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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

October 10–November 6, 1937

The accompanying table summarizes the prevalence of eight important communicable diseases based on weekly telegraphic reports from State health departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of Disease." The table gives the number of cases of these diseases for the 4-week period ending November 6, the number reported for the corresponding period in 1936, and the median number for the years 1932–36.

DISEASES ABOVE MEDIAN PREVALENCE

Poliomyelitis.—The number of cases of poliomyelitis dropped from 2,615 during the 4 weeks ended October 9 to 879 for the 4 weeks ended November 6. The current incidence was lower than that for the corresponding period in both 1936 and 1935, but was considerably above that for the years 1932 to 1934. It was only about 40 percent of the incidence in the epidemic years of 1930 and 1931.

From a comparison of reports of poliomyelitis cases with the incidence in recent years it is evident that the recent outbreak affected practically every section of the country; and while the incidence has been on a decline for several weeks, the disease is still unusually prevalent in certain regions. In the West North Central region, five of the seven States in that group continued to report a rather high incidence, while in other regions the excesses seemed largely attributable to a smaller proportion of States. Some of those still reporting a relatively high incidence were California (80), New York (73), Illinois (60), Texas (40), and Michigan (35).

The South Atlantic region appears to have been the least affected by the epidemic and the incidence in that region during the current period was near the seasonal expectancy. The incidence in the Middle Atlantic region was higher than in 1936 but low in relation to the 1932–36 median. The severe epidemic of 1931 started in the Middle Atlantic region, as did also the minor epidemic of 1933, and in 1935 an outbreak that occurred in South Carolina spread also into the North Atlantic coast regions. In the South Atlantic, East South Central, and East North Central regions the numbers of cases for the current period were considerably below the numbers reported last year, when a minor epidemic occurred in those regions; but, unlike the South Atlantic region, the current incidence in each of the East Central groups was still relatively high. The recent outbreak spread from the West South Central region into the North and East Central groups.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Oct. 10–Nov. 6, 1937, the number for the corresponding period in 1936, and the median number of cases reported for the corresponding period, 1932–36 [1]

Division	Current period	1936	5-year median	Current period	1936	5-year median	Current period	1936	5-year median	Current period	1936	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	3,943	3,507	5,699	2,832	2,659	2,599	7,216	2,022	4,513	246	243	146
New England	48	42	90	13	7	19	396	440	397	10	11	8
Middle Atlantic	262	256	423	80	73	60	2,529	451	1,076	46	43	37
East North Central	620	483	1,112	309	261	329	1,740	240	570	44	54	37
West North Central	349	182	554	157	395	174	694	87	224	16	16	16
South Atlantic	1,305	1,299	1,520	750	624	749	766	155	467	57	52	22
East South Central	507	656	1,072	333	268	251	311	155	209	40	28	12
West South Central	509	332	741	871	649	628	90	55	55	10	14	14
Mountain	191	83	95	161	200	92	476	279	279	14	12	9
Pacific	152	174	211	158	182	173	214	160	798	9	13	13
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid fever		
United States [1]	879	902	705	12,506	9,939	15,050	487	204	211	1,388	1,768	1,959
New England	53	19	26	672	575	796	0	0	0	41	24	51
Middle Atlantic	122	70	198	1,901	1,753	2,469	0	0	0	176	273	273
East North Central	190	436	140	4,114	2,976	4,517	53	17	52	190	243	350
West North Central	191	78	51	2,058	1,312	1,416	181	89	89	107	128	128
South Atlantic	38	72	43	1,301	1,082	1,705	2	2	3	221	433	433
East South Central	56	116	33	581	571	923	67	2	9	157	202	259
West South Central	89	40	23	619	207	423	9	4	14	334	271	271
Mountain	40	18	8	523	614	614	88	81	22	115	127	149
Pacific	100	53	53	737	849	944	87	9	44	47	67	79

[1] 48 States. Nevada is excluded, and the District of Columbia is counted as a State in these reports.
[2] 44 States and New York City. The median is for the years 1933–36 only; the data for 1932 are not comparable.
[3] 46 States. Mississippi and Georgia are not included.

With the exception of the year 1935, when an epidemic occurred in regions along the Atlantic seaboard, the current incidence has been the highest since 1931. For the first 44 weeks of the current year the number of cases totaled approximately 9,000, as compared with 3,700, 10,000, and 6,700 for the corresponding weeks in 1936, 1935, and 1934, respectively. For the same period in 1931 approximately 13,800 cases were reported.

Measles.—Approximately 7,200 cases of measles were reported during the current 4-week period—an increase of about 4,000 cases over the preceding 4 weeks. The number was about 3.6 times that for the corresponding period in 1936, and was the largest number recorded for this period in the 9 years for which these data are available. In the New England region the incidence was about on a level with the average incidence for recent years; in the Pacific region, although the number of cases was slightly above that for last year, it was less than 30 percent of the 1932–36 median. Except for these two regions, the number of reported cases of measles is unusually large in all parts of the country.

Meningococcus meningitis.—The number of reported cases of meningitis for the current 4-week period was 246, as compared with 243 and 273 for the corresponding period in 1936 and 1935, respectively; the average for this period in the years 1932–34 was 135 cases. In the South Atlantic and East South Central regions the incidence was considerably above the average level of the 5 preceding years, but other regions reported about the normal seasonal incidence.

Smallpox.—This disease still continues to be unusually prevalent. For the current period 487 cases were reported, as compared with 204, 244, and 350 for the corresponding period in the years 1936, 1935, and 1934, respectively. Of the total number of cases, North Dakota reported 88, Washington 50, Iowa 49, Montana 46, and Kentucky 29—almost one-half of the total cases occurred in those 5 States. No cases were reported from the North Atlantic regions and only two from the South Atlantic region.

Influenza.—The increase of influenza that occurred during the 4 weeks ended November 6 was slightly above normal. The number of cases, 2,832, was about 10 percent above the average incidence for the 4 preceding years. The highest incidence was reported from the West South Central region, where the number of cases (871) was the highest reported for this period in 4 years. The incidence in the East South Central and Mountain regions was also somewhat above the normal seasonal level, while other regions compared very favorably with the experience of recent years.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The 3,943 cases of diphtheria reported for the current 4-week period represented an increase of about 12 percent over the figure for the corresponding period in 1936, but it was considerably below the incidence in preceding years. The disease was more prevalent than at this time last year in all regions except the East South Central and Pacific. An unusually high incidence in Utah (129 cases) raised the incidence in the Mountain region to the highest level in recent years.

Scarlet fever.—The number of cases of scarlet fever rose from 7,431 for the preceding 4-week period to approximately 12,500 for the 4 weeks ended November 6. This figure was about 25 percent in excess of that for the corresponding period in 1936, but approximately 20 percent below the average incidence for the 5 preceding years. The disease was unusually prevalent in the West North Central region and was somewhat above the seasonal expectancy in the West South Central region. A sharp increase in scarlet fever is normally expected at this season of the year.

Typhoid fever.—The number of cases of typhoid fever, 1,388, reported for the 4 weeks ended November 6 was the smallest for this period during the 9 years for which these data are available. Texas, reporting 167 of the 334 cases occurring in the West South Central region, seemed mostly responsible for a considerable increase over recent years in that region; in the New England region the current incidence was slightly above that of 1936 and 1935; in all other regions the incidence was low in relation to preceding years.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended November 6, based on data received from the Bureau of the Census, was 10.9 per 1,000 inhabitants (annual basis). The rate was slightly lower than the rate (11.1) for the corresponding period in 1936. The average rate for this period in the years 1931–35 was 10.6, while for the preceding 5 years (1926–30) the rate was 11.6.

IMMUNIZING PROPERTIES OF FORMOLIZED ROCKY MOUNTAIN SPOTTED FEVER RICKETTSIAE CULTIVATED IN MODIFIED MAITLAND MEDIA

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The vaccine of Spencer and Parker (*1*) produced from Rocky Mountain wood ticks (*Dermacentor andersoni*) reared under laboratory conditions has been of great value in the prevention of Rocky Mountain spotted fever (*2*). As shown by those investigators, adult infected ticks after feeding 3 days on guinea pigs may contain as many as 5,000 minimal infective doses, which, in proportion to volume, may be 500 to 5,000 times as many as are to be found in the serum of infected guinea pigs. Ticks thus infected constitute highly infectious material, which, when inactivated with phenol or a phenol-formalin mixture, is protective against the disease.

The method of preparation of this vaccine is, however, laborious and there is a considerable element of danger in the work. Some method not involving the use of infected ticks in the preparation of the vaccine has, therefore, seemed highly desirable. The rather favorable results recently reported by the writer (3) in the cultivation of the rickettsiae of Rocky Mountain spotted fever in modified Maitland media suggested the use of this material in the preparation of vaccines.

The medium used consists of one part of fresh guinea pig serum and four parts of Baker's solution with the tunica vaginalis of a guinea pig infected with the Bitterroot strain of Rocky Mountain spotted fever as the tissue component of the medium. Visceral as well as parietal tunica has been found suitable. Incubation is usually continued for 8 to 12 days at 37° C., and transfers are made to media containing fresh tissue after about the same interval of time. All flasks of cultures are stored in the warm room at 37° C.

Vaccines have been prepared from cultures carried through a number of passages and also from growth in the first generation. The cultures apparently do not lose virulence, but the organisms do not seem to become any better adapted to the medium in the later generations than in the early ones, and therefore there appears to be no advantage in making transfers for the vaccines.

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The first vaccine was prepared in a manner similar to that used by Kligler and Aschner (4) for European and Mediterranean typhus vaccine except that the tissue was from flasks which had been incubated for a longer period of time. Tissue from cultures in the eleventh to the fourteenth generations which had been incubated for 2 to 3 months was separated from the fluid portion of the medium by centrifugation in pointed centrifuge tubes containing a small amount of sterile ground glass. After removal of the supernatant fluid, the precipitated tissue was triturated with a glass rod and frozen and thawed twice and again triturated. A sufficient amount of sterile saline was added so that the volume of fluid was one-half the original volume of fluid in the flasks. Formalin was added to the vaccine in the proportion of 0.1 percent, and it was allowed to stand at ice-box temperature for 10 days.

Six guinea pigs were given three subcutaneous inoculations of 1 cc each of the vaccine at intervals of 1 week. Three weeks later five of the animals, together with four controls, were inoculated with blood from an infected guinea pig. The vaccinated animals received 1 cc, the controls, through oversight, 2 cc, which is the amount routinely used for transferring the strain.

The controls all developed typical symptoms of Rocky Mountain spotted fever and died. Three of the vaccinated animals did not show temperatures above 39.6° C., while two had temperatures ranging from 39.7° to 40.3° C. for periods of 3 to 4 days. All of these animals survived.

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The results obtained in the first test were sufficiently encouraging to justify further tests. A second vaccine was prepared from material in the first generation of growth after removal of tissue from the guinea pig. This material was obtained from the animal on the sixth day of fever and consisted of visceral tunica. Incubation of the cultures was continued for 12 days at 37° C.

In the preparation of this vaccine the method used was partially suggested by the method used by Laidlaw and Dunkin (*5*) in the preparation of a vaccine against dog distemper, though in their vaccine tissue taken directly from ferrets was used as the vaccine material.

