THE

FAMINES OF THE WORLD:

PAST AND PRESENT.

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BY

CORNELIUS WALFORD, F.I.A., F.S.S., F.R.H.S.,

ETC., ETC.,

BARRISTER-AT-LAW,

AUTHOR OF "INSURANCE CYCLOPÆDIA," ETC., ETC.

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CONTENTS:

My present subject has at once the advantage and the disadvantage of being novel. I do not find that any previous writer has deemed the subject of famines worthy of careful investigation. I could not find, when I required to write upon the subject some two years ago, that even a list of the famines which had occurred in the history of the world, so far as we know of that history, had been compiled. I then made the chronological table, which I shall presently give, as a first effort in this direction. I felt that it must necessarily be incomplete. I have since added to it, and begin to hope that it is now sufficiently matured to be presented to this Society.

It is not so much a mere table of famines, instructive as I venture to think such records are, when compiled with any view to completeness, that I desire to bring before you this evening. There are many direct and indirect considerations arising out of the subject, which naturally commend themselves for elaboration. Anything affecting the food supply of the people has always been regarded as of importance here. Famines too often affect the very existence of the peoples among whom they occur. A table of the total deaths resulting from famines, even in one generation of men, would present a terrible picture. This can never be presented: the materials for its compilation nowhere exist. I know of no more terrible contemplation than that of the starvation of large numbers of our fellow creatures. Some writers have appeared to look upon famines as furnishing one of the necessary checks, upon what they

would term the inordinate growth of population; and in that sense as being one of the means devised for the regulation of the universe. Such a view appears to me to be altogether incompatible with any ideas of Divine wisdom: it can only be such a clumsy and cruel expedient, as might be resorted to in the working out of a design wherein wisdom had taken no part. The occurrence of famines would appear to me to be likely to result rather from the failure of human means and foresight in many instances than otherwise. In my table I have been careful to note the assigned cause wherever the records furnish any. I think it will be convenient at this point to present the table. It takes us at once from the domain of speculation into that of history. The authorities from which the materials of the table were drawn, are so numerous that it is impossible, except occasionally, to make any reference to them.

TABLE I.—*Chronology of Famines.*

B.C.	
	The Scriptures speak of several famines which had been in Palestine and in the neighbouring countries, as that in the time of Abraham (Gen. xii, 10), and again in the time of Isaac (Gen. xxvi, 1).
1708	*Egypt.* The seven years' famine (Gen. xli, 27) began this year. It was not confined to Egypt, but extended to Palestine at least, if not further. *Vide* v. 56.
503–443	*India.* During the reign of the Emperor Jei-chund, extending over this period, there was a great pestilence and famine.
493	*Rome.* Visited by a famine.
436	„ Famine. Thousands threw themselves into the Tiber.
A.D.	
6	*Rome.* Famine.
10–15....	*Ireland.* A general fruitlessness, giving rise to famine and great mortality.
42	*Judea.* "Desolated by a famine."
51	*Greece.* Famine.
54	*England.* Grievous famine.
76	*Ireland.* Great scarcity.
104	*England and Scotland.* Famine.
107	*Britain.* From long rains.
119	„ "After a pillar of fire seen several nights in the air."
151	*Wales.* Grievous.
160	*England.* Multitudes starved.
173	„ After severe frost and snow.
175	*Rome.* Famine.
192	*Ireland.* General scarcity; bad harvest; mortality and emigration, "so that lands and houses, territories and tribes, were emptied."—First notice of emigration.
228	*Scotland.* "Thousands were starved."
238	„ "Most grievous.
259	*Wales.* Thousands were "pined to death."
272	*Britain.* People ate the bark of trees and roots.
288	„ Famine all through.
298	*Wales.* After a comet.
306	*Scotland.* Thousands died; "most grievous and fatal" for four years.—SHORT.
307	*Asia Minor.* A famine prevailed in Cappadocia.
310	*England.* 40,000 perished. [SHORT gives this in A.D. 338 (?) 308.]
325	*Britain.* Generally, severe famine.

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
331	*Antioch.* This city was afflicted by so terrible a famine that a bushel of wheat was sold for 400 pieces of silver. During this grievous distress Constantine sent to the Bishop 30,000 bushels of corn, besides an immense quantity of all kinds of provisions, to be distributed among the ecclesiastics, widows, orphans, &c.—*Ency. Brit.*
336	*Syria.* Also plague.
370	*Phrygia.* Awful famine.
381	*Antioch.* Reign of Theodosius the Great, again visited by a famine, "accompanied with a grievous plague;" also "terrible" famine amongst the Goths.
410	*Rome.* Followed by a plague.
434	*Italy.* Famine.
439	*Britain.* After a comet.
446	*Constantinople.* Severe famine.
450	*Italy.* When parents ate their children.—DUFRESNOY.
466	*Britain.* "And bad fatal air."—SHORT.
475	*Northern Nations.* A famine, partly from locusts.
480	*Scotland.* After a comet.
484	*Africa.* From drought.
515	*Britain.* "Most afflictive."
520	*Venice.* A famine. The city relieved by Theodoric the Great.
523	*Scotland.* "Terrible."
527	*North Wales.* Famine.
531	*South Wales.* And a small plague.
535	*Ireland.* Destruction of food and scarcity, lasted four years.
537	*Scotland.* Dearth; also in *Wales.*
538	*Italy.* Great famine.
547	„ Famine.
576	*Scotland.* "Fatal."
590	*England.* From a tempest that raised a great flood.
592	„ Drought from 10th January to September; and locusts.
600-604	*France.* Famine.
605	*England.* From heat and drought.
625	*Britain.* Grievous.
664	*Ireland.* Great famine preceding second appearance of *Buidhe Chonnaill.*
667	*Scotland.* Grievous.
669	*France.* Great famine.
669	*Ireland.* Great scarcity; and in following year.
680	*Britain.* From three years' drought.
683	*Syria and Libya.* Famine.
695	*England* } Famine and pestilence during three years, "so that men
700	*Ireland* } ate each other."
703	*Italy.* Three years' famine.
712	*Wales.* Famine.
718	*Syria.* Famine.
730	*England, Wales, and Scotland.* Great famine.
746	*Wales.* Dearth.
748	*Scotland.* Famine.
759	*Ireland.* Great famine throughout the kingdom; and more or less for several years.
768	*Ireland.* Famine and an earthquake.
772	„ Famine from drought.
774	*Scotland.* "With plague."
791	*Wales.* Grievous.
792	*Scotland.* Dearth.
793	*England.* "After many meteors;" and in other parts of the world.
803	*Scotland.* "Terrible."

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
822-23....	*England.* "Thousands starve;" also in *Scotland*, according to SHORT.
824-25....	*Ireland.* Great dearth.
836	*Wales.* "The ground covered with dead bodies of men and beasts."—SHORT.
845	*Bulgaria.* Great famine.
850	*Paris.* Famine prevailed.
851	*Italy and Germany.* Famine.
856	*Scotland.* A four years' famine began.
863	„ With a plague.
868	*Paris.* Suffered again from famine.
872	*England.* "From ugly locusts."
873	*Paris.* Suffered again from famine.
879	*Universal* famine prevailed.
883	*Italy.* "Terrible."
887	*England.* "Grievous two years."
890	*Scotland.* Great dearth.
895-97....	*Ireland.* Famine from invasion of locusts.
896-99....	*Paris.* This city again suffers from famine.
898	*France.* "Sore famine."
900	*England.* Famine.
931	*Wales.* Famine.
932	*France.* Famine.
936	*Scotland.* After a comet; four years, "till people began to devour one another."—SHORT.
945-46....	*France.* Famine.
946	*Italy.* "Shocking."
954	*England, Wales, and Scotland.* Great famine, which lasts four years.
962	*England.* Famine caused by frost.
963-64....	*Ireland.* An intolerable famine, "so that parents sold their children for food."
968	*Europe.* Chiefly *Germany* and *Scotland.*
969	*England.* "All grain burnt by the winds."—SHORT.
975	*Paris.* A great number of inhabitants carried off by famine.
„	*England.* Famine scoured the hills.
976	„ This was the "great famine," *micla hungor.*—JOHN OF BROMPTON.
987	*Albania.* Dearth.
988	*England.* From rains and barren land.
989	„ "Grievous, from a rainy winter; bad spring; neither ploughing nor sowing; snowy harvest."
1004	*England.* "Such a famine prevailed as no man could remember."
'05	„ "This year was the great famine in England." Sweyn the Dane quits in consequence.
'08	*Wales.* Attended with plague.
'12	*England—Germany.* Endless multitudes died of famine.
'16	*Europe.* Awful famine throughout Europe. "Hails, thunder, and lightning."—SHORT.
'22	*Hindustan* (reign of Mussood I). Great drought followed by famine: whole countries entirely depopulated. This year was remarkable for drought and famines in many parts of the world.—DOW'S *Hindustan.*
'25	*England.* From rains, and plague.
'31	„ From great rains and locusts.—SHORT.
'35	*Byzantine Empire.* Visited by famine.
'42	*England.* About this time such a famine came on that a sextarius of wheat, which is usually a load for one horse, sold for 5 solidi and more.—HENRY OF HUNTINGDON. Lasted seven years.
'47	*Ireland.* Great famine and snow; also in *England*, from snow and frost.

