed, will be noted as exceptional though not unprecedented. But beyond all such features, the terrible results in loss of human life and destruction of property will be remembered with undying emotions of sorrow and anguish.

Long as the death list is, vast as are the figures that tell the tale of ruin, the one would be longer and the other yet greater had the center of disturbance been a short distance off shore. In such a case the great sea wave, called into being by the oscillation of the sea floor, would have rolled in upon the coast with devastating force. The story of Lisbon may have been surpassed.

CAUSED BY "FAULTING" EARTH.

With the preservation and precautions already expressed in view of the dearth of accurate data, I venture the provisional and tentative opinion, that the immediate cause of the recent earthquake was the faulting and slipping of the crust area lying west of the coast range. Later shocks as secondary or after effects, were to be expected—these being due to the slipping of the newly fractured crust blocks one upon another. Thus far there is lack of evidence of a second shock as a distinct wave of independent disturbance. The earth wave thus started was observed and automatically recorded at the seismic observatories on the opposite side of the globe.

Horrible as is the story of ruin and death, crushing as is the blow



THE CELEBRATED SUTRO HEIGHTS.

Which Are Reported to Have Been Badly Rent—They Commanded a Magnificent View on the Bluff Above the Cliff House.

on mind and heart, indescribably overwhelming as the catastrophe is when viewed from the standpoint of human interests, yet as a feature of earth development it is but an ordinary and an inevitable fact. Mountains are not born without birth-throes, they grow not without motion and disturbance.

LIABLE TO READJUSTMENT.

Regions of accumulating sediments, and areas of young and rising ranges, are particularly liable to crustal rupture. While the time of disruption and readjustment cannot be predicted, the fact that such disturbances shall surely occur may be confidently affirmed. The stages of geologic growth have not been completed, there or elsewhere. We cannot say when, but sometime surely other convulsions will visit the coast, for the continent is still growing and adjustments are inevitable.

MAY OCCUR IN UTAH.

Suggested doubtless by the last California disaster questions have been raised as to the condition of our own region with respect to prospective disturbances by earthquakes. In this connection certain fateful predictions by geologists who have studied the local area are called to mind. The western face of the Wasatch range marks the course of a great fault plane, the mountain mass having risen with reference to the down-throw valley section. The Wasatch mountains are yet rising; evidences of fracture of geologically recent date are abundant. Minor fault scarps fresh and jagged appear at intervals along the foot hills. Upward motion of the range is not continuous, nor does any one displacement necessarily affect the entire range. Growth is accomplished by localized and intermittent up-lift.

Dr. Grove K. Gilbert of the United States geological survey has expressed the opinion that earthquake movements are to be expected in the valleys lying immediately west of the Wasatch range. The fact that the valley floors are already fractured by fault planes inspire the hope that the gentle movements so frequently occurring along these planes may prevent sudden and destructive dislocations.

MAYOR SCHMITZ ASKS FOR BLANKETS, COTS AND BEDDING

San Francisco, April 21.—Mayor Schmitz has sent a letter to the mayors of Los Angeles, Stockton, Sacramento, Portland, Seattle and Salt Lake asking that blankets, cots and bedding, the need of which is imperative, be shipped immediately.

TO PAY FIRE LOSSES.

British Companies Will Pay as Soon as Losses Are Adjusted.

New York, April 21.—The North British Mercantile Fire Insurance company has instructed its New York representatives to pay losses sustained in San Francisco disaster as soon as they are adjusted.

The Liverpool and London and Globe Insurance company has taken similar action.

SHOCK FELT IN MOSCOW.

Moscow, April 21.—Practically simultaneously with the San Francisco earthquake a slight shock was felt here. The seismograph in the Moscow university registered that the disturbance almost to the hour of its occurrence.

ALBERT MCCORMICK IS SAFELY HOME.

He Witnessed Many Scenes Entirely Too Terrible to Describe.

THEN ESCAPED TO OAKLAND.

Suffering of People For Lack of Food And Drink Was Frightful in The Extreme.