The tunica tissue after separation from the fluid portion of the medium by centrifuging was not subjected to freezing and thawing as before but was simply macerated with a glass rod in the presence of powdered glass. It was then made up to one-half of the original volume of the fluid portion of the Maitland media with sterile 0.85 percent salt solution and transferred to a flask containing sterile glass beads. After vigorous shaking for 15 minutes, the suspension was drawn through a small piece of sterile cotton held against the bottom of the flask with a 10-cc pipette. Dilutions of 1/10, 1/50, and 1/250 were tested on guinea pigs, with the following results:

Dilution 1/10 Guinea pig 1: No temperature.
Dilution 1/10 Guinea pig 2: Fever sixth day followed by death on seventh day.
Dilution 1/50 Guinea pig 3: Fever fifth to twelfth days. Survived.
Dilution 1/50 Guinea pig 4: Fever fifth to twelfth days. Survived.
Dilution 1/250 Guinea pig 5: Fever seventh to fourteenth days followed by death on fourteenth day.
Dilution 1/250 Guinea pig 6: No fever. Died on sixth day.

Formalin was added to the vaccine in the proportion of 0.1 percent and it was allowed to stand at ice-box temperature for 10 days. It then contained a certain amount of precipitate. It was divided into two equal parts and one part (R2a) was left in the same state and the precipitate was removed from the other part (R2) by slow centrifuging and the supernatant fluid was used as the vaccine.

Five guinea pigs were given two subcutaneous inoculations of 1 cc each of vaccine (R2) and 5 were similarly inoculated with vaccine (R2a). The inoculations were 1 week apart. Two weeks later, the 10 vaccinated animals, together with 4 controls, were inoculated intraperitoneally with 1 cc of blood from infected guinea pig.

All the control animals developed typical symptoms of Rocky Mountain spotted fever in 4 days and all died in from 4 to 15 days. All the vaccinated animals survived without showing a temperature rise or other symptoms of the disease (table 1).

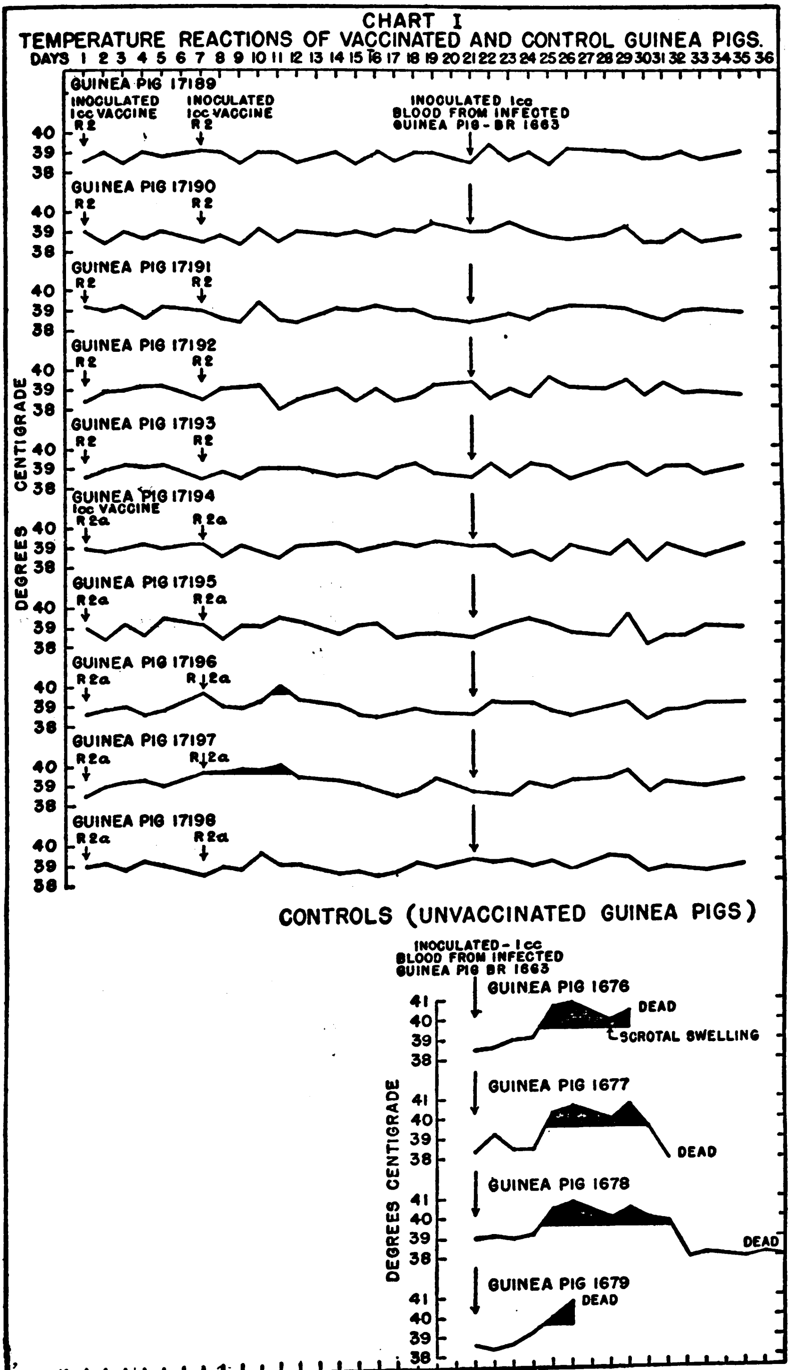
CHART I
TEMPERATURE REACTIONS OF VACCINATED AND CONTROL GUINEA PIGS.
DAYS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
DEGREES CENTIGRADE
GUINEA PIG 17189
INOCULATED 1cc VACCINE R2
INOCULATED 1cc VACCINE R2
INOCULATED 1cc BLOOD FROM INFECTED GUINEA PIG - BR 1663
GUINEA PIG 17190
R2
GUINEA PIG 17191
R2
GUINEA PIG 17192
R2
GUINEA PIG 17193
R2
GUINEA PIG 17194
1cc VACCINE R2a
R2a
GUINEA PIG 17195
R2a
GUINEA PIG 17196
R2a
GUINEA PIG 17197
R2a
GUINEA PIG 17198
R2a
40
39
38
CONTROLS (UNVACCINATED GUINEA PIGS)
INOCULATED - 1cc BLOOD FROM INFECTED GUINEA PIG BR 1663
GUINEA PIG 1676
DEAD
SCROTAL SWELLING
GUINEA PIG 1677
DEAD
GUINEA PIG 1678
DEAD
GUINEA PIG 1679
DEAD
41
40
39
38

TABLE 1.—*Temperature records of vaccinated and control guinea pigs*

Day	R2-vaccinated guinea pigs					R2a-vaccinated guinea pigs					Control guinea pigs			
	17189	17190	17191	17192	17193	17194	17195	17196	17197	17198	BR1676	BR1677	BR1678	BR1679
1 (day of first inoculation with vaccine)	38.6	39.0	39.2	38.4	38.6	39.0	39.0	38.6	38.5	39.0				
2	39.0	38.4	39.0	38.9	39.0	38.8	38.4	38.9	39.0	39.1				
3	38.5	39.0	39.2	39.0	39.2	39.0	39.2	39.0	39.2	38.8				
4	39.0	38.7	38.6	39.2	39.1	39.2	38.6	38.6	39.3	39.2				
5	38.8	39.0	39.2	39.2	39.2	39.0	39.5	38.8	39.0	39.0				
6														
7 (day of second inoculation with vaccine)	39.1	38.5	39.0	38.5	38.5	39.2	39.1	39.7	39.7	38.5				
8	39.0	38.8	38.6	39.0	38.8	38.6	38.4	39.0	39.7	38.9				
9	38.5	38.4	38.4	39.1	38.5	39.1	39.0	38.9	39.8	38.8				
10	39.0	39.1	39.4	39.2	39.0	38.8	39.0	39.2	39.8	39.6				
11	39.0	38.5	38.5	38.0	39.0	38.5	39.5	40.0	40.0	39.0				
12	38.5	39.0	38.4	38.5	39.0	39.0	39.2	39.3	39.4	39.0				
13														
14	39.0	38.8	39.1	39.0	38.6	39.2	38.6	39.0	39.2	38.5				
15	38.4	39.0	39.0	38.4	38.7	38.8	39.0	38.5	39.0	38.6				
16	39.0	38.8	39.2	39.0	38.5	39.0	39.1	38.4	38.7	38.4				
17	38.6	39.1	39.0	38.4	39.0	39.2	38.4	38.6	38.4	38.6				
18	39.0	39.0	39.0	38.6	39.2	39.0	38.6	38.8	38.7	39.0				
19	39.0	39.4	38.6	39.2	38.7	39.2	38.6	38.6	39.3	38.8				
20														
21 (day of inoculation with infected blood)	38.5	39.0	38.4	39.4	38.5	39.0	38.4	38.5	38.6	39.2	38.5	38.4	39.0	38.6
22	39.4	39.0	38.5	38.5	39.2	39.0	38.8	39.1	38.5	39.0	38.6	39.2	39.1	38.4
23	38.6	39.4	38.8	39.0	38.5	38.5	39.1	39.0	38.4	39.1	39.0	38.5	39.0	38.6
24	39.0	39.0	38.5	38.6	39.2	38.7	39.3	39.0	39.0	38.8	39.1	38.5	39.2	39.2
25	38.4	38.7	39.0	39.6	39.0	38.2	39.0	38.6	38.8	39.0	40.7	40.3	40.5	40.0
26	39.2	38.6	39.2	39.1	38.4	39.0	38.6	38.4	39.1	38.6	40.9	40.6	40.8	40.8
27														Dead.
28	39.1	38.8	39.1	39.0	39.1	38.5	38.4	38.8	39.2	39.3	40 RS*	40.0	40.0	
29	39.0	39.2	39.0	39.4	39.2	39.2	39.5	39.0	39.6	39.2	40.4	40.7	40.5	
30	38.7	38.4	38.7	38.6	38.5	38.2	38.0	38.2	38.5	38.5	Dead.	39.6	40.0	
31	38.7	38.4	38.4	39.2	39.0	39.0	38.4	38.6	39.0	38.7		38.0	39.8	
32	39.0	39.0	38.9	38.7	39.0	38.7	38.4	38.7	38.9	38.6		Dead.	38.0	
33	38.6	38.4	39.0	38.8	38.6	38.4	38.9	39.0	38.8	38.5			38.2	
34														
35	39.0	38.7	38.8	38.6	39.0	39.0	38.8	39.0	39.0	38.8			38.0 38.2 Dead.	

*Scrotal lesions.

During the process of vaccination 2 of the animals developed slight temperatures, 1 having a temperature of 40° C. for 1 day and the other having temperatures ranging from 39.7° to 40° C. for 5 days. These two animals were in the group which had been inoculated with the vaccine (R2a) from which the precipitate had not been removed. It is possible that there were small pieces of tissue containing rickettsiae which had not been killed by the formalin.

DISCUSSION

As described in the publication referred to by the writer (*3*), the rickettsiae of Rocky Mountain spotted fever are present in fair numbers in the modified Maitland media. While the rickettsiae of endemic and European typhus were much more numerous in the same medium, the results with vaccines prepared from the cultures of endemic typhus rickettsiae have been less encouraging than those here reported. Apparently the rickettsiae of Rocky Mountain spotted fever are more highly antigenic than those of endemic typhus.

Spencer and Parker call attention to the contrast in immunizing properties of tissue and tick virus, the killed tick virus possessing strong immunizing properties such as were "rarely exhibited by killed tissue virus." It seems probable that the number of rickettsiae present in the tissue influence to some extent the results obtained. There are many more rickettsiae associated with the tissue in Maitland media cultures than are visible in the tissue as removed from the guinea pig. After removal of the tissue from the body and transfer to the Maitland media, it remains viable for 4 or 5 days. At the same time the inhibiting factors which tend to limit the multiplication of the organisms in the body are absent and the rickettsiae are more free to multiply.