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
1047–48	*Scotland.* Famine extending over two years.
'50	*England.* Great famine and mortality; from barrenness of the land.
'51	*Mexico.* Famine which caused the Toltecs to migrate.
'52–60	*Hindustan.* There was seven years' drought in Ghor [? Ghore, supposed to be one of the earliest seats of the Afghan race], so that the earth was burned up, and thousands of men and animals perished with heat and famine.—DOW'S *Hindustan.*
'53	*England.* Famine after a comet; lasted two years.
'58	*Poland.* Grievous famine.
'64	*Egypt.* For seven successive years the overflow of the Nile failed, and with it almost the entire subsistence of the country; while the rebels interrupted supplies of grain from the north. Two provinces were entirely depopulated; in another half the inhabitants perished; while in Cairo city (El-Káhvich), the people were reduced to the direst straits. Bread was sold for 14 dirhems to the loaf; and all provisions being exhausted, the worst horrors of famine followed. The wretched resorted to cannibalism, and organised bands kidnapped the unwary passenger in the desolate streets, principally by means of ropes furnished with hooks and let down from the latticed windows. In the year 1072 the famine reached its height. It was followed by a pestilence, and this again was succeeded by an invading army.—*Encyclopædia Britannica*, Art. Egypt.
'68	*England.* Famine and plague after a severe winter.
'69	„ Normans desolated England, and in the following year famine spread over the northern counties of England, "so that man, driven by hunger, ate human, dog, and horse flesh;" some to sustain a miserable life sold themselves for slaves. All land lying "between Durham and Yorke lay waste, without inhabitants or people to till the ground, for the space of nine years, except only the territory of St. John of Bewlake" [Beverley]. "Divers other parts of his realm were so wasted with his wars that for want both of husbandry and habitation, a great dearth did ensue, whereby many were forced to eat horses, dogs, cats, rats, and other loathsome and vile vermin; yea, some abstained not from the flesh of men. This famine and desolation did specially rage in the north parts of the realm."—*Harleian Miscellany*, III, p. 151.
'73	*England.* Famine, followed by mortality so fierce that the living could take no care of the sick, nor bury the dead.—HENRY OF HUNTINGDON.
'78	*Constantinople.* "From the multitudes of strangers."—SHORT.
'80	*Denmark.* Famine.
'86	*England.* A great murrain of animals, and such intemperate weather that many died of fever and famine.—HENRY DE KNYGHTON. Excessive rains.—SHORT.
'87	*England.* Pestilence followed by famine; great suffering.
'87	*Denmark.* King Olaf II, surnamed the "Hungry," in consequence of famine in his reign.
'93	*England.* Great famine and mortality.—STOW.
'96	„ "Heavy-timed hunger that severely oppressed the earth."—*Saxon Chronicle.* Summer rain, tempests, and bad air.—SHORT.
'99	*England.* Famine from rains and floods.
1100	*Antioch.* Famine.
'06	*England.* From barren land; then plague.
'11	„ Winter long and very severe; great scarcity followed.
'16	*Ireland.* Great famine, "during which the people even ate each other."
'17	*England.* From tempest, hail, and a year's incessant rains.
'20	*Jerusalem.* "Plague of mice and locusts."—SHORT.
'21–22	*England.* "Great famine from long and cruel frosts."

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
1123–24	*France and Germany.* Famine from terrible weather; "greatest plague."—SHORT.
'24	*England.* "Such a famine prevailed that everywhere in cities, villages, and cross-roads lifeless bodies lie unburied." "By means of changing the coine all things became very deere, whereof an extreame famine did arise, and afflict the multitude of the people, even to death."—PENKETHMAN.
25	*England.* Great flood on St. Lawrence's Day; famine in consequence of destruction of crops, &c.
'26	*England.* Incessant rains during the summer, "when followed in all England a most unheard of scarcity. A sextarius of wheat sold for 20*s.*"
'30–31	*Rome.* Great famine.
'35–37	*England.* Great drought and famine.
'41	„ Famine, said to have lasted twelve years.—SHORT.
'46	*France.* Famine.
'51–52	*Europe and Palestine.* Famine.
'53	*Ireland.* Great famine raged in Munster, and spread all over Ireland.
'54	*England.* From rains, frost, tempest, thunder, and lightning.
'57	*Italy.* After great snow and frost.
'62	Said to have been a great famine all over the world.
'75	*England.* Pestilence, followed by great dearth.
'76	*Wales.* A great famine and mortality.
'83	*England and Wales.* A great famine severely afflicted both England and Wales.
'88	*Ireland.* Great scarcity of food in north of Ireland.
'93–96	*England, France.* Famine occasioned by incessant rains. "The common people (*vulgus pauperum*) perished everywhere for lack of food; and on the footsteps of famine the fiercest pestilence followed, in the form of an acute fever."—WALTER HEMINGFORD.
1200	*Ireland.* "A cold, foodless year."
1200	*Egypt.* Famine of great severity from deficient rise of the Nile.
'03	*England.* A great mortality and famine, from long rains.
'03	*Ireland.* A great famine—"so that the priests ate flesh meat in Lent."
'09	*England.* Famine from a rainy summer and severe winter.
'24	„ A very dry winter and bad seed-time, whence followed a great famine.
'27	*Ireland.* A great famine throughout the country.
'30	*Rome.* After a deluge of the Tiber.
'35	*England.* Famine and plague; 20,000 persons die in London; people eat horseflesh, bark of trees, grass, &c.—SHORT.
'39	*England.* Great famine, "people eat their children."—SHORT.
'43	*Hungary.* Great famine from Tartar invasion.
'48	*Germany.* Famine.
'52	*England.* "By reason of embasing the coin a great penury followed." „ No rain from Whitsuntide to autumn; no grass; hence arose a severe famine; great mortality of man and cattle; dearness of grain and scarcity of fruit.
'57	*England.* The inundations of autumn destroyed the grain and fruit, and pestilence followed.
'58	*England.* North winds in spring destroyed vegetation; food failed, the preceding harvest having been small, and innumerable multitudes of poor people died. *Fifty shiploads of wheat, barley, and bread were procured from Germany;* but citizens of London were forbidden by proclamation against dealing in same. "A great dearth followed this wet year pest, for a quarter of wheat was sold for 15*s.* and 20*s.*, but the worst was in the end; there could be none found for money when—though many poor people were constrained to eat barks of trees and horseflesh; but many starved for want of food—20,000 (as it was said) in London."—PENKETHMAN.

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
1262	*Ireland.* Great destruction of people from plague and hunger.
'68	*Sicily.* Terrible famine; also in *Vienna.*
'71	*England.* A violent tempest and inundation, followed by a severe famine in the entire district of Canterbury.
'71	*Ireland.* Pestilence and famine in the whole of Ireland.
'81	*Poland.* Famine.
'86	*England.* Short speaks of a twenty-three years' famine commencing this year.
'89	*England.* A tempest destroyed the seed, and corn rose to a great price.
'91	*India.* No rain fell in the provinces about Delhi, and there was in consequence a most terrible famine.—*Vide* BIENI'S *Hist. of Feroze.*
'94	*England.* Severe famine; many thousands of the poor died.
'95	„ No grain or fruits, "so that the poor died of hunger."—CAMDEN. Hail, great concussion of elements.—SHORT.
'95	*Ireland.* Great dearth during this and the previous and following years.
'97	*Scotland.* "Calamitous" famine and pestilence.
'98	*England.* 26 Edward I. "A great famine in England, chiefly want of wine; so that the same could scarcely be had to minister the communion in the churches."—PENKETHMAN.
'99	*Persia* ravaged by famine and pestilence.
1302	*England, Scotland, Ireland.*—Famine.
'14	„ Grains spoiled by the rains. Famine "so dreadful that the people devoured the flesh of horses, dogs, cats, and vermin." Parliament passed a measure limiting the price of provisions.
'14	*Ireland.* Famine and various distempers.
'14	*Thuringia, Poland, Silesia.* Lasted years in *Lithuania.*
'16	*England.* Universal dearth, and such a mortality, particularly of the poor, followed, that the living could scarcely bury the dead. Royal proclamation: no more beer to be made.
'16	*Ireland.* Great dearth. Eight captured Scots eaten at siege of Carrickfergus.
'17	*Ireland.* A great famine throughout the country in consequence of Bruce's invasion.
'21	*England.* Famine again; this is regarded by some writers as the last serious famine in this country.
'32	*Ireland.* A peck of wheat sold for 22*s.*
'35	*England.* Famine occasioned by long rains.
'36	*Scotland.* Desolated by a famine.
'37	*China.* A famine occasions a pestilential epidemic.
'39	*Ireland.* A general famine.
'41	*England, Scotland.* Great dearth in this and following year. People ate horses, dogs, cats, &c., to sustain life.—HOLINSHED.
'42	*India.* Famine in Delhi, very severe; few of the inhabitants could obtain the necessaries of life.
'44–45	*India.* A famine, supposed to have extended more or less over the whole of Hindustan. Very severe in the Deccan. The Emperor Mahommed, it is said, was unable to procure the necessaries for his household.—DOW'S *Hindustan.*
'47	*Italy.* A dreadful famine which swept away by absolute starvation vast numbers of the inhabitants; and in the following year a pestilence of a deadly nature swept the peninsula. "Such was the sufferings produced by these visitations that it was calculated that two-thirds of the whole population were destroyed." War followed. *Encyclopædia Britannica,* Art. Italy.
'50	*Barbary.* Grain exported from *England,* causing dearth here.
'53	*England, France.* Great famine.—RAPIN.
'55	„ Great scarcity; grain brought from *Ireland* afforded much relief.