Albert McCormick, son of W. S. McCormick, reached home late yesterday afternoon from Oakland, safe and sound, to the great relief of his family. He says he was sleeping on the second floor of the Palace hotel when the shock came, and he was awakened by the cracking of the building. Then he saw the ceiling in motion, and his valise appeared to be executing a dance over the floor. With the plaster dropping on his head he hurried on his clothing, picked up a few of his effects, and made for the street, as he heard women screaming and throngs of people hurrying to and fro. Mr. McCormick made his way to the Lufkord hotel and went to bed again. He woke up again at 11 o'clock amid shouts of "Fire!" Then the Salt Lake got up and saw scenes of the street he felt entirely unable to describe. Buildings

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SWEET CANDY COMPANY, Makers.

YOUNG FAMILY REUNION.

Arrangements for Birthday Anniversary Celebration Were Discussed.

Members of the Young family reunion, to the number of nearly 100, attended a meeting of that organization last evening at the Lion House. Arrangements for celebrating the birthday anniversary of president Brigham Young were under discussion. It has been decided to issue a publication to be called the Young

Magazine, to make its appearance quarterly. Richard W. Young was chosen as chairman of the historical and publication committee, which will have charge of the magazine. An amendment to the constitution of the Young Family association was adopted, providing that hereafter the officers shall be honorary members. As such Dr. Seymour B. Young and Franklin W. Young were last night voted upon. Mrs. Susan Young Gates was appointed chairman of the Temple work committee, the other members being Don Carlos Young, Mrs. Young Sanborn and Mrs. Myra Young Rosseter.

The association's officers at present are: B. Morris Young, president; Oscar B. Young, vice president; Doris Young Hagah, secretary; Russell Y. Rosseter, treasurer.

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Manufacturers and Merchants Association Endorses Hewlett's THREE CROWN PRODUCTS

Here is what Mr. Gordon H. Place, the manager, says of them: Hewlett Bros. Co., City:

Gentlemen—I have received from the State Chemist, Herman Harms, copies of the results of his findings in the analyses of the following food products manufactured by your firm:

"Three Crown Coffee."
"Three Crown Baking Powder."
"Three Crown Extracts."
"Three Crown Spices."
"Golden Grain Cereal Coffee."

I am glad to advise you that these analyses have demonstrated that the goods specified are STRICTLY HIGH GRADE, ABSOLUTELY PURE, and MEET ALL THE REQUIREMENTS OF THE UTAH PURE FOOD LAW.

Upon this excellent showing I am pleased to give you authority to use the official label of the Manufacturers and Merchants Association of Utah upon all lines specified and to recommend these goods as being worthy of the consumers' patronage.

Yours very truly,
GORDON H. PLACE, Manager.
Manufacturers and Merchants Association of Utah.

Subject of a Hospital Clinic

Doctors Differed--Pale, Weak, Helpless, Hopeless--Poor, Thin Blood the Undoubted Cause.

Now Does Her Own Housework and Gladly Tells What Cured Her.

"Nashua, N. H., Jan. 10, 1906.

"I regard it my duty to let you know what Hood's Sarsaparilla has done for me. I acknowledge without the slightest hesitation that

Hood's Sarsaparilla Has Saved My Life

As to the nature of my disease there was a difference of opinion among the doctors, but the original trouble was undoubtedly anemia or lack of blood. I tried one thing and then another without effect and I grew very poor and pale. One day a physician who had been treating said to my husband, 'If this medicine does her no good get another doctor or stop giving her medicine.' His medicine did me no good. I had several other doctors. I was finally taken to the Massachusetts General Hospital. The hospital physicians studied my case and I was made the subject of a lecture. They said there was no help for me and took me back home. The only food I could retain was raw eggs. I could not sit up. My sister saw an account in a newspaper of a case similar to mine of a woman who was cured by Hood's Sarsaparilla. She persuaded me to try this remedy. The first dose I took was a teaspoonful. After I had taken it for about two weeks I felt that I



could eat. My appetite improved until I could take five eggs a day. Within three months I was so much better that I could eat almost any kind of food and was able to go out of doors. I continued taking Hood's Sarsaparilla until I was well. I now do my own housework. I am glad indeed to let the world know of the wonderful medicine which has saved my life. I hope my letter may be of service to some other sufferer." Mrs. F. H. Salisbury, R.F.D., No. 2, Nashua, N. H.

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