The amount of vaccine which may be prepared from the tunica of one guinea pig is sufficient to suggest this method of preparation as practicable. The visceral tunica is as suitable as the parietal tunica and much more of it is available. In our work the parietal tunica is usually distributed among three or four flasks containing 5 cc of the fluid portion of the medium. The amount of visceral tunica from one testicle is sufficient for 15 or 16 flasks and, therefore, the number of flasks from one guinea pig would total 35 or 40. Diluting the tissue suspension to about one-half of the original volume, the amount obtained would be 90 to 100 cc, which would be sufficient to immunize 40 to 50 guinea pigs. If transplants are made to flasks containing fresh media for second passage growth, the number of flasks may be multiplied by four, as the material in one flask is usually sufficient to inoculate four fresh flasks. The results obtained, therefore, appear to justify further experimentation with vaccines prepared from the growth in the media described.

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METHODS FOR THE DETERMINATION OF QUARTZ IN INDUSTRIAL DUSTS

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Increasing understanding of the role of quartz as the causative agent in silicosis has given rise to an insistent demand for better methods of determining the quartz content of dusts, especially in the presence of silicates.

At present the available methods are more or less unsatisfactory from the point of view of their general applicability to routine analysis. In 1933, Knopf (*1*), in his paper on the quantitative determination of quartz in dusts, brought the subject up to date. Since that time other procedures have been developed or suggested. It is the purpose of this paper to assemble this material, and in presenting it together with Knopf's method, to determine the present status of the question.

Chemical analyses of rock samples are reported more or less arbitrarily in terms of the oxides of the elements present. Silicon is reported as silica (SiO_2), silicon dioxide. Thus, if it is stated that a rock or dust sample contains a certain percentage of silica, there is no implication that the silicon is present as quartz, as silicate, or any other compound of silicon. To make a distinction, the term "free silica" is usually used to mean quartz but may denote any form of silicon dioxide, and the term "combined silica" is used to denote silica that is combined with other elements in the various siliceous materials. In other words, the percentage of silica or total silica is the sum of the "free silica" plus the "combined silica".

Methods for the determination of quartz fall into two classes, chemical and petrographic. Chemical methods usually depend on dissolving or decomposing all of the material present with the exception of the quartz, which can then be isolated and determined by either weighing it or volatilizing it with hydrofluoric acid and determining it by difference.

The procedure and principles involved in petrographic analysis are covered in most of the standard works on mineralogy (*2*) (*3*) (*4*). Flotation methods fall under general mineralogy.

CHEMICAL METHODS

Ultimate analysis.—A complete chemical analysis is made following the methods of rock analysis (*5*).

Knopf's procedure using hydrofluosilicic acid.—After a preliminary petrographic examination, the material is treated as follows:

It is first ground to pass a 150-mesh sieve. It is then weighed in a platinum crucible. About half a gram sample is taken.

If the preliminary microscopic examination indicates the presence of any organic material, the platinum crucible and its contents are carefully heated to white heat for 30 minutes to burn off the organic matter.[1]

Hydrochloric acid treatment.—If the preliminary examination shows the presence of carbonate minerals, hydrochloric acid is added to the contents of the platinum crucible and the crucible is gently heated. The contents of the crucible are filtered and washed, and the filter paper and precipitate are ignited in the same platinum crucible, which is then allowed to cool.

Hydrofluosilicic acid treatment.—After these operations, hydrofluosilicic acid in moderate excess is added to the material in the platinum crucible. If the composition of the dust is such that the ignition and hydrochloric acid treatment are unnecessary, the hydrofluosilicic acid is added to the substance to be analyzed immediately after the first weighing. The crucible is carefully covered and set away in a place where the temperature is reasonably constant and *not above room temperature.* Care must be exercised not to raise the temperature during the hydrofluosilicic acid treatment, because hydrofluosilicic acid (H_2SiF_6) decomposes, on heating, into silicon tetrafluoride (SiF_4) and hydrofluoric acid (HF), which will readily attack the free silica. It is left for a time, ranging in different specimens from 24 to 48 or even 72 hours. Some samples may require a week or more to decompose.

It is then carefully decanted into an ashless filter paper, and the crucible contents are thoroughly washed onto the filter paper. The precipitate is washed until the wash water gives no precipitate in a clear mixture of dilute KCl with 95 percent alcohol. The precipitate is dried, ignited in the platinum crucible, and weighed, and the percentage loss in weight is noted.

The hydrofluosilicic acid treatment is repeated until the weight of the residue remains unchanged.

Microscopic examination of residue.—A small portion of the residue is then examined under the petrographic microscope. If minerals other than quartz are present, the amount of quartz in the residue

[1] It is safer to omit this ignition. The presence of alkali carbonates may cause fusion of the sample and in this way convert quartz to silicate.

can be estimated with a reasonable degree of accuracy. If quartz is the only mineral indicated by the microscopic examination, the percentage of quartz in the sample can be calculated directly from the weight of the residue.

Volatilization of residue with hydrofluoric acid.—A check on the microscopic determination of quartz is given by volatilizing the residue with hydrofluoric acid in the platinum crucible. Free silica volatilizes completely with hydrofluoric acid. Combined silica in silicate minerals volatilizes with hydrofluoric acid; but after the treatment, there remains a residue made up of the bases that were in combination in the silicates. If no residue is left, the material was all quartz.

It is necessary to apply a correction factor for the loss of quartz due to its solubility in hydrofluosilicic acid. Knopf determined this factor and found it to be 0.7 percent per day for pure ground quartz passing a 150-mesh sieve.

The sieving of samples, while placing limits upon the size of the grains, does not give an accurate picture of the physical characteristics of the sample. It is necessary to know the particle size distribution of the ground material. The median particle size and the standard deviation should be determined. For example, two samples having the same particle size as determined by sieving may have a greatly differing percentage of particles of a certain particular size (*6*). The solubility of the quartz in a given reagent will depend on the percentage of very finely divided material in a given sample. Controls must, therefore, be run, using quartz having the same particle size distribution as in the sample.

The fluoboric acid method.—Line and Aradine (*7*) have developed a method for the determination of quartz following the lines of Knopf's method but substituting fluoboric acid for hydrofluosilicic acid. The procedure is as follows:

Preparation of fluoboric acid.—Dissolve 32 grams of purified boric acid in 75 cubic centimeters of pure 48 percent hydrofluoric acid. Pour the hydrofluoric acid into a 125-cubic centimeter platinum dish and cool this in an ice bath. Keeping the dish in the ice bath, add the boric acid in small amounts, allowing each portion to dissolve before more is added. In this way the solution does not become overheated. When all the boric acid has been added (the last portion will not dissolve while the solution is cold), concentrate the solution to about 50 cubic centimeters on a steam bath. Cool to 0°–5° and filter. The resulting acid is a slightly yellow, fuming, sirupy liquid that should have a specific gravity of about 1.45 and should analyze about 40 to 45 percent HBF_4 by the Lange method. It should give no test for fluoride with calcium chloride or lead nitrate solutions. It must be stored in wax or rubber bottles, but the filtration may be done with glass apparatus.

Decomposition of silicate.—In a platinum crucible, weigh a 0.15- to 0.2-gram sample of material that has been ground to pass a 100-mesh sieve. To this add 5 cubic centimeters of fluoboric acid, 1 cubic centimeter of phosphoric acid, specific gravity 1.39, and 2 cubic centimeters of 2 M ferric chloride. Heat the crucible at 50° C. for 48 hours, adding more ferric chloride if the yellow color of the solution fades. Transfer the residue to an ashless filter and wash four times with N hydrochloric acid and five times with hot water. Unless the residue is negligible at this point, place paper and residue in the crucible and destroy the paper by heating the crucible to dull redness. Repeat this treatment for 48 hours longer. Filter, wash, and determine the weight of the residue. Unless solution has been complete, repeat this treatment for 48-hour periods until a loss of only 1 to 2 milligrams is found. This indicates complete solution of the silicate.

Some siliceous materials may be decomposed in less than 48 hours, in which case the treatment with fluoboric acid should be stopped as soon as complete decomposition is apparent. In other cases, even 8 to 12 days may not effect complete decomposition.

Determination of free silica.—Treat the residue insoluble in fluoboric acid with 2 to 3 cubic centimeters of 48 percent hydrofluoric acid, and repeat until constant weight is obtained after ignition. The loss in weight corresponds to the free silica content of the residue. This value must be corrected for the amount of free silica dissolved during the time required to decompose the silicate. The correction factor is 0.34 percent per day.

When the residue is practically pure silica, the treatment with hydrofluoric acid will give the correct value for quartz; if undecomposed silicates remain, the loss with hydrofluoric acid will be too high, owing to attack of the silicates.

Apparatus.—For maintaining the crucibles at a constant temperature for long periods, a large vacuum desiccator is placed in an electric oven, the heating unit of which is controlled by a thermostat. An outlet tube is connected to a suction pump and a constant current of warm air to remove the fumes is drawn through the desiccator. The inlet tube is so arranged that a thermometer can be inserted into the desiccator to check the temperature without disturbing the apparatus.

This method is an improvement on Knopf's procedure inasmuch as the correction factor for the solution of the quartz is only 0.34 percent per day at 50° C. However, the decomposition even under these conditions is still large enough to make a correction factor necessary. An advantage claimed for this method is that fluoboric acid dissolves a variety of silicates more rapidly than does fluosilicic acid, and a greater number of more insoluble silicates can also be dissolved in fluoboric acid.

Shaw's modification of Selvig's method—"Rational Analysis."—Shaw (*8*) has described this method and has made some improvements in it. It is applicable only to special kinds of silicates—the coal measure rocks and shales (*9*).

Shaw's procedure is as follows: Five grams of the sample, ground to pass 60 mesh, are mixed with 300 cubic centimeters of dilute hydrochloric acid (2.5 percent by volume), and heated to boiling in a deep porcelain dish of 1,300-cubic centimeters capacity. The dish is allowed to stand for 2 hours, or until the material has settled, and the clear liquid is siphoned off. It is advisable to have a tap or pinch-cock in the siphon tube to reduce the rate of flow toward the end of the operation; if the siphon is clamped so that the end of the short limb is adjustable in the liquid, it will be found possible to remove practically the whole of the solution without disturbing the solid material. The residue is stirred with 100 cubic centimeters of water, 100 cubic centimeters of sulphuric acid (1:1) are added, and the mixture is boiled, with frequent stirring, until acid fumes are freely evolved. The temperature of the solution should not rise above 200° C., and the total time of evaporation should be approximately 45 to 60 minutes.

The dish is allowed to cool for 30 minutes, and its contents are diluted with a liter of water, well stirred, and allowed to settle. The clear solution is siphoned off, and the residue is treated with 100 cubic centimeters of water and 100 cubic centimeters of the sulphuric acid and evaporated once more. After dilution, and settling and siphoning off the solution, the residue is neutralized with Lunge solution (100 gm of crystallized sodium carbonate + 10 gm sodium hydroxide in 1 liter of solution). If the amount of acid liquid remaining in the dish is large (20 cc or more), 50 percent sodium hydroxide solution should be used for neutralization, to prevent excessive dilution of the Lunge solution in the following operation. Three hundred cubic centimeters of Lunge solution are then added, and the liquid is heated to boiling, with frequent stirring. After standing for 2 hours, the solution is siphoned off, and the residue is boiled for 5 minutes with 500 cubic centimeters of concentrated hydrochloric acid, diluted to 1 liter, and allowed to settle. The acid solution is siphoned off, the residue is neutralized with Lunge solution or 50 percent sodium hydroxide solution, 150 cubic centimeters of Lunge solution are added, and the liquid is heated to boiling.