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
1358	*England.* "A great dearth and pestilence happened in England, which was called the second pestilence."—PENKETHMAN.
'61	*Poland.* Famine.
'69	*England.* Great pestilence among men and larger animals; followed by inundations and extensive destruction of grain. Grain very dear.
'74–75	*Italy.* Famine.
'90	*England.* Great famine arising from scarcity of money to buy food.
'92	„ Great scarcity for two years; people ate unripe fruit, and suffered greatly from "Flux." The Corporation of London advanced money and corn to the poor at easy rates.—STOW. Short attributes the famine of these three years to the "hoarding of corn." Penkethman gives further details regarding the assistance rendered by the Corporation of London, as follows: "The Mayor and Citizens of London took out of the Orphan's chest in their Guild-hall, 2,000 marks to buy Corn and other Victualls from beyond the sea; and the Aldermen each of them layd out 20 pound to the like purpose of buying Corn; which was bestowed in divers places, where the poore might buy at an appointed price, and such as lacked money to pay doune, did put in surity to pay in the yeare following: in which yeare, when Harvest came, the fields yielded plentifull increase, and so the price of Corne began to decrease," p. 68.
1410	*Ireland.* "A great famine."
'12–13	*India.* Great drought, followed by famine, occurred in the Ganges-Jumna delta.
'27	*England.* Famine from great rains.
'29	*Scotland.* Dearth.
'33	*Ireland.* Famine of great severity.
'37–38	*England.* Wheat rose from its ordinary price of 4*s.* to 4*s.* 6*d.* per quarter to 26*s.* 8*d.* Bread was made from fern-roots.—STOW. Rains and tempests.—SHORT.
'38	*England.* "In the 17th yeere of Henry the Sixt, by meanes of great tempests, immeasurable windes and raines, there arose such a scarcitie that wheat was sold in some places for 2 shillings 6 pence the bushell."—PENKETHMAN.
'39	*England* (18 Hen. VI). "Wheat was sold at London for 3*s.* the bushell, mault at 13*s.* the quarter, and oates at 8*d.* the bushell, which caused men to eat beanes, peas, and barley, more than in an hundred years before: wherefore Stephen Browne, then maior, sent into *Pruse* (Prussia), and caused to be brought to London many ships laden with rye, which did much good; for bread-corne was so scarce in England that poor people made their breade of ferne rootes."—PENKETHMAN.
'40	*England.* A scarcity. *Scotland.* A famine.
'42	*Sweden.* A famine.
'47	*Ireland.* Great famine in the spring.
'71	*India.* A famine in Orissa.
'86	*England.* "Famine sore."
'91	*Ireland.* Such a famine that it was called "The Dismal Year."
	England. Considerable scarcity.
'94	„ Great scarcity and high prices.
'95	*India.* A great dearth occurred about this date in Hindustan.
'97	*Ireland.* "Intolerable famine throughout all Ireland—many perished."
1521	*England.* Famine and mortality. "Wheat sold in London for 20*s.* a quarter."
'21	*India.* A very general famine in Sind.
'22	*Ireland.* A great famine.
'23	*England.* Severe famine.
'27	„ (19 Hen. VIII). "Such scarcitie of bread was at London and throughout England that many dyed for want thereof. The

TABLE I.—*Chronology of Famines—Contd.*

A.D.	
	North China—Contd.
1877-78	means of keeping body and soul together. The memorialist, his heart wrung with despairing pity, cannot but ask why has a calamity so awful as this been visited upon the people. He can only ascribe it to his own failure in the due discharge of his duty, and he feels that his shortcoming admits of no excuse. In reply, the Grand Council has received a rescript expressing profound sympathy with the sufferings of the people as reported in this memorial, and directing that all that is possible for their relief be done, in consultation with the governor of the province."
	Note.—The Empire of *China* has long been subject to the most serious famines; but of these we have found no details available.
'78	*Morocco.* A correspondent of the *Jewish World*, residing at Mogador, and carrying on business in that city as a merchant, writes:—"I regret to say that from want of rain the southern part of Morocco, comprising the provinces of Soos, Haha, Antuga, and the Morocco districts, is suffering from famine, every description of food being exceedingly scarce, and the pauper population of Mogador, always disproportionately large, forming about one-third of its entire inhabitants, is being rapidly increased by numerous famished Jewish and Moorish families from the adjacent districts. It is a fearful sight to see some of them—mere living skeletons. The Jews are behaving well, and have collected large sums and distributes them; they have now agreed to pay a tax of 3½*d.* on every package of food and grain imported, and the money is being distributed weekly among the Jewish poor. The Moors, poor creatures, get no assistance from the Government, and little or nothing from their co-religionists; they are mainly dependent upon the charity they receive from the Jews and a few Christians. Unless this Government quickly does something to assist the sufferers, I fear that the limited resources of the merchants here will necessarily fail under the continual drain, and render them unable to assist the increasing number of poverty-stricken people. There is no kind of business now doing, except in articles of food, and consequently the working classes have nothing to do. They are selling their clothes and furniture to obtain food, and when these have gone the amount of destitution will be increased. I fear, unless relief comes from the Government here, or from some charitably-disposed persons, that I shall have to relate the most distressing accounts. Already some cases of actual starvation have occurred among the Moors. If you could see the terrible scenes of misery—poor starving mothers, breaking and pounding up bones they find in the streets, and giving them to their famished children—it would make your heart ache. Raise a few pounds if you can, and if you can do so lay it out in rice at the wholesale brokers, and have it shipped by the steamers leaving England."
'78	*Cashmere.* Severe famine, regarding which, however, no exact details have come to hand.

It is seen from the preceding table (which includes in the whole over 350 famines in various parts of the world) that famines have given rise to several of our more important and distinctive institutions—as the POOR LAW in England in 1586, and its equivalent in India in 1781-83; as to Government RELIEF WORKS, *vide* famine in India in 1790-92, since followed out in various parts of the empire.

But in truth they gave rise to our CORN LAWS, see first record of importation of grain during the famine, 1258. I expect to be able

to show, in a later part of this paper, that famines gave rise to imperial restrictions on the price of FOOD as early as about the twelfth century. The literature of famines will be passed under review in the second portion of this paper. The subject of *Indian famines*, which occupy such a prominent place during the last century of the table, will be spoken of specially later in this paper.

Enumeration of the Causes of Famines.

A careful analysis of the preceding table, and of the authorities from which it is compiled, reduces the causes of famines to the following :—

1. RAIN, by excess of which, producing FLOODS, the soil becomes saturated, and decomposition of the seed is produced.

2. FROST, whereby either the process of sowing is retarded, or rendered impossible, or the vitality of autumn-sown seed becomes destroyed; whereby also the transport of grain was in former periods rendered impossible.

3. DROUGHT, whereby the natural moisture essential to vegetable production is withheld from the soil.

4. METEOROLOGICAL PHENOMENA, other than the preceding, as comets, hail, earthquakes (the latter frequently leading to irruptions of the sea, &c.).

5. INSECTS, as locusts, grasshoppers, ants, &c. VERMIN, as rats, &c., destroying vegetation.

6. WAR, whereby cultivation is prevented, or the crops wilfully destroyed, or, as to particular towns and localities, where a blockade has been established.