After standing for 2 hours, the Lunge solution is siphoned off, and the residue is boiled for 5 minutes with 200 cubic centimeters of concentrated hydrochloric acid. Two hundred cubic centimeters of water are then added, and the liquid is filtered through a Whatman

No. 40 filter. The residue is transferred to the filter, washed twice with hydrochloric acid (1:3 by volume) and then with water, until the washings are free from chlorides, and, finally, ignited to constant weight in a tared platinum crucible. To the ignited residue are added 5 cubic centimeters of water, 5 to 10 drops of concentrated sulphuric acid, and 15 cubic centimeters of hydrofluoric acid, and the resultant liquid is evaporated on a hot plate until sulphuric acid fumes are evolved. The evaporation is repeated with two further quantities of hydrofluoric acid, heating being continued during the final evaporation until sulphuric acid fumes are *freely* evolved, to insure complete removal of fluorine, which would interfere with the determination of alumina in the residue. The contents of the crucible are extracted with water, and the solution is filtered. The alumina in the extract is then determined in the usual way by precipitation with ammonia, methyl red being used as indicator to avoid excess. The weight of alumina, multiplied by 5.41, gives the equivalent weight of potash feldspar, and this, subtracted from the weight of the ignited residue previously determined, gives the amount of quartz or "free silica" in the sample.

PETROGRAPHIC METHODS

Determination of free silica in rocks.—In general, it is comparatively easy to identify quartz in a rock specimen by petrographic methods, using the polarizing microscope. The sample is crushed to a powder the individual grains of which are about 0.06 millimeters in thickness. Portions of the powder are then successively immersed in liquids of known refractive indices until a point is reached where in one position of the microscopic stage the boundary between the grains and the liquid disappears. This occurs when a refractive index of the mineral is the same as the index of the liquid in which it is immersed. By this method, the refractive indices of a mineral can be determined, together with other optical properties.

In the case of quartz, the mineral is identified by the following criteria: Cleavage not distinctly observed; fracture conchoidal to subconchoidal, uneven to splintery; hardness = 7; specific gravity, 2.65; luster vitreous, colorless when pure; streak, white; transparent to opaque; uniaxial, optically positive; double refraction weak; indices of refraction, $\omega = 1.544$, $\epsilon = 1.553$.

No one of such criteria is sufficient to determine a mineral, although one criterion may be enough to distinguish it from some other mineral with which it is associated. Some minerals can be identified by determining three or four optical properties; others require more for conclusive determination. According to Knopf, the smallest grain which can be positively identified by petrographic methods is about 10 microns.

The Rosiwal method.—For petrographic quantitative determination, investigators have used the Rosiwal (*10,11*) method. This method consists in measuring the linear intercepts of a given mineral along numerous parallel lines. The ratio between the sum of all the intercepts of quartz to the length of the measured traverse should give the percentage of quartz, because it can be shown mathematically that the linear intercepts are proportional to volumes.

However, two minerals may crystallize in widely different habits. It is, therefore, necessary to determine the shape factor (*6*) of a mineral and take it into account when making any calculation of volume.[3]

The method of Ross and Sehl (*12*).—This method depends entirely upon the value of the refractive indices of the constituents in the sample. It is an application of the Becke line principle. The dust is immersed in fennel-seed oil, which has a refractive index of 1.54. After focusing the microscope, the objective is raised. All particles with a refractive index greater than 1.54 will appear bright, while the remainder will appear darker. These bright particles will consist of quartz plus particles which have a higher refractive index than quartz. Another portion of the dust is immersed in nitrobenzene, which has a refractive index of 1.55. It is examined in the same way. This time the bright particles are those which have a higher refractive index than quartz. If A is the percent of bright particles in fennel-seed oil and B the percent of bright particles in nitrobenzene, then:

$$A-B=\%\text{ of quartz or ``free silica''}$$

In making the counts and measurements of particle size, a Sedgwick-Rafter cell is used and a Whipple disk. According to Line and Aradine, "the modified petrographic immersion method of Ross and Sehl is capable only of a reasonable accuracy."

This method is open to a number of objections. Error is introduced in making the conversion from particle size to percent by weight. More serious, however, is the fact that only one criterion is used for the identification of the mineral, the refractive index. Anticipating this objection, Ross and Sehl state in a footnote in their paper: "This method does not positively identify the counted particles as quartz. There are other minerals whose refractive indices would fall within the limits of 1.54 to 1.55. But in ordinary dust analyses these other minerals do not occur in amounts sufficient to cause appreciable error." Exception is taken to this last statement. To take an extreme case, but nevertheless an actual one, three samples of rock drillings were received for analysis. In these samples, which turned out to be mainly diorite, and consisted almost entirely of feldspar

[3] Report of an investigation of this matter will shortly be published by this laboratory.

and quartz, the feldspar had a refractive index identical with that of quartz. Using the above method, the sample would consist of 95 percent quartz, whereas actually there was less than 5 percent of quartz present. Other criteria, such as twinning, cleavage, and interference figures were used to differentiate the two minerals.

Flotation methods.—Quartz may be separated from other minerals which differ from it in specific gravity by the use of various liquids of definite specific gravity. Bromoform is one of such liquids commonly used. Sartorius and Jötten (*13*) have developed a method using a mixture of acetylene tetrabromide and ethylene bromide. The dust is treated with sulphuric acid, dried, and then centrifuged in this mixture, whose specific gravity approaches that of quartz, 2.65. By centrifuging at great speed (10,000 r. p. m.) it is possible to remove everything of specific gravity under 2.63. The remaining particles are examined for quartz.

LIMITATIONS OF THE FOREGOING METHODS

1. Attempts are always being made to calculate the quartz content of a material from its chemical analysis. Sometimes this method proves quite successful (*14*); but unless the various minerals in the sample have been identified petrographically, the chemist has no definite facts upon which to base his calculations. Shaw (*8*) gives the following data on four samples in order to show the error which such procedures may lead to:

Sample no.	Percent of quartz (calculated)	
	Composition assumed to be quartz, feldspar, kaolin, etc.	Composition assumed to be quartz, micas, kaolin, etc.
1	11.4	17.6
2	19	34.8
3	64.2	67
4	4	11.5

Calculations based on the formulas for certain minerals as given in texts on mineralogy should never be made. Such formulas are usually empirical and may refer to a particular sample from some definite locality, or they may refer to an ideal formula for the pure mineral. It is necessary to analyze the particular mineral which is a constituent of the sample and then apply the results of such an analysis for such calculations. This should be done with the utmost caution.

2. According to Ross and Sehl, the hydrofluosilicic acid method is inaccurate for such materials as shale, clay, pumice, etc., when compared with petrographic methods. As described, the method applies

to material ground to pass a 150-mesh sieve. When applied to finely divided material, the use of this method may lead to erroneous results. This is due to the increased solubility of quartz in hydrofluosilicic acid as the exposed surface of the quartz increases.

Hatch and Moke *(15)*, after using this method on foundry dusts, were led to doubt the accuracy of their results. Accordingly, Moke *(16)* investigated the solubility of finely divided quartz in hydrofluosilicic acid. He found that the quartz was soluble in this acid to a fairly great extent. "If sufficient time and acid were employed, all the quartz would undoubtedly go into solution."

3. Line and Aradine tested their fluoboric acid method on 17 mineral silicates. They found that six of these—garnet, sillimanite, zircon, beryl, forstirite, and dumortierite—could not be completely decomposed. They used material ground to pass through a 100-mesh sieve.

The author measured the solubility of finely divided quartz in fluoboric acid. A 325-mesh sample with a median size of 8.4 microns and a geometric standard deviation of 3 was used. For the first 48 hours the samples lost 1.4 percent per day. After 48 hours the loss dropped to 0.8 percent per day. This is twice as great as the loss reported for 100-mesh quartz, viz, 0.34 percent per day.

4. Shaw's modification of Selvig's method is applicable only to the coal measure rocks and shales.

Samples must be ground to pass a 60-mesh sieve. Experiments by Shaw on the solubility of quartz in Lunge solution showed that finely divided quartz is readily soluble. The following figures were obtained by him:

Solubility of quartz in Lunge solution

	Percent
5 grams, 200 mesh	2.0
0.5 grams, 200 mesh	6.2
60 mesh	1.2

Mineralogical analysis.—A mineralogical analysis combines chemical and petrographic methods. When determining the quartz content of dusts it is absolutely essential to use such methods. From a consideration of the foregoing methods it is seen that no one of these methods is adequate for dust determinations. The median size of industrial dust samples runs below 10 microns. For rafter samples it is about 7 microns. Quartz ground to pass a 200-mesh sieve has a median size of 65 microns. It is, therefore, necessary when adopting any of the chemical methods to run careful controls on quartz having the same particle size distribution as the sample to be analyzed, in order to determine whether the correction for the solubility of the quartz will be small enough to insure reasonable accuracy.

When dealing with dusts below 10 microns, quantitative petrographic methods also break down. However, it is usually possible when examining a dust sample to find a number of particles which are large enough to be identified. In this way one may get a rough idea of the constituents in a given dust sample.

RECOMMENDED PROCEDURE FOR DUSTS

Sampling.—By judicious sampling it is possible to overcome many of the difficulties inherent in the analysis of dusts. The more information the analyst can obtain concerning the sample, the easier it is for him to make a satisfactory analysis. The accompanying form is designed to provide such information.

DUST SAMPLE SUBMITTED FOR ANALYSIS

Sample number ------------- Industry ------------------------ Location ------------------------
Where was sample collected? (Name of factory, quarry, mine, etc.)------------------------------------
What process was carried on where this sample was collected?--
----

Method used for collecting sample--
From what material did this dust presumably arise?--
(Samples of the coarse material should be submitted, together with any available analytical data.)

IF SAMPLE IS OF MINERAL ORIGIN:
Name of principal mineral--
Location of deposit--
Nature of deposit (vein, dike, bed, etc.)--
Size of deposit--
Associated gangue materials--
Geological description of area--

ADDITIONAL INFORMATION---

Date-------------------------- Collected by----------------- Submitted by----------------------

Supplementing the actual dust sample, samples of all the materials from which the dust may have presumably arisen should be obtained. Such materials will usually prove amenable to analysis, whereas the dust itself may not. In many cases it happens that the dust sample has practically the same chemical composition as the material from which it arises.

In such a case it is very simple to obtain an accurate analysis of the dust sample from the analysis of the parent substance. In any case an overabundance of samples is not a great evil, while the lack of a particular sample may make itself keenly felt.

Petrographic methods.—A petrographic examination should always be made. It is a basis for further work on the sample, whether along petrographic or chemical lines.

Chemical methods.—A complete chemical analysis should be made. The total silica content alone at least gives the upper limit for the amount of free silica present. With judgment, a certain minimum amount of silica necessary for combination with the other elements present may also be calculated.

With this information available, it becomes easier to make a choice of a method for further identification of the dust, the hydrofluosilicic acid method, the fluoboric acid method, etc. Sometimes it may be necessary to use more than one, or all, of these methods.

SUMMARY

Various methods for the determination of quartz or "free silica" have been given. No one of these methods has general applicability for all dusts regardless of their composition. Therefore, a petrographic examination is first made and also a chemical analysis. Then one or more of the methods herein outlined is used to determine quartz. After the minerals and other constituents of a dust sample have been identified, it is usually possible to choose a suitable procedure.

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A STUDY OF DUST CONTROL METHODS IN AN ASBESTOS FABRICATING PLANT

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An extensive medical and engineering study of the health of asbestos workers has been conducted by the United States Public Health Service (*5*). The material contained in this paper supplements the general study with a detailed study of the dust control methods used in an asbestos fabricating plant. It is a report on present conditions and how they have been obtained and is presented as an example of the results of the application of scientific methods of dust control. These data should be interesting not only to the asbestos industry but also to other industries having similar dusty processes.

The plant studied has only partly completed an extensive dust control program, and conditions are being improved continually; consequently, these results should not be interpreted as representing the maximum possible efficiency in the control of asbestos dust, but it is believed that they are representative of the best practice in this country at this time. The dust control systems in use with the various processes in each department are described. An occupational analysis of employees is presented, with a comparison of the atmospheric dust concentrations associated with controlled and similar uncontrolled processes.

FABRICATION OF ASBESTOS TEXTILES

Asbestos is the class name for several different fibrous minerals, but the asbestos of commerce (*1*) is mainly the fibrous form of serpentine known as chrysotile.[1] Due to its fibrous nature, flexibility, and heat-resistant properties, asbestos fiber finds many practical applications. One of its important industrial uses is in the manufacture of fire-resistant textiles.

In the plant studied, practically all raw material was crude Canadian or South African asbestos. Some imported short fiber was used, as well as some of the short fiber salvaged in the recovery process, but most of the short recovered fiber was shipped to other plants. Significant variations in atmospheric dust concentrations due to the grade of fiber being processed were not evident in controlled processes in this plant. Consequently, the type of fiber used has not been considered in the analysis of the data. Each dust controlled process tended to decrease the amount of dust generated in subsequent

[1] Chrysotile is a hydrous magnesium silicate ($H_4Mg_3Si_2O_9$ or $2H_2O\cdot3MgO\cdot2SiO_2$) containing 44.1 percent silica, 43.0 percent magnesia, and 12.9 percent water. Other types of asbestos often contain silicates of iron, calcium, and aluminum as well as magnesium (*2*).

processes. These factors must be considered when comparing dust concentrations reported in this plant with the data which have been reported for other plants.

Approximately 300 persons were employed in this plant, of whom 180 worked in departments having a potential asbestos dust hazard. This study was confined to these departments; namely, preparation; carding; spinning, twisting and winding; and weaving. The occupational distribution of exposed workers is shown in table 1.

TABLE 1.—*Occupations and dust exposures of workers in an asbestos textile plant*

Occupation	Number of workers	Average dust concentration, M. P. P. C. F.	
		Normal	Without exhaust ventilation
Preparation:			
Crushermen	2	3.5	
Cotton openers	1		
Asbestos openers	2	[1] 3.5	[3] 59.6
Bed builders	2	[1] 5.4	
Pickermen	2	[1] 6.7	
Others	5	[1] 2.4	
Carding:			
Carders	6	[1] 1.7	[2] 62.4
Stock rollers	10	[1] 4.6	[3] 40.4
Card tenders	8	[1] .7	
Wick, rope, and cord	6	1.7	
Others	6	.3	
Spinning, twisting, and winding:			
Mule spinners and helpers	32	.9	
Ring spinners	6	5.0	
Spoolers	16	[1] 2.9	[2] 9.6
Cop winders	4	6.9	
Twisters	13	11.0	
Universal winders	7	2.8	
Others	16	5.0	
Weaving:			
Weavers:			
Dry cloth		[1] .7	[2] 9.6
Wet cloth	18	2.7	
Tape and listing		3.0	
Creelers	7	1.3	
Inspectors—Cloth	2	[1] .5	[2] 11.8
Inspectors—Tape	2	3.1	
Others	7	1.3	

[1] Dust exhaust system for this operation.
[2] Sample after 1 hour's operation without exhaust.
[3] Sample taken inside bin during loading.

METHOD OF STUDY

This investigation included a study of atmospheric dust concentrations in the factory workrooms and a study of the exhaust systems used to remove asbestos dust.

Eighty-two atmospheric dust samples were collected at the workers' breathing level with the impinger dust sampling apparatus (*3*). Sixty-nine of these represented present working conditions and 13 represented conditions while exhaust apparatus had been turned off for 1 hour. A collecting medium containing 25 percent ethyl alcohol in distilled water was found to prevent flocculation without causing excessive evaporation in either the sampling flasks or the counting cells. All samples were counted the day after collection. Owing to the low dust concentrations encountered, most of the samples represented the dust in from 20 to 30 cubic feet of air. Samples were diluted with distilled water and counted according to the light-field technique described by Bloomfield and DallaValle (*3*). A micrometer eyepiece having an engraved square equivalent to one-fourth the standard Whipple square was used in counting. Since it is customary to count only one quadrant of the Whipple field, the same volume of sample (0.25 cubic millimeter) per field was counted (*7*).

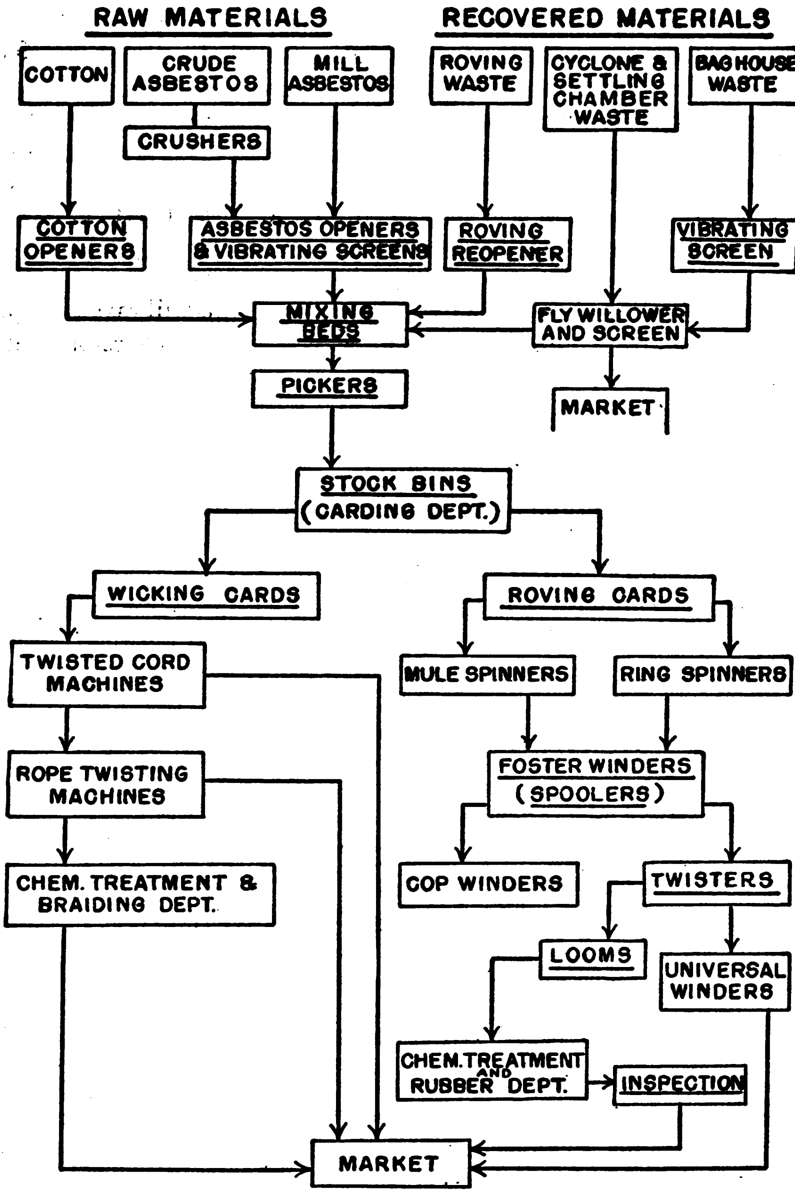
The quantities of air removed through the various exhaust systems were calculated from pitot tube measurements of center-line velocities in the pipe lines (*4*). Average exhaust rates per process are listed in table 2 and discussed a little later in the description of exhaust systems. Entrance velocities at open hoods were measured with an Alnor velometer and checked with a vane anemometer. Most of the hoods were of the enclosed type designed to exhaust only enough air to prevent the escape of asbestos dust into the workroom. Where individual measurements were impractical, air volumes exhausted through each hood were calculated from measurements of main-line velocities. Whenever differences in exhaust volumes were noted between similar hoods on the same operation, the average value is given.

DESCRIPTION OF PROCESSES AND DUST CONTROL MEASURES

Asbestos is received in burlap bags containing 100 pounds of fiber. Cotton is received in standard bales. These are the only raw materials used in the preparation of asbestos yarn at this plant. Unloading, storage, and transportation of the packed raw materials were not hazardous occupations. The progress of the material from raw fiber to completed fabric is shown by means of a flow sheet (fig. 1). Individual processes and the measures for dust control are described below.

PREPARATION DEPARTMENT

Crushing.—Some of the asbestos fiber arrives at the plant as "precrushed" fiber, but most of the crude fiber has received no treatment other than mining, sorting, and screening. This latter type is hand dumped from the bags into rim-wheel crushers and crushed from 5 to 15 minutes. These crushers have two heavy rollers attached to a radial axle, and revolve on a smooth-surfaced tray in which the asbestos is placed. During the crushing, the asbestos fiber is constantly stirred by revolving scrapers. After being crushed, the fiber is replaced in the bags and carried to the asbestos opener. Crushers were not enclosed or exhausted in any way, but the general ventilation in the preparation department was sufficient to prevent high concentrations of dust near this operation. Crusher men had res-



NOTE; UNDERLINED PROCESSES HAVE DUST EXHAUST SYSTEMS.

FIGURE 1.—Process flow-sheet, asbestos textile plant.

pirators [2] and usually wore them while loading or unloading the crushers. The average exposure of a crusher man tending three crushers was 3.5 M. P. P. C. F.

[2] All employees in the preparation department and all repairmen and janitors were provided with respirators of a type approved by the U. S. Bureau of Mines against high concentrations of fine silica dust.