7. DEFECTIVE AGRICULTURE, arising either from ignorance, indifference, or unsuitability of climate or location.

8. DEFECTIVE TRANSPORT, or bad roads, want of canals, or shipping, or wilful obstruction.

9. LEGISLATIVE INTERFERENCE, whereby the natural course of supply and demand has been interfered with or interrupted.

10. CURRENCY RESTRICTIONS, including debasing the coin, whereby either direct or indirect influences may be brought into play.

11. SPECULATION, known technically as "engrossing," whereby the necessary supply of food for the people has been "forestalled."

12. MISAPPLICATION OF GRAIN, such as its excessive use in brewing, distilling, or by burning, whether wilfully or by misadventure.

At a first glance these causes arrange themselves into two entirely distinctive divisions:—1. NATURAL CAUSES, or those beyond human control. 2. ARTIFICIAL CAUSES, or those within human control. The first five causes named rank almost entirely under the first division. The remainder are all subject to human control, although

not always immediately so, at least by those most affected at the moment. I shall deal with the natural or unavoidable causes first.

1. RAIN.—In temperate climates like our own, an excess of rain very frequently leads to famine. The ground becomes sodden, and it is thus impossible to get upon it for purposes of efficient cultivation; or the seed having been deposited, is destroyed. Or again, if the rainfall be in the latter half of the year, the grain is not sufficiently ripened for the harvest; or if it shall have been cut, then it becomes stacked without being properly dried, by which means mildew is engendered, and it moulders and spoils. It is remarkable to notice what a large proportion of the famines in the three divisions of the United Kingdom have been occasioned by rains. Improved cultivation of the land, as good drainage, &c., lessen these evils.

Unfortunately in this country we have no meteorological records by which the rainfall over any lengthened period of time can be ascertained. In the absence of these, I am driven to another expedient, and this is to bring into requisition a table of *floods*. The effect of this table is to widen our view of the causes from which famines may arise and have arisen. Many of the statistical details contained in this table have a value quite apart from any immediate bearing upon famines. I have extended it to all parts of the world, in order that its range may be identical with that of the famine table.

TABLE II.—*Of the Floods and Inundations of the World.*

B.C. Date not fixed.	The *Deluge*, the first mention of which occurs in Gen. iv, 7—22, where is described the directions received by Noah relative to the construction of the ark. The commencement of the Flood is related in Gen. vii, 10—12. The waters increased for 40 days (*v.* 17), and remained upon the earth 150 days (*v.* 24), at the end of which time the ark rested on the mountain of Ararat (Gen. viii, 4). This was regarded by the narrators of the event as a general deluge—a fact now very much doubted on scientific grounds. The date of the occurrence ranges according to the estimates of different authorities from B.C. 3246 down to B.C. 2104.—TOWNSEND'S *Dictionary of Dates.*
1760	*Attica* (Greece). A flood known as the Deluge of Ogyges. It was occasioned by the sea being driven in by winds, and is sometimes spoken of as the "Second Deluge."
1504	*Deucalion* (Greece). Great flood from rain, which extended all through Thessaly. It is sometimes spoken of as the "Third Deluge."
322	*Ephesus* (Asia Minor) was destroyed by an inundation. Rebuilt on a more elevated site B.C. 300.
241	*Rome.* The overflowing of the Tiber is said to have swept away all the houses and buildings in the lower part of the city. The river overflowed again B.C. 54 and 27. (See A.D. 15.)
A.D.	
7.....	*England.* Great flood in valley of the Thames; many persons drowned, and cattle destroyed.
9.....	*England.* Great overflow of Humber, flooding the country all round.

TABLE II.—*Of the Floods and Inundations of the World—Contd.*

A.D.	
14	*England.* Overflow of Severn; great damage.
15	*Rome.* The Tiber again overflowed, and did such serious damage that it was proposed in the Senate to diminish its waters by diverting some of the chief tributaries. (B.C. 241.)
29	*England.* Great overflow of the Trent.
33	„ Overflow of the Dee; great damage done to Chester.
37	„ Medway overflowed, and drowned many cattle.
48	„ The Thames overflowed, the waters extended through four counties; 10,000 people drowned, and much damage to property.
68	*England.* Volcanic eruption, followed by inundation of sea. Isle of Wight separated from Hampshire.
80	*England.* Great overflow of the Severn, many people and much cattle drowned.
86	*England.* Great overflow of the Medway. Loss of life.
95	„ Humber overflowed; damage extended over 50 miles of country.
115	*England.* The Severn again overflowed; great loss of life and cattle.
125	„ The Humber again overflowed.
131	*Dorsetshire* (England). Inundation of the sea, which came 20 miles inland. Great loss of life and property.
155	*Edinburgh* (Scotland). Considerable damage from flood.
214	*England.* Trent valley overflowed. Great destruction, extending 20 miles from ordinary course of stream.
218	*Northumberland.* Great flood in Tweed; much damage.
245	*Lincolnshire.* An eruption of the sea laid under water many thousand acres.—CAMDEN.
250	*England.* The Ouse overflowed, and drowned many people and cattle.
268	*England.* The Humber overflowed and did great damage.
317	*Isle of Thanet* (Kent). Flooded. Loss of life and property.
323	*England.* The inhabitants of Ferne Island (off coast of Northumberland) destroyed by inundation of sea.
330	*England.* Irruption of the sea in Lancashire.
336	„ Great overflowing of the Tweed.
352	„ Severn valley flooded; great loss.
358	*Cheshire* (England). Inundation from the sea; several thousands [about 5,000] of people drowned, and much damage.
365	*Egypt.* An inundation consequent upon an earthquake destroyed many of the inhabitants.
368	*Sicily.* Inundation from sea; great destruction.
387	*Cheshire.* Overflowing of the Dee, and great destruction.
393	*Egypt.* Unusual overflow of Nile; great damage.
419	*Hampshire.* Inundation of sea and great destruction, near Southampton.
441	*Wales.* The sea made great inroads, both north and south, many people and much cattle drowned.
469	*Constantinople.* Much flooded, consequent upon four days' incessant rain.
479	*London.* The Thames for many miles above and below much flooded; great damage.
487	*England.* The Severn valley again overflowed; great damage.
525	„ The Trent overflowed. Great number of cattle drowned.
525	*Edessa* (Mesopotamia), sometimes called "Antioch of the Fair Streams." A destructive flood did considerable damage to the city.
529	*England.* The Humber overflowed. Many people and cattle drowned.
536	*Northumberland.* The Tweed again overflowed. People and cattle drowned.
540	*France* and *Italy.* Great floods from rains.
552	*Greece.* Inundation from the sea; part submerged.
553	*Scotland.* Violent rain storms extending over five months.

TABLE II.—*Of the Floods and Inundations of the World.—Contd.*

A.D.	
564	*England.* Great rain floods.
570	*Italy.* Great rains and floods.
575	*England.* Parts of Essex, Suffolk, and Norfolk inundated from the sea.
579	*France* and *Italy.* Great rains and floods.
580	*Anglesea* (Wales). Much damaged by the sea.
590	*Italy.* Great floods from tempest; followed by plague.
634	*Ireland.* Floods in Munster.
649	*Cheshire* and *Lancashire* (England). Greatly damaged by inundations of sea.
669	*Kent* (England). The Medway overflowed; great damage.
684	*Japan.* More than 500,000 acres of land in the Isle of Sikokf swallowed up by inundation of the sea, following earthquake.
685	*Ireland.* Great inundation from the sea.
690	*Italy, Venice, Liguria.* Great floods from violent rain storms.
693	*Ireland.* Floods of rain in Leinster.
717	*Rome.* The Tiber greatly overflowed from rains.
719	*Ireland.* A rainy summer; great inundations of the sea.
730	*Edinburgh* (Scotland). Great damage by rain or inundation.
738	*Glasgow.* Great floods; more than 400 families drowned. [Some authorities give the date 758.]
776	*Ireland.* Great fall of rain, and consequent floods.
785	„ "A flood in Darinis."
788	*Italy.* The Tiber much flooded by rains.
813	*England.* Great overflow of the Severn; 2,000 people and 7,000 cattle drowned.
818 or 820	*France.* Great rains and floods.
834	*Northumberland.* Tweed overflowed and extended 30 miles round. Loss of life and cattle.
840	*Germany.* The Rhine flooded from rains.
856	*England.* Great rains and floods, followed by epidemic of quinsy.
861	*Kent* (England). Floods in Medway. Great loss of cattle.
864	*England.* The Humber again greatly flooded.
876	*Saxony.* Great rains in June. Extended damage.
885	*Cheshire.* The Dee greatly overflown; many villages injured.
912	*Saxony.* Flooded by rain, "after a comet."
918	*Scotland.* Rains extending over five months; consequent floods.
918	*Ireland.* A great flood.
935	*Southampton.* Great floods; many people drowned.
942	*England.* December. Great rains and floods, "after comet in November."
942	*Ireland.* Great flood of the Shannon.
952	*Bagdad* (Asiatic Turkey). Half the city inundated from great overflow of the Euphrates.
959	*Bagdad.* Nearly three-fourths of the city inundated from a serious overflow of the Euphrates.
968	*Persian Gulf.* Severe irruption following earthquakes. Several cities destroyed, and new islands formed.
973	*England.* Thames greatly overflown; many people drowned.
989	„ Floods all the winter.
1012	„ and *Germany.* Great inundations of the sea.
'13	„ Earthquake, floods, thunder, lightning, hurricane.
'14	„ Great inundations of the English coasts; "a number of seaport towns demolished."
'16	*Ireland.* Excessive rains and floods—producing cattle mortality.
'20	*England.* Great floods followed by plague.
'31	„ Extended general floods from rains.
'40	*Germany.* Great floods.
'45	*Flanders.* Inundations from the sea.
'46	*Severn Valley* (England). Great rain floods; loss of cattle.