Asbestos opening and screening.—The crushed fiber is dumped from bags to the floor beside the asbestos openers and lifted into the feed lattice hopper with wooden hand forks. Two openers of different design were in operation, but the method of exhaust hooding was the same on both. (See schematic design, fig. 2.) The feed lattice hopper was partially enclosed and exhausted at the top (hood A). A second hood exhausted the bottom fly and settled dust from the bottom of the opener (hood B). The opened fiber was picked up by hood C and pneumatically transported to a cyclone separator where the fibers were removed and dropped onto an enclosed vibrating screen. A large portion of the dust and fine fibers entering the asbestos opener

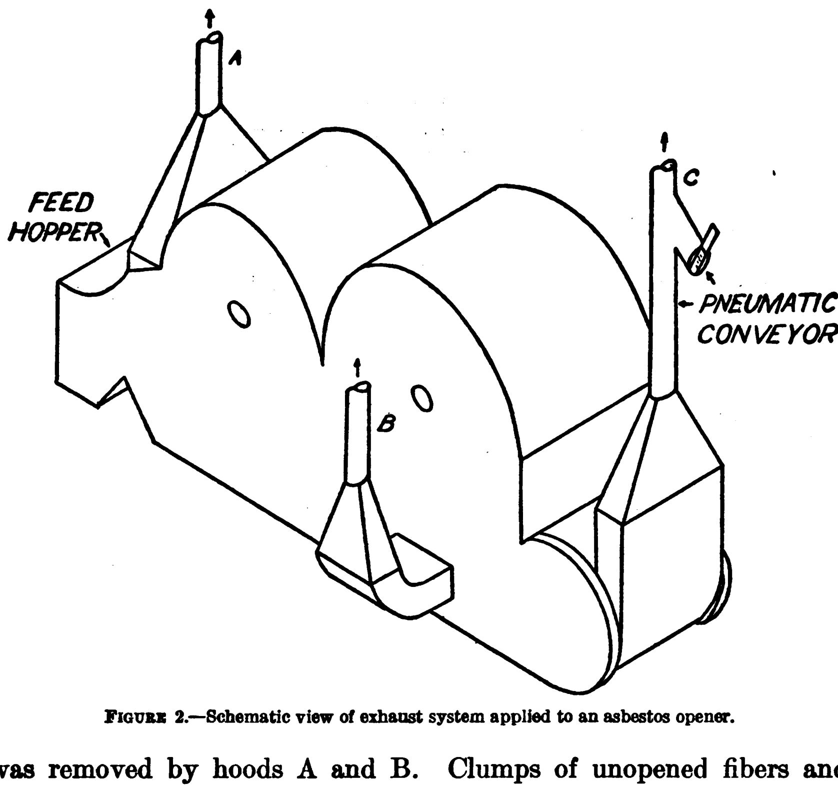


FIGURE 2.—Schematic view of exhaust system applied to an asbestos opener.

was removed by hoods A and B. Clumps of unopened fibers and pieces of rock too heavy to be lifted by the pneumatic fiber conveyor fell onto an enclosed belt conveyor serving both openers, and were carried to the recovery process. (Belt conveyor is not shown in fig. 2.) Exhaust volumes through the hoods were as follows: Hood A, 400 cfm; hood B, 400 cfm; hood C (pneumatic conveyor), 1,800 cfm; conveyor velocity, 2,730 feet per minute.

Each opener had its own cyclone separator and enclosed and exhausted vibrating screen. One screen had two exhaust hoods, one beside the charging hopper drawing 400 cfm and one over the discharge end of the screen and the stock car, drawing 770 cfm. The second screen had one hood only, over the discharge end, drawing 615 cfm. Short fibers and rock particles passing the screens fell through a chute to the enclosed recovery conveyor. Fiber failing to pass these screens dropped into a stock car. Full stock cars were pushed to a platform scale and then to the mixing beds.

The same men charged the openers and filled the stock cars. The average dust exposure of asbestos-opener operators was 3.6 M. P. P. C. F.

Cotton openers.—The best grades of insulation contain very small amounts of cotton, if any; but in all other cases, cotton fiber is mixed with asbestos fiber to improve its spinning qualities. At this plant the batch seldom contained more than 15 percent of cotton by weight but as much as 20 percent cotton was used in lower grade yarns. The two-stage Saco-Lowell cotton opener was provided with exhausts at three points; 770 cfm of air were exhausted through a canopy hood over the feed lattice, 270 cfm from the bottom of the primary opener, and 1,120 cfm from the bottom of the secondary opener. Opened cotton fiber was discharged into stock cars. No samples were taken at the cotton openers, but the operators' average exposure was about 2.4 M. P. P. C. F. (general air, preparation department).

Mixing.—Weighed quantities of asbestos and cotton were placed in alternate layers in the mixing beds. Occasionally, layers of roving waste from the carding room were reopened and added to the bed. Mixing was done in six "exhausted" booths, each 10 feet 2 inches deep by 6 feet 10 inches wide by 6 feet high. Sides of the booths were permanent, while the back consisted of a removable wood and canvas section. Each booth was covered by a pyramid hood 32 inches high, through which approximately 1,025 cubic feet of air per minute per hood were exhausted. The velocity of air motion into these booths averaged 50 feet per minute during bed making and about 30 feet per minute during picker loading. Dust concentration averaged 5.4 M. P. P. C. F. for the bed-making operation.

After a bed had been placed, the picker operator removed the rear partition of the booth and forked the batch into the charging hopper of a picker (fig. 3). The picker machine mixes the fibers in revolving beaters. The four machines represented three different operations and two different types of exhaust systems. The first machine, not in operation during this study, discharged mixed fiber into a stock car. This material was then passed through a second picker for remixing. The second and third machines discharged mixed fiber onto a belt conveyor which transported it to bins in the carding room. The product of the fourth picker was carried to the carding room by a pneumatic conveyor. Each of the first three machines had a hood over the charging lattice, exhausting approximately 500 cfm, a pipe exhausting about 1,650 cfm from the bottom-fly settling chambers

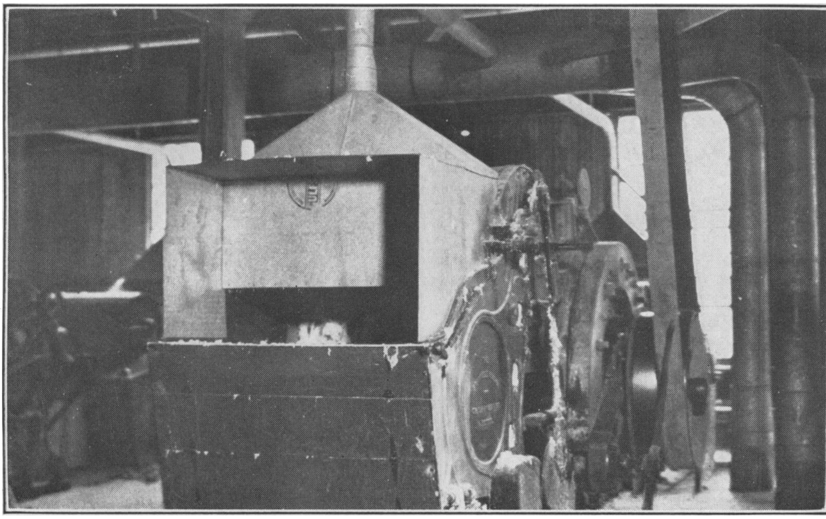


FIGURE 3.—Picker mixing machine.

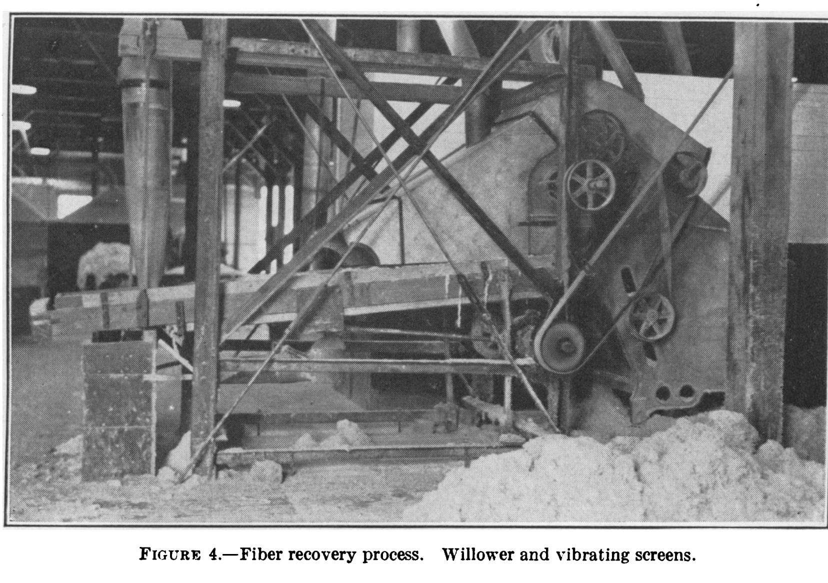


FIGURE 4.—Fiber recovery process. Willower and vibrating screens.

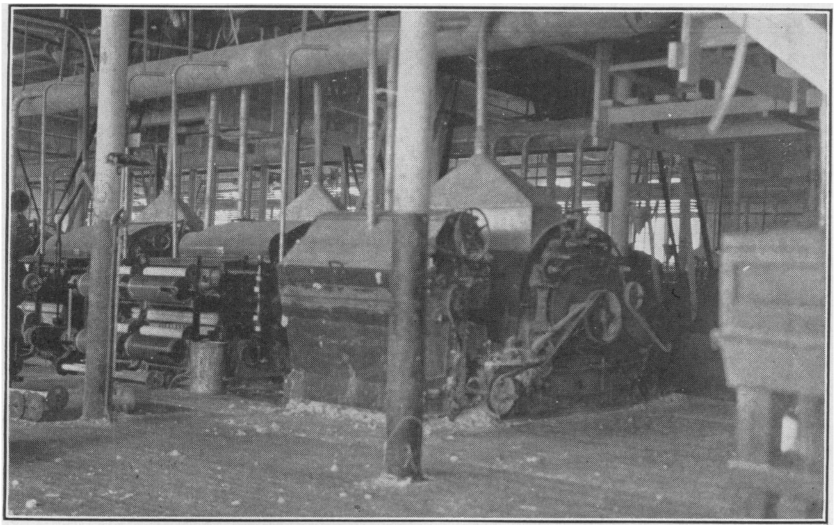


FIGURE 5.—Breaker and roving cards.

FIGURE 6.—Foster winding machines (spoolers).

under the main picker drum, and a hood over the end of the discharge lattice exhausting about 400 cfm. The fourth picker had the same hood arrangement over the charging lattice but had no bottom-fly exhaust, and the mixed fiber was removed by a pneumatic conveyor exhausting approximately 2,000 cfm of air at a velocity of 2,550 feet per minute. The picker operators wear respirators during the charging operation. Dust concentrations during picker charging varied from 4.0 to 9.5 M. P. P. C. F., averaging about 6.7 M. P. P. C. F.

Recovery processes.—Waste roving from the card room was returned to the preparation department for reopening. The roving reopener was exhausted only from the pit below the last beater, but the 1,780 cfm of air drawn through this hood were sufficient to prevent the escape of dust through the discharge lattice.

The dusty air collected by the exhaust systems in the preparation and carding department was blown into a large settling chamber occupying two stories in the end of a separate building. Air was displaced from this room to a bag house occupying the second floor on the other end of this building. Dust was filtered out by burlap filters stretched on A-frames. The filters were beaten down by hand daily during the noon rest period. The collected dust was removed during the week end shut-down, and stored in bins in the preparation department. Bag-house dust was screened on a completely enclosed and exhausted vibrating screen (background, fig. 4), and the long fibers were removed to a cyclone collector by a pneumatic conveyor. The dust from the settling chamber, the long fibers from the bag-house dust, and fibers separated by cyclones on the exhaust lines from the spooling operation and the weaving department were passed through a fly-willower and vibrating screen (fig. 4). Approximately 250 cfm of air were exhausted from the top of the charging lattice and 620 cfm from the discharge side of the opening drum. Dirt passing the screen dropped onto an inclined tray and was removed by an exhaust hood drawing 730 cfm. Fibers which did not fall through the screen were removed by the hood at the lower end of the screen (1,710 cfm) and pneumatically conveyed to a cyclone collector. Rock and other impurities not picked up by the pneumatic conveyor fell into a waste box below the end of the screen. The market for recovered fiber is limited, and such fiber is usually too soiled for use in high-grade textiles. Consequently only part of the collected dust was passed through this process. Average exposure of operators was estimated at between 3 and 5 M. P. P. C. F.

As a measure of the effectiveness of the dust control system in the preparation department, the exhaust fans were shut off for 1-hour. Pneumatic conveyors remained in operation. Dust concentrations increased steadily to about 50 M. P. P. C. F., at which time the exhaust fans were turned on. The samples taken during this period were only a partial measure of uncontrolled conditions, since the hoods and enclosures had a definite control value.

While the location and design of hoods were the most important factors in dust control in the preparation department, general ventilation helped prevent high dust concentrations. This department occupied approximately 320,000 cubic feet of space, from which approximately 34,650 cfm of air were exhausted. Consequently 6.5 air changes per hour were produced by mechanical ventilation, which was supplemented by natural ventilation through doors, windows, and roof ventilators. Fortunately heating was not a problem in this plant.

CARDING DEPARTMENT

Mixed fiber from the preparation department was dropped from pneumatic or mechanical conveyors into bins in the carding department. The total volume of exhaust from four bins was 6,850 cfm, the major portion of this air being drawn through the one or two bin doors left open during the loading of carding room stock cars. Dust concentrations as high as 40.4 M. P. P. C. F. were measured inside an active bin while the dust concentration just outside the door of the same bin was only 4.6 M. P. P. C. F. Workers, classed as stock rollers, fork the mixed fiber from the bin into stock cars. This operation is supposed to be performed with both stock car and stock roller outside the bin door. This rule of keeping out of the bins should be strictly enforced. However, stock rollers, wearing respirators, like to push their cars under the chute and then climb into the car and "tread-down" the stock.

The cards are machines having a series of revolving cylinders wound diagonally with strips of leather set with fine, sharp, steel bristles. Carding removes remaining small bits of rock and combs the fibers into a more or less parallel condition to facilitate spinning. At the time of this study, 31 roving card units and 2 wicking cards were being operated. A roving card unit (fig. 5) consisted of two cards, a breaker, or primary card, and a finisher or roving card.

The mixed fiber was fed by hand from the stock car to the feed hopper of the breaker card. The stock roller wore a respirator during this operation. The fiber passed through the breaker card, emerging as a loose blanket or web. It was carried to the finishing card by a lattice conveyor or camel back. The fiber was stripped from the last cylinder of the finisher onto a moving leather apron, where a set of reciprocating rubbers condensed it into loose rovings of unspun yarn. These rovings are wound on long "jack" spools to be taken to the spinning department. The rovings at the extreme ends of the cards cannot be used for spinning because they lack uniform thickness. These rovings are collected by two small hoods and pneumatically conveyed to a collection bin for return to the preparation department.

The exhaust system applied to roving cards is shown schematically in figure 7. The quantity of air exhausted varied from 1,100 cfm to 1,800 cfm on different carding units with an average exhaust of 1,440 cfm per unit. Cards are partially enclosed and only sufficient air is exhausted to prevent the escape of dust.

Each breaker card is exhausted at three points. Hood B exhausts from the top of the feed hopper over the feed apron. This hopper was enclosed and covered, the cover being lifted during filling. About 160 cfm of air were exhausted through the hood. Hood A exhausted the top fly from the enclosure covering the main carding cylinder. Hood

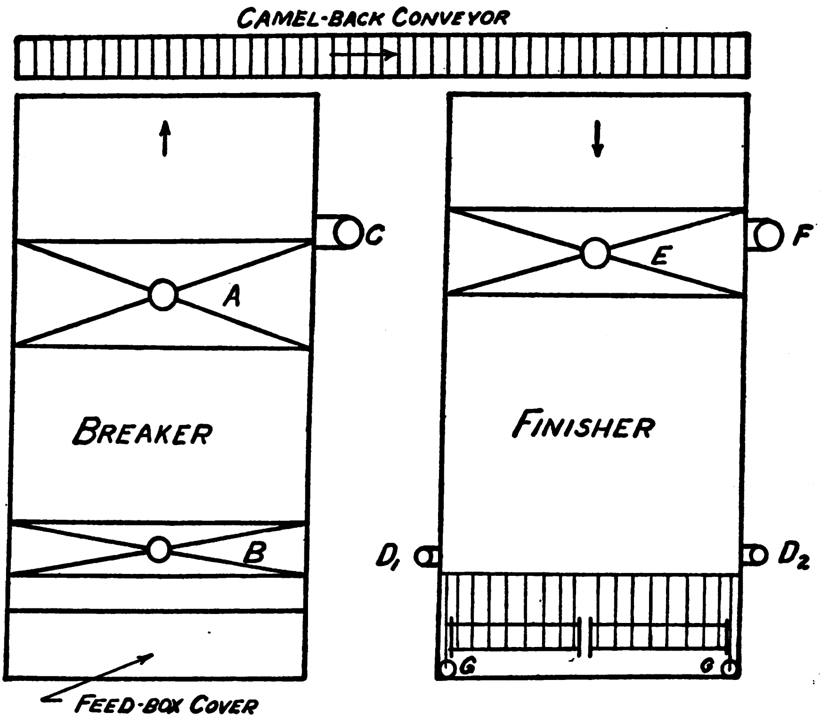


FIGURE 7.—Schematic plan of card exhaust system.

C exhausted the bottom fly from the settling chamber under the carding cylinders. Approximately 285 cfm were exhausted through each of these hoods.

The finishing card had four exhaust connections besides the two small hoods G which removed the waste roving. Hoods E and F correspond to hoods A and C, respectively, on the breaker card, providing an exhaust of approximately 285 cfm each. The doffer card cylinder, doffer combs, and roving apron were exhausted from below, through hoods D^1 and D^2 at 70 cfm each. About 40 cfm were exhausted through each roving collector.

The volumes of air exhausted through each hood were estimated on the basis of pipe areas. Actual volumes showed wide variations on different units.

Single cards were used in the manufacture of asbestos wick and rope, since a thick roving was desired. The wick or rope was twisted from the unspun roving. The wicking cards were exhausted at three points. Approximately 380 cfm of air were drawn from under the feed lattice, 490 cfm were exhausted from the top of the main cylinder cover to remove the top fly, and 550 cfm were exhausted from the bottom-fly settling chamber.

Dust concentrations during carding averaged 1.7 M. P. P. C. F. This was also the average exposure of wicking card operators and wick and rope twisters. Samples taken near the carding department weight scales showed less than 0.5 M. P. P. C. F.

Card rolls were cleaned and ground at night, except in cases of emergency. Cleaning was done with hand scrapers made of strips of card cloth, and the card cylinder was turned by hand. Grinding was done with the usual type of card grinders. The large roll was ground in place in the carding machine. Slightly greater quantities of air were exhausted during grinding due to the decreased loss of head resulting from removal of the wooden card covers. The small card cylinders were ground in a grinding frame. These frames were partially enclosed and covered with a canopy hood exhausting 2,330 cfm per grinder. Dust concentrations averaged 0.65 M. P. P. C. F. during grinding.

A special run of a group of carding machines made with all exhaust ventilation turned off and windows closed showed that dust concentrations steadily increased. At the end of 1 hour the concentration was 62.4 M. P. P. C. F. in the air. Under normal operating conditions about 64,000 cfm of air are exhausted from the carding department. This is equivalent to about 5.5 air changes per hour, disregarding natural ventilation through windows on all four sides of the room.

Spinning, twisting, and winding.—The yarn as roving is twisted or spun into compact threads on either mule or ring spinning frames. In this plant most of the spinning was done on mule spinners. The spun thread was transferred from the spinning spindles to spools, on Foster winding machines (spoolers). Spooled thread to be used as filler (or woof) in woven cloth was rewound on a cop winder into cops which will fit into the loom shuttles. The remaining spooled thread was respooled on twisters which twist several threads into a yarn. The number of strands used determined the size of yarn. Both plain and metallic yarns were twisted. Metallic yarn contains one or more strands of fine wire. Part of the twisted yarn was used in cloth weaving while the remaining yarn was rewound on Universal winding frames for the market.

Mule spinning was separated from other operations in this department by partial partitions. Natural ventilation was good and no exhaust systems were used. The average dust concentration was 0.85 M. P. P. C. F. with a maximum of 1.3 M. P. P. C. F. recorded.

Ring spinning, cop winding, and Universal winding machines were located in the same room with the twisting machines. Average exposures in the first three operations, which were not themselves especially dusty, were due to dust from the twisting operation. With the exception of a trial exhaust system on one twister, the remaining machines were not provided with exhaust. The trial system was reported to be satisfactory and is to be installed on all twisting

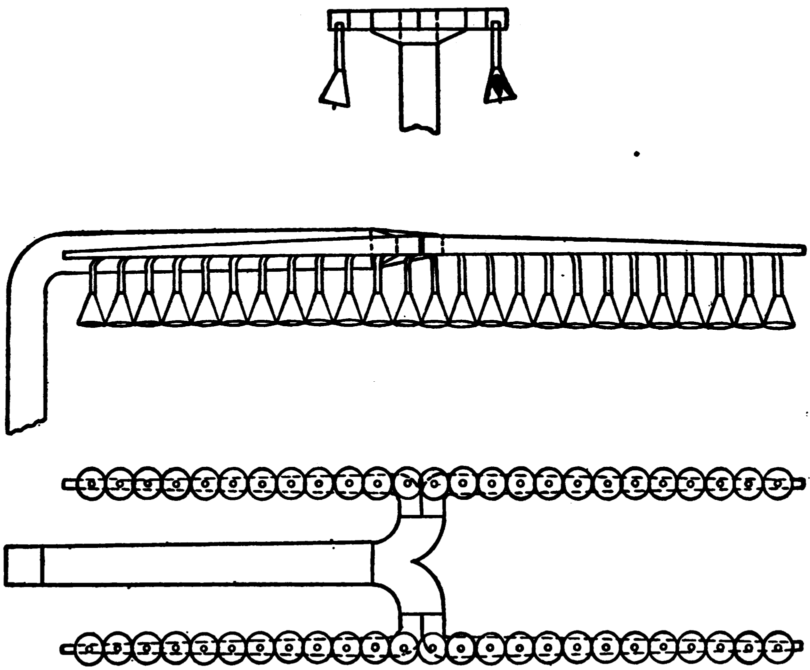


FIGURE 8.—Schematic views of exhaust system applied to Foster winders.

machines. In this system, the bottom of the twisting frame was enclosed and a total of 1,700 cfm of air per machine was drawn downward past the twisting yarns and through five conical hoods distributed along a central exhaust duct.

Average dust concentrations at the various operations in this room were ring spinning, 5.0 M. P. P. C. F.; cop winding, 6.9 M. P. P. C. F.; Universal winding, 2.8 M. P. P. C. F.; and twisting, 11.0 M. P. P. C. F., with a maximum of 18.8 M. P. P. C. F. recorded beside a twisting frame. No accurate measurements of the efficiency of the exhaust system on the single exhausted twister could be secured, but simultaneous samples on both sides of this frame showed a dust concentration of 18.0 M. P. P. C. F. on the side toward the unexhausted twisting frames and a concentration of 6.3 M. P. P. C. F. on the other side.

Four Foster winders (spoolers) were partially separated from the other operations by partitions (fig. 6). The exhaust system consisted of an individual conical hood around each spindle holder (fig. 8). Approximately 46.5 cfm were exhausted through each hood, or a total of 9,270 cfm through the 200 hoods on the 4 spooling frames. Dust concentrations at the spoolers averaged 2.9 M. P. P. C. F. and increased to 9.6 M. P. P. C. F. within 30 minutes after the ventilation had been shut off.