TABLE II.—*Of the Floods and Inundations of the World—Contd.*

A.D.	
1076	*Bagdad.* The Tigris overflowed and inundated Bagdad.
'86	*England.* Heavy floods from rain. "In the twentieth year [of William the Conqueror] there fell such abundance of rain that the rivers did greatly overflow in all parts of the Realm. The springs also rising plentifully in divers hills, so softened and decayed the foundations of them, that they fell down, whereby some villages were overthrown. By this distemperature of weather much cattle perished, much corn upon the ground was either destroyed, or greatly impaired. Thereupon ensued first a famine, and afterwards a miserable mortality of men" [Plague]—*Harleian Miscellany*, iii, p. 167.
'88	*Bagdad.* The Tigris again overflowed and did much damage.
'90	*Constantinople.* Great floods.
'93	*Ireland.* "Great rains and inundations in summer and autumn."
'93	*England.* Great floods, and afterwards severe frost.
'94	*Ireland.* "Great inundations in all Ireland."
'98 or (1100)	*English Channel.* Earl Godwin's lands, exceeding 4,000 acres, overflowed by the sea, and an immense sand-bank formed on the coast of Kent, now known as the Godwin Sands.—CAMDEN.
1099	*England.* Rains and sea floods, "fatal to much people and cattle." Thames much flooded on festival of St. Martin.
1100 or 1108)	*Flanders.* A terrible inundation forced many of the inhabitants to leave the country. Some settled in England. Nearly the whole of this country is believed to have been covered by the sea in early times. On this occasion the town of Ostend was immersed.
05	*England.* Great floods, followed by famine.
'06	„ Inundation from the sea.
'18 or 19	„ Constant floods all the year; "no corn sown or reaped."
'25	„ Great flood on St. Lawrence's Day.
'33	*France.* Great floods from rain.
'34	*Flanders.* Inundation from the sea.
'52	*Germany.* Great floods on the Rhine from rains.
'56	*England.* Rain floods, lasting all the harvest.
'57 or 58	*Italy.* Great overflow of the Tiber. *Normandy.* Great floods.
'61	*Sicily.* Inundation of the sea; drowned 5,000 persons; "floods in many rivers, multitudes of people lost." (1165.)
'62	*Holland.* Inundation from the sea; many people and cattle lost.
'65	*Sicily.* Irruption of the sea; 12,000 people drowned. (1161.)
'70	*Holland, Friesland,* and *Utrecht.* Terrific flood. In the latter province the water rose to so great a height that the people were able to catch fish with nets within the walls of the town.—DAVIES' *Holland.*
'71	*England.* Inundation of the sea; harvest destroyed in many places.
'72	*Ireland.* "Great floods destroyed numbers of men."
'72	*Germany.* Great floods on the Rhine.
'73	*Holland.* Great flood [? inundation] which considerably extended the limits of the Zuyder-zee.
'76	*Lincolnshire* (England). Inundation from the sea; also in *Holland.*
'79	*England.* "Many floods from a most severe winter."—SHORT.
'87	„ Great floods.
'88	„ Inundations of sea "killed very much people and cattle."
'96	*England.* Great floods in March from rains.
'99	„ Serious floods from rain.
1208	*France.* Terrible rains and great floods, destroying bridges, houses, &c. "Greatest ever seen in France."—SHORT.
'09	*England.* Great floods on St. Nicholas Eve, "after a tempest of thunder and lightning." December.

TABLE II.—*Of the Floods and Inundations of the World—Contd.*

A.D.	
1210 or 12	*Perth* (Scotland). Great flood from overflow of Tay and Anan rivers: many houses washed down and people drowned. The king lost his youngest son and nurse in it; and twelve of the court ladies were drowned. The king and his brother with great difficulty escaped in a boat.
'12	*Sicily.* Inundation from the sea, "thousands of people swept away by it."
'18	*England.* Great floods in the night in winter.
'19	*Nordland* (Norway). "The St. Lawrence Lake broke out and drowned 36,000 people, besides cattle."
'20	*Poland.* Floods from constant rains; *Friesland,* inundations, October.
'22	*England.* High tides; great damage. Also continuous rain storms. „ In the "seventh yeare of Henry III, on Holy Rood Day, was a great thunder and lightning tempest throughout all England, and such great floods of water followed with great winds and tempests, which continued till Candlemass, that the yeare following wheat was sold for 12*s.* the quarter."—PENKETHMAN.
'28	*Frieseland.* Irruption of the sea, 100,000 people drowned.
'30	*Italy* and *France.* Great overflow of the Tiber; floods in France.
'32	*Austria.* Great overflow of the Danube.
'40	*England.* The Thames greatly flooded from rains. Extended above 6 miles at Lambeth.
'47–50	*England.* Several inundations of the sea; great losses.
'51	„ Tides rise 6 feet higher than usual.
'51	*Ireland.* 29th June. Great inundation of the Shannon.
'57	*England.* July. Great floods from rains.
'60	*Germany.* Great floods on the Rhine.
'66	*Scotland.* Great inundations of the Tay and Forth from the sea.
'69	*England.* February. Great floods from thaw.
'76	„ Great floods from the sea, and from rains.
'76	*Bagdad.* The city again inundated after appearance of red flame.
'77	*Holland.* Great inundations at *Friesland,* forming the Dollert Sea.
'78	*Italy.* Great overflowing of the Tiber.
'80	*England.* Great floods all the summer; especially in August.
[? '87]	*Winchelsea* (England). Great inundation of the sea; more than 300 houses swept away. "Charter granted for erection of new port."
'86–87	*Holland.* A dreadful storm, laid the whole country on both sides of the Zuyder-zee under water. To such a height did the water rise that Count Florence took advantage of the circumstance to subdue the inland towns by armed vessels called "cogs."—DAVIES' *Holland.*
'87	*England.* Winter excessively rainy; great floods. 1st June. Sea broke in from the Humber to Yarmouth, forced by the winds. In December on Suffolk and Norfolk coasts. Plague all the year.
'87	*Salandria* (?). Fifteen islands submerged by the sea, 15,000 people drowned.
'89	*England.* Great hailstorm, followed by heavy rains, greatly affecting the next year's harvest.—PENKETHMAN.
'91	*Damascus* (Syria). Inundated by overflowing of streams.
'99	*England.* Flood after a comet. In November inundation from the sea, in the Thames. "In December great calm, heat, and clearness."—SHORT.
1304	*Damascus.* Again inundated.
'15	*England.* Great rains and floods during harvest; much grain spoiled.
'30	*England.* Heavy rains; grain did not ripen; harvest not commenced till Michaelmas.
'33	
'33	*Florence.* November. Great overflow of the Arno.
'35	*England.* Continued rain storms; corn spoiled.

Object of Preceding Tables.

The object of the preceding tables, is manifestly that of endeavouring to obtain a complete, or at all events a comprehensive view of the causes of famines, so far as they fall within the category of being the result of natural or unavoidable causes. We see first from an analysis of the table of famines, the causes to which they are mainly attributed. We then follow out these causes as a separate branch of inquiry. We suppose the facts presented in the several tables will act and react upon each other in such a manner that the law of famines may be deduced, at all events that the extent of cause and effect may be made in some degree apparent.

For the purpose of this analysis, it is necessary to limit our range to some one country. We take our own, for instance, and apply the test of frosts. Famines in Great Britain have resulted from severe frosts. We take the table of frosts, which I believe contains something like a complete record of those which may be regarded as historical. From this table we turn to that of famines. Has a famine usually resulted from intense frost? Here we must take into account a chronological incident. Under what is now designated the "old style," the year did not terminate until 25th March. The change took place in 1752, which year began on 1st January. It is very important to keep this fact in mind in most chronological inquiries. In this instance it is especially so. The frost of one year would usually affect the crops of the *next year*, prior to 1752. Where indeed the frost came in very early, so as to affect the harvesting of the grain—as is sometimes even now the case in North Britain—it might be that the famine would arise in the same year as the frost. The same remark will also apply to floods. But I need not dwell upon these details: for I am compelled to admit that when critically examined in this manner, the facts in the one table do not, taken as a whole, at all coincide—to say nothing of presenting complete harmony—with those in the other. There are some correspondences, but these may be simple coincidences. The same admission has to be made with respect to the other tables. If you attempted to produce a table of the famines of Great Britain from the combined details of the causes which are usually credited as producing famines, you would produce a result almost entirely out of harmony with actual recorded facts.

That this discovery and consequent admission is very discouraging after the labour bestowed is but too obvious. But we must not abandon all our efforts in despair. The facts presented in the several tables as facts are, I hope I may say, of essential value. They have not heretofore been presented in our *Journal*. To the statistician, as to the scientific inquirer, all facts are of value. My duty now is

to endeavour to account for this breakdown of a system of inquiry, which I venture to think was logically as also theoretically correct. This may have been occasioned by the cumulation of several causes. The first and most readily suspected being that the *data are incomplete:* an incompleteness of data must necessarily imply in-harmony of results. The answer on my part is that I have had recourse to all known authorities. The next consideration is founded upon the well known want of harmony in the chronology of early recorded events. You consult any two or three of the early chronicles as to the occurrence of any known incident. You will not unfrequently find one year's, two years' or even three years' variation in the dates of the respective writers, occasionally very much greater and more perplexing discrepancies. Before universal calendars, or a settled chronology obtained, the mode of computing time was usually by reference to the year the reigning sovereign had occupied the throne, as third of Richard II, &c., &c. In this manner mistakes may well have arisen. We know that such discrepancies have existed even as regards the date of particular Acts of Parliament —more than one chronological date being assigned to many of our more important legislative enactments. Still on the whole even these discrepancies may be harmonised, from the circumstance that great historical events do not usually happen in such immediate proximity, that the one may be mistaken for the other. In the use of comparative tables, however, where cause and effect are sought to be established, this conflict of dates becomes very perplexing, and occasionally entirely misleading.

Again, in order to a complete understanding of the causes of famines in any given country, the operation of the artificial causes, as *wars* (including invasions and blockades), *legislation* (including limitation of imports, extent of import duty, or enforced restriction of prices). The effect of *Pestilences*, as resulting from the neglect of the laws of public health, may be included in this category, although as a rule these latter are the results from rather than the occasions of famine. These will be considered in the second part of my paper.

Yet another consideration remains to be presented, and it is this, that it is more than probable that very frequently several causes combine to produce such a national calamity as famine, I mean a combination of natural causes. For instance, *frosts* following seasons of excessive *rain*, will be far more destructive of all vegetation than frost succeeding dry seasons. In this latter case the frost often benefits the soil, and advances vegetation by destroying largely its insect and reptile antagonists. And here I am disposed to think my tables may be of real value, as affording means of comparison not otherwise readily available.

I ought indeed at this point to notice the poetic, perhaps I had better say the dramatic, or even mythical aspect of the subject. No one can be familiar with the old chroniclers, from whom we necessarily draw so much of our historical information, without being struck with the tendency of these persons to pile up the agony, so to speak, on certain great historical occasions. Comets in early times occasioned great dread; eclipses of the sun, or moon, were deemed to be direct manifestations of the wrath of the Almighty; hurricanes, whirlwinds, waterspouts, were but lesser indications of the same divine vengeance; while earthquakes formed as it were the *grande finale* to the provocation of erring man against his Creator. That the poets should seize upon such events to give dramatic effect, and lend force to their creative outpourings, is but natural. They often deal with history as represented by popular tradition.

Thus Virgil in his "Georgics," speaks of comets and eclipses as appearing synchronously with great historical events, such as the death of Cæsar:

"Sol etiam extincto miseratus Cæsare Romam,
Quum caput obscurâ nitidum ferrugine texit."

* * * * *

"nec diri toties arsêre cometæ."

which may be rendered:

"The sun himself on Rome
Looked down with pitying eye when Cæsar fell,
And hid his face in gloomy shrouds of night."

But that the chroniclers, who were mostly ecclesiastics, should ever have stooped to exaggerate their narratives with monsters seen in the heavens, with showers of blood, with sulphuric emanations, with unnatural eclipses, and with other most unreasonable horrors, and these too not unfrequently associated with those historic personages who had incurred the displeasure of the Church—which perhaps is the only sort of excuse, but can be no justification—seems remarkable. It is loading history with a perpetual lie, on the small pretext of affording an example to other heretics and offenders! It may be replied that the combined miseries of the plagues of Egypt, afford at least a precedent for such horrors; while the sun standing still on the command of Joshua, prepares one for all that may follow at any time or place. I am not of this opinion, and I have accordingly eliminated from my tables as far as possible the elements which I regard as purely mythical. Two very mild instances of such exaggeration are given, the one under dates 1382-96; the other 1658.

But while endeavouring to exclude all hypothetical considerations from my paper, there yet remains to be considered a meteoro-

logical solution of famines in various parts of the world, to which I have not in any way alluded at present, and this is the "sun-spot" theory, which is the most modern of all famine theories, and in the further elucidation of which several of the tables included in this paper may yet be of value. It will of course be understood that in attempting to deal with this, "the newest scientific plaything" as I have seen it called, I make no pretension to scientific knowledge. I shall deal here, as in other parts of the paper, with recorded facts, and shall only follow where these may lead.

Indian Famines.

In this connection our minds naturally revert to Asia, and more particularly to that important empire of *India*, with which we have so much concern. I have endeavoured to make my table of famines complete as to India in modern times.* The first great famine there of which we have any knowledge—many earlier ones of lesser magnitude have occurred—was that of 1769-70, "when the "Government did not attempt to cope with the disaster; when the "people died of starvation by hundreds of thousands; and a "desolation spread over the country, the marks of which have not "wholly ceased." (*Vide* Col. George Chesney, "Indian Famines in "Nineteenth Century," November, 1877.) We see in our table that it is estimated that *three millions* of the population then died of starvation, an estimate I am not inclined to deem exaggerated; and we are told that Bengal has been subjected to famines periodically since—why *since*, as distinguished from *previously*, does not appear. In 1799 there was again a famine in Hindustan, and in 1803. In 1810 there was a famine in the North-West Provinces, and from 2 to 8 per cent. of the population died, 90,000 in one central district alone! In 1813-14 Hindustan again; in 1832 in Madras, when 200,000 perished in the district of Guntoor. In 1837-38 in Northern India, "the worst famine of this century"—but this was written before the more recent famines we now have to record. In 1861 famine in North-West Provinces; in 1866, "awful famine" in Orissa, one million and a-half of the people, half the population of London, reported to have perished. In 1874, the Bengal famine, which cost this Government 6½ millions sterling, for an organised system of relief; and lastly that of 1877, more terrible perhaps than any during this century, over which our Indian experience extends, and which it is estimated will cost in all nearly 10 millions sterling!

In all there have been thirty-four famines (above twenty on a

* It is impossible for me to express too fully the obligations I am under to Mr. F. C. Danvers of the India Office, for the assistance he has rendered me regarding the Famines, and Famine incidents of India.

large scale) in India in just over a century. I much regret that I am not able to present more complete statistical details as to some of these. Under the former Government of India, usually known as the Company's rule, statistics were not a feature. Many of the historical details which I have been able to give in my table of famines, are drawn from a most able report, prepared some little time since, but not yet made public—much as its facts are needed just now—from some State reason, or want of reason, which I do not profess to understand. If I had found myself in possession of anything like complete meteorological data regarding *India*, I should have endeavoured to examine the causes of famines in that empire in much more detail.

Mr. F. C. Danvers says:—

"Famines in India have arisen from several different causes; ***but the most general cause has not been failure of the usual rains.*** Distress has also, however, been caused by hostile invasions; by swarms of rats and locusts; by storms and floods; and not unfrequently by the immigration of the starving people from distant distressed parts into districts otherwise well provided with food supplies; ***and occasionally by excessive exports of grain into famine-stricken districts;*** or by combinations of two or more of the above-named circumstances." Report, 1878, p. 2.

There is one peculiarity about the famines of India which deserves especial notice, and it is this: certain districts only are so visited at any one period; and in India, taken as a whole, there is always produced food enough for all its inhabitants. The *immediate* question is therefore one of transport only; the ultimate question is of course the prevention of famines. This state of things has given rise to a somewhat fierce controversy between the respective advocates of railway and canal (or irrigation) extension. Into that controversy I do not propose to enter further than to say: for the purposes of Imperial Government one cannot but admit that railways are of the first necessity. For the purposes of local and domestic government, canals (with which can be combined irrigation), are at least in those districts most subject to famine droughts, of paramount importance on the score of humanity. The soil of India under irrigation never fails to produce a crop. In some districts canals, as a means of transport, have been found to pay as a financial investment. In others they have involved immense loss, in the way of an unproductive lock-up of capital. In some parts of the empire, the country is naturally suited to canal and irrigation works; in others the physical or engineering difficulties are very great. The problem for the Government in the last-named cases is a very serious one. Irrigation where it can be successfully carried out, in fact is a preventative of famines. Railways afford the means of distributing food when famines arise; and in the meantime they aid greatly in developing the resources

of the country. I know the anxious care which the present Government have bestowed upon this question. If the near occurrence of two such severe famines could have been foreseen, it would no doubt have been wise to have expended in irrigation works the 12 or 15 millions sterling which have been spent or lost by their occurrence, even if this enterprise had not been pecuniarily productive. To meet probable future requirements, an extended and well-considered system of combined water carriage and irrigation must be devised. A return upon the outlay may be provided in the shape of a tax or water charge upon the districts benefited.*

This important question is ably discussed in an important paper by Colonel George Chesney, in the "Nineteenth Century," for November, 1877.

Sun-Spot Theory.

When or by whom the sun-spot theory as applying to India was first observed upon, I need not stop to inquire. There seems to have been several independent inquirers, as is very often the case. The name of Mr. W. W. Hunter is notably associated with the inquiry; and in the "Nineteenth Century" for November, 1877, is an interesting article, the joint production of Mr. J. Norman Lockyer and Mr. Hunter, to which those who desire details beyond those here given may with advantage refer.

In the article named, after an explanation of the more recently observed phenomena connected with the sun, the writers proceed to state (p. 584) :—

"All these phenomena ebb and flow once in *eleven years*. So that every eleven years we have the greatest activity in the production of uprushes, spots, and prominences; and between the period of *maximum* we have a period of *minimum*, when such manifestations are almost entirely wanting. In fact, the spots may be taken as a rough index of solar energy, just as the rainfall may be taken as a convenient indication of terrestrial climate. They are an index but not a measure of solar activity; and their absence indicates a reduction, not a cessation of the sun's energy."

Now if the matter could have been reduced to as simple a problem as is here indicated, the effect of the variations of the sun's spots upon rainfall and other climatic conditions would have been easily within our reach, for even twenty-two years of meteorological

* In speaking of *India* it is always to be remembered that just as famines become obviated, and a regular food supply be obtained for the people, so will the population increase. All that is now done must therefore be considered in the light of the additional millions and tens of millions which will be planted upon that soil within the next half-century.

Sir J. Strachey had come to the conclusion that as a sort of insurance against future famines, he must have a surplus of some 2,000,000*l.* annually.—Lord George Hamilton in the House of Commons, 1878.

observations would have shown us whether the results were perfectly uniform, or whether much variation was to be expected. Besides such regularly recurring results could not have escaped observation at an earlier period. A correspondent to the "Times" (14th December, 1877), Mr. A. Cooper Ranyard, supplied the following important qualifications:—

"Will you permit me to draw attention to the fact that the periods of *maximum* and *minimum* of sun-spot development do not occur at uniformly regular intervals of time, as some of your correspondents appear to assume? It is true that on the average sun-spot *maxima* occur at intervals of 11·11 years, but occasionally thirteen or fourteen years will elapse between two periods of sun-spot *maxima*. In one instance in comparatively recent times—viz., between 1788·1 and 1804·2—16·1 years elapsed; while, on the other hand, between the sun-spot *maxima* of 1829·9 and 1837·2 only 7·3 years elapsed. Dr. Wolf, of Zurich, in a memoir which will shortly be issued by the Royal Astronomical Society, shows that the divergence from the mean period has during the last two centuries and a-half amounted on the average to 2·03 years. The *data* which he has made use of are derived from a very extensive series of manuscript and printed record of sun-spot observations dating from 1610 (shortly after the invention of the telescope) to the present time. An examination of these records shows that the irregularity in the development of sun spots is so great that only value prognostications can be made with regard to the time of an approaching *maximum*; for example, six months before the time assumed from the eleven-year law as a time of *maximum* development, it would be impossible upon examination of the sun to assert that the period of *maximum* development had just arrived, or whether it might be delayed for another two or three years. And what is true with regard to periods of *maximum* development is also true for periods of *minimum* development. It will thus be seen that if the newly-broached theory were fully established, the Indian Government would be as far as it is at present from being able to predict a year or two beforehand whether any particular season would be a season of famine or no."

From this we also learn, what indeed was to be expected, that the theory will receive the most critical investigation and elucidation.

We have yet to understand the mode in which the changing aspect of the sun makes itself felt on this planet. The "Nineteenth "Century" article thus enlightens us (p. 585):—

"It was, perhaps, scarcely necessary thus to clear the ground for the general statement, *now an accepted fact of science, that with the exception of tide work, all our terrestrial energies come from the sun.* In the great modern principle of the conservation of energy, we have not only proof that the actual energy stored up in our planet is constant, but that the solar energy is the great prime mover of all the changeable phenomena with which we are here familiar, especially in the inorganic world. *That energy gives us our meteorology by falling at different times on different points of the aërial and aqueous envelopes of our planet, thereby producing ocean and air currents, while, by acting upon the various forms of water which exist in those envelopes, it is the fruitful parent of rain, and cloud, and mist. Nor does it stop here. It affects in a more mysterious way the electricity in the atmosphere, and the magnetism of the globe itself.*"

We are next told how it is that these effects are variable, instead of being constant, as most of nature's operations are:—

"If the energy radiated from the sun were constant, we should expect that the terrestrial conditions which depend on the amount of solar energy received at any one place would be constant too. The daily change in the earth's rotation, the yearly change brought about by the earth's revolution would be there; but there the change would stop. The fire, as well as the air, earth, and water, would be constant quantities. *But suppose the fire to be variable, in other words, suppose the solar energy to change in amount from year to year. To the daily and unusual changes of our terrestrial phenomena would then be added another change; a change absolutely irregular and unpredictable, if the variation in the amount of solar energy were subject to no law; but a change as regular as the daily and the yearly one, if the variations in the amount of the solar energy were subject to a law.* The period of the additional terrestrial change would agree with the period of the solar change, whatever that might be; and to the daily and yearly response of the earth to the solar energy, there would be superadded an additional change, depending upon and coincident in the main with the period of the solar change. We have said coincident in the main, because it is easy to imagine in the case of meteorological phenomena dependent upon a long train of intermediate influences between the impact of the solar energy and the final result, that time would be taken for their development. In this case, although the dependence would be there, an exact coincidence would not. There would be a lagging behind, and this lagging behind would possibly not be the same at different latitudes."

I think we may now (thanks to our learned instructors) feel that we understand the *rationale* of sun-spot influences sufficiently for the purposes of this paper.

Reverting again more particularly to *India*, I desire to supplement what I have already said by the following able remarks communicated to the "Times" by Mr. Henry F. Blandford, of the Meteorological Association of Calcutta, under date 9th November, and put in that journal 4th December, 1877:—

"Before concluding, I would say a few words on a subject which has been much discussed in the newspapers during the last few months, viz., the supposed recurrence of famines in Southern India at intervals of about eleven years, in accordance with the period of sun-spot variation. The idea that years of *maximum* sun spots are also years of abundant harvests, originally suggested by Sir William Herschel, has lately been brought into prominence mainly through the labours of Mr. Meldrum of the Mauritius, whose latest paper on the subject, published in the monthly notices of the Mauritius Meteorological Society, gives figures based on the rainfall statistics of a large number of stations in different parts of the world. These seem to show that the average rainfall of the globe is subject to a regular fluctuation through periods of about eleven years, and that at its *maximum*, which occurs about a year later than the epoch of *maximum* sun spots, the mean fall is about 15 per cent. greater than at its *minimum*, which precedes that of *minimum* sun spots by one or two years. The "Register of the Presidency Town of Madras," lately published by Mr. Pogson, shows a greater fluctuation than this, apparently about 25 per cent.; but this seems to be quite local. Two other stations in Southern India, equally involved in the present famine (the only two I may mention, for which I have been able to obtain many [forty] years' registers), viz., Bangalore and Mysore, show a large irregular fluctuation, but scarcely an appreciable regular oscillation according to the eleven-year cycle; and the mean of seven stations, all situated in tropical India (including Madras), gives a probable periodical fluctuation not exceeding 9 per cent. Such a fluctuation is, of course, quite insufficient to warrant the expectation of the regularly recurrent famines. I cannot but think that some confusion has been unconsciously introduced into the

discussion, by the fact that the name of the town which shows the largest fluctuation is also that of the province, in one part or another, of which famines have occurred, for many of the famines which are supposed to illustrate the law of periodicity, have chiefly affected districts which receive their principal rainfall at a different season of the year from Madras itself and the Carnatic, and also from a different source. That of 1866, for instance, is chiefly memorable as the Orissa famine; and while it involved certain districts of Madras, the dearth also extended to Western Bengal and Behar, regions which, like Orissa itself, receive their rainfall during the summer monsoon—the latter chiefly from the west coast, the former from the Bay of Bengal. That of 1854 was most severe in Bellary, which also depends mainly on the summer monsoon from the west coast. The law of famine recurrence even in southern India is, then, by no means so simple as one might be apt to infer from much that has lately been written on the subject; and it becomes still more complicated if we include northern India, which is a region of equal importance from an administrative point of view. The worst famine of this century was that of 1837-38, 1837 being a year of *maximum* sun spots, the highest in this century previous to 1870; and 1870 was preceded by the famine of Rajpootana and the North-West Provinces in 1868-69, and followed two years later by great scarcity in Khandeish (in the Bombay Presidency), and again two years later by that of Behar and the neighbouring districts of the North-West Provinces; the memorable famine of 1861, in the upper North-West Provinces, also followed immediately on a year of *maximum* sun spots. My conclusion is then, that we are as yet far from having discovered the law of famine recurrence. As far as the evidence yet put forward can be said to point to any law of periodicity, it is this—that severe famines seem to tend to occur more frequently about the time of *minimum* sun spots in southern India, and about that of *maximum* sun spots in northern India; but the evidence is very imperfect, and requires thorough examination. It is unquestionable that a great deficiency of rainfall in one region is in many cases attended by a great excess elsewhere. The rains which were withheld from Madras at the close of 1876, were discharged over the Bay of Bengal, producing two severe cyclones; and while the North-West Provinces during the present summer have suffered an almost entire loss of the crops of that season from continued drought, those of Pegu have been drowned and washed away by the extraordinary floods of the Irawaddy."

He adds:—

"The law discovered by Mr. Meldrum is a most important one, and everyone must rejoice at the attempts which are now being made to trace out in the vicissitudes of the atmosphere the influence of the varying action of the sun. But no good will be effected by hasty and crude generalisation, and while much may be expected from a patient study of meteorological physics, the hasty promulgation of empirical laws, founded on insufficient *data*, can only lead to disappointment. A prophecy that the rains would again fail this year in Madras, purporting to bear the authority of Mr. Pogson, the Government astronomer of Madras, has been largely circulated in the newspapers in England and India. Happily it has been falsified by the event."

I ought here to mention that two distinguished members of our own body have thrown some additional light on the sun-spot theory. Professor W. Stanley Jevons, F.R.S., read a paper at the British Association meeting at Bristol in 1875, on "The Influence of the "Sun-Spot Period upon the Price of Corn." This falls rather to be noticed in the second part of my present paper than here. Mr. Henry Jeula, who as Secretary of the late Statistical Committee at Lloyd's, had extended means for observing the influence of the

seasons in relation to storms, in a letter published in the "Times" of 19th September, 1877, furnishes some facts of much interest.* The following are the chief passages of his letter:—

"The account given in the 'Times' of the 28th of March last, of Dr. W. W. Hunter's researches into the Madras rainfall and its possible connection with sun spots, led me to throw together the scanty materials available relating to losses posted on Lloyd's loss book, to ascertain if any coincidence existed between the varying numbers of such losses and Dr. Hunter's results, for as the cycle of rainfall at Madras coincides, I am informed, with the periodicity of the cyclones in the adjoining Bay of Bengal, as worked out by the Government astronomer at Mauritius, some coincidence between maritime casualties, rainfall, and sun spots, appeared at least possible, and you may consider even so humble an attempt to enlarge the area of comparison to be alike of some use and interest.

"I was only able to obtain *data* for two complete cycles of eleven years—namely, from 1855 to 1876 inclusive—while the period investigated by Dr. Hunter extended from 1813 to 1876, and his observations related to Madras and its neighbourhood only, but the losses posted occurred to vessels of various countries, and happened in different parts of the world.

"It was necessary to bring these losses to some common basis of comparison, and the only one available was the number of 'British registered vessels of the United Kingdom and Channel Islands'—manifestly an arbitrary one. I consequently cast out the percentage of losses posted each year upon the number of such registered vessels for the same year, and also the percentage of losses posted in each of the eleven years of the two cycles upon the total posted in each complete cycle, thus obtaining two bases of comparison independent of each other.

"The results were sufficiently remarkable to justify me in communicating my materials to Dr. Hunter, and he has most courteously worked out with me a series of tables showing the final results; these would occupy too much of your space, but from them I hand you a short comparative one, which may be of some interest.

"The dates of the losses are those of report, not of occurrence, which would be earlier—sometimes considerably earlier—consequently they should lag somewhat behind the cycle, as they appear to do. The characteristics of Dr. Hunter's theory of cyclones have been so fully discussed by meteorologists, and are so clearly set forth in Mr. Buchan's letter in the 'Times' of the 8th instant, that I need only say the earlier and later years of the cycle show a *minimum* of sun spots and rainfall, while the years in the centre of the cycle show a *maximum* of both.

"Dividing the eleven years, as nearly as the number will allow, into three parts, and taking the percentages of losses posted, I find a coincident *minimum* period of four years at the extremities of the cycle, a *maximum* period of three years in the centre of the cycle, and an intermediate period of four years lying between the *maximum* and *minimum* periods.

"The annexed table brings this clearly in view. For the figures relating to maritime casualties I am responsible; those referring to rainfall and sun spots have been kindly furnished me by Dr. Hunter, and for them he is responsible. The sun spots are taken from a list previous to that just issued by Dr. Rudolf Wolf, of Zurich, but the differences in these lists, Dr. Hunter states, do not affect the general aspect of the case.

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* I have only learned since this paper was prepared, that as far back as 1846, another distinguished member of our Society, Mr. Hyde Clarke, prepared a paper: *A Preliminary Inquiry into the Physical Laws Governing the Periods of Famines and Panics.* This appeared in the "Railway Reporter" for that year; and I shall probably have occasion to refer to it in some detail in the second division of my present paper. Again, in 1838, this learned gentleman had contributed to "Herapath's Railway Magazine" a paper *On the Mathematical Law of the Cycle;* leading up to the same line of observation.

A Table showing the Mean Percentage of Losses Posted on Lloyd's Loss Book upon the Total Registered Vessels of United Kingdom and Channel Islands; also on the Total of the Losses Posted in each Cycle of Eleven Years, 1855-76 *inclusive; Compared with the Eleven-Year Cycles of Sun Spots and Rainfall at Madras.*

	Mean Percentage of Losses.		Average Rainfall at Madras, 1813-76.	Average Relative Number of Sun Spots, 1810-60.
	On Registered Vessels of United Kingdom and Channel Islands, 1855-76.	On the Total Posted in each Cycle of Eleven Years, 1855-76.		
			Inches.	
Minimum Group— Mean of 1st, 2nd, 11th, and 10th years of cycles	11·13	8·64	41·58	14·26
Intermediate Group— Mean of 3rd, 4th, 9th, and 8th years of cycles	11·91	9·21	51·37	42·46
Maximum Group— Mean of 5th, 6th, and 7th years of cycles	12·49	9·53	52·65	64·10

"In conclusion, permit me to express the hope that the great practical importance of Dr. Hunter's theory, if proved to be true, in relation not only to Indian famines, but, it would seem, to maritime commerce generally, will lead to a full and exhaustive examination of all the evidence bearing upon it."

A previous correspondent in the "Times" had suggested that the theory of rainfall and sun-spot connection should be conducted rather by a Fellow of this (the Statistical Society) than by a meteorologist. This was deemed by Mr. Jeula a sufficient justification for his entering upon the inquiry. I trust it may also be deemed a sufficient excuse for myself on this occasion.

The second part of my paper—which will treat of the "Artificial "Causes of Famines," as enumerated in the earlier part of this paper—will be presented to the Society whenever a favourable opportunity may arise; and I trust therein to show that the interest attaching to famines is by no means exhausted at present.

NOTE.—In finally revising this paper, I have brought the facts down several months later than the date at which it was read. The incidents of 1878 are in many respects important. I do not know —in the absence of systematic records—if they exceed those of other years, or whether the apparent increase is simply due to the more extended observation which the pursuit of the present investigation has induced me to make.