WEAVING AND INSPECTION

Cloth, tape, listing, and brake bands were woven on different types of looms. In this plant, exhaust systems had been applied to the dry cloth looms, since these were considered to be the most important source of dust. The dust control program calls for installation of exhaust systems on dry tape, listing, and brake-band looms. At present these operations are mainly performed wet or partially wet. Brake-band looms were not in operation during this study. Significant differences could not be noted between dust samples collected around the various tape and listing looms. Dust concentrations ranged from 1.2 to 4.0 M. P. P. C. F. and averaged 3.0 M. P. P. C. F.

Nineteen cloth looms were in operation in this department. One of these was a wet loom not provided with exhaust hoods, 4 were dry looms provided with exhaust hoods, and the other 14 were so provided but could be operated either wet or dry. A loom without exhaust hoods is shown in figure 9. The exhaust system is shown schematically in figure 11. A double exhaust hood drew air from under the warp while a second hood was attached to the top of the loom lay with exhaust ducts running down the side of each picker arm to an airtight swing joint at the bottom. The openings in the loom-lay hood consisted of four slots nine inches long by 1 inch wide extending over a space of 4 feet across the woven fabric at right angles to the warp. A total volume of approximately 10,500 cfm of air was exhausted from the 18 hooded looms. This averaged about 580 cfm per loom; but since it was seldom necessary to operate more than 10 dry looms at one time, the average quantity of air exhausted was close to 1,000 cfm per loom. Exhaust dampers were provided on all looms, and a sufficient number to balance the system are closed on wet or idle looms. The average dust exposure of a weaver operating a dry loom with exhaust was 0.7 M. P. P. C. F., while the average exposure in wet weaving without exhaust was 2.6 M. P. P. C. F. Samples taken beside a dry loom without exhaust showed dust concentrations of 9.6 M. P. P. C. F.

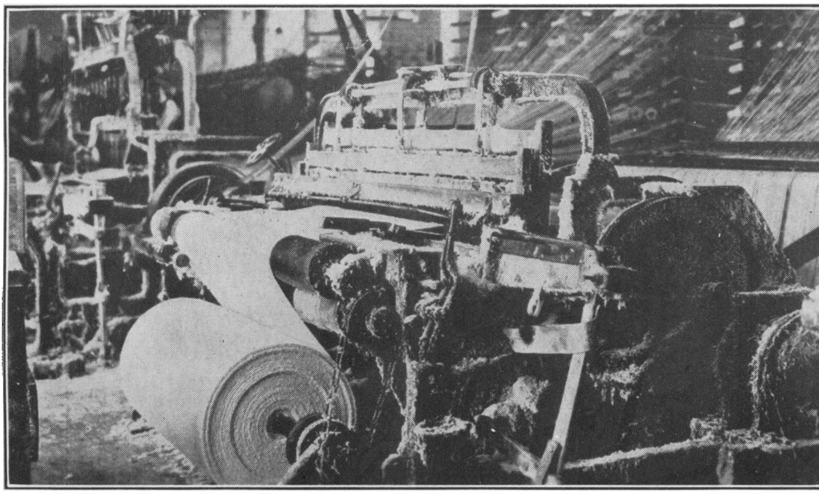


FIGURE 9.—Unexhausted broad loom.

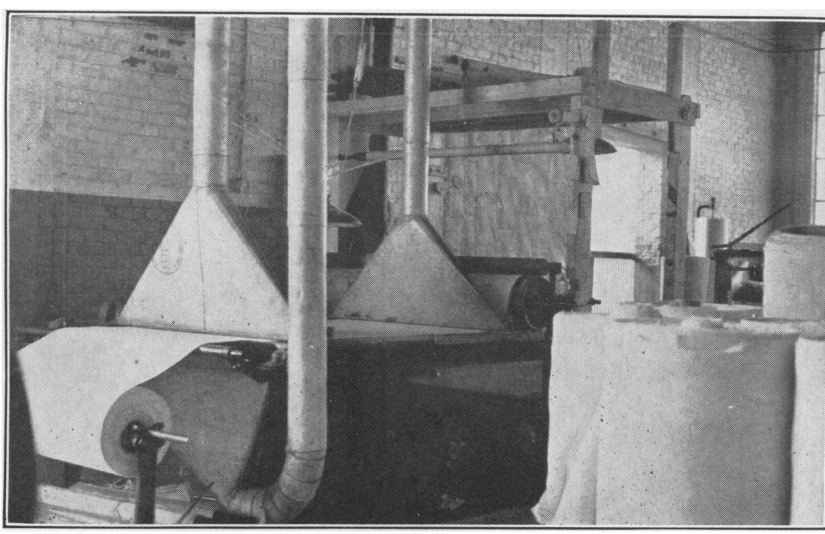


FIGURE 10.—Table for inspecting, calendering, and brushing woven cloth.

after 45 minutes. Average dust concentrations during dry weaving have been shown as 49.7 M. P. P. C. F. (*5*).

Woven cloth was inspected, brushed, and calendered on the inspection table shown in figure 10. Each of the power-driven brushes was

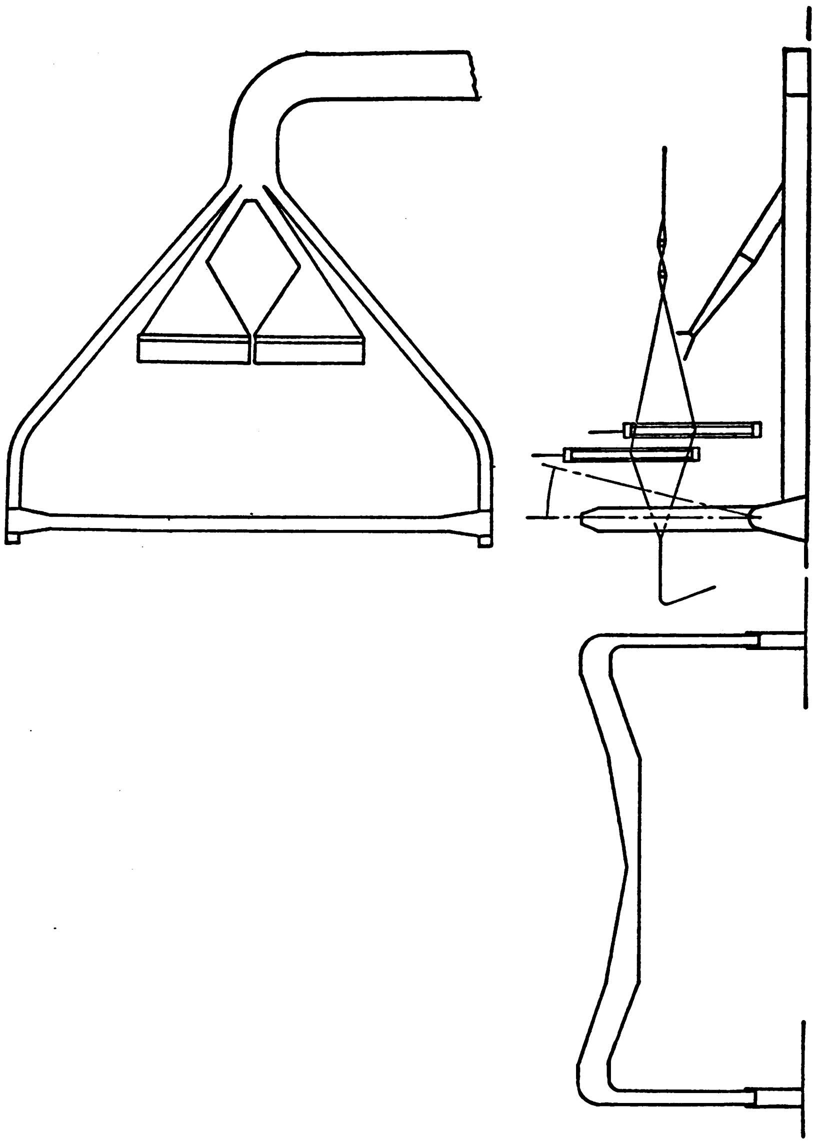


FIGURE 11.—Schematic views of exhaust system applied to broad looms.

partially enclosed and exhausted. Approximately 750 cfm of air were drawn through each of the two hoods at the front of the table and about 200 cfm were drawn through the cleaning hood at the back of the table. Dust concentrations during inspection averaged 0.5 M. P. P. C. F. A sample taken while a roll of fabric was passed across the table without benefit of exhaust showed a dust concentration of 11.8 M. P. P. C. F.

Doffing, inspection, and calendering of tape and listing were hand operations and were not provided with exhaust. Dust concentrations of 5.0 M. P. P. C. F. were recorded during these operations but the exposure was intermittent.

Creelers had an average exposure of about 1.3 M. P. P. C. F. while placing spools and threading looms.

An exhaust of 12,200 cfm of air was provided in the weaving department, corresponding to approximately three air changes per hour. In cold weather, warm air was distributed through the department from a plenum system, while in warm weather natural ventilation was secured through use of windows on all four sides of the department.

OTHER OPERATIONS

Other operations in this plant consisted of processes in which the yarn was chemically treated and fabricated, or processes for chemically treating or rubberizing fabricated cloth. No potential asbestos hazard was associated with these processes, with the exception of one braiding machine used to make large diameter asbestos tubing. This machine was covered with a conical canopy hood about 6 feet in diameter, which provided an exhaust of approximately 200 cfm of air. A sample taken beside this machine showed a dust concentration of 0.4 M. P. P. C. F. at the operators' breathing level.

TABLE 2.—*Volumes of air exhausted per machine in various operations in an asbestos textile plant*

Operation	Connections	Total volume of air exhausts per minute (cu. ft./min.)	Dust concentration with exhaust, M.P.P.C.F.	Dust concentration without exhaust, M.P.P.C.F.
Asbestos opener	[1] 2	625–1,000	3.5	[2] 11.1–36.0
Vibrating screen	1	700		
Cotton opener	3	2,160	----	----
Mixing beds	1	1,025	5.4	[3] 3.1–10.6
Picker	3	2,570	6.7	[2] 34.3–74.3
Roving reopener	1	1,780	----	----
Fly willower and screen	[1] 3	1,600	----	----
Roving cards:				
Breaker (primary)	3	1,420		
Finisher	4	1,440	1.7	62.4
Wicking card	3	1,420		
Card grinders	1	2,330	.7	----
Foster winders (spoolers) [4]	[4] 1	2,225	2.9	[2] 13.1
Twisters	1	1,700	----	11.0
Weaving (broad looms)	2	1,300	.7	[2] 49.7
Brusher—Calenderer	3	1,650	.5	11.8

[1] Equipped with pneumatic conveyor—exhaust through conveyor not included.
[2] Unpublished data, other plants (J. M. DallaValle, U. S. P. H. S.)
[3] Fulton, et al. Ref. (*2*).
[4] Individual cone for each spindle connected to exhaust manifold.

SUMMARY

Table 2 gives a summary of the operations provided with exhaust, listing the number of exhaust ducts and the rate of ventilation per machine, as well as the average dust concentrations to which operators are exposed. Average dust concentrations measured near corresponding operations without exhaust are tabulated to show the effectiveness of the control methods which have been described.

CONCLUSION

This study of actual results secured by a dust control program in an asbestos fabricating plant is presented as an example of engineering control of an industrial hazard. Adequate data have not yet been published to justify the determination of threshold limits of dustiness which will produce asbestosis in any definite period of time. In the absence of such threshold values it is not possible to determine permissible limits of dustiness on a medical basis. Nevertheless, any appreciable decrease in the amount of asbestos dust will cause a decrease in the incidence and severity of the resulting asbestosis. The elimination of all the dust in an industrial workroom is rarely necessary from a physiological standpoint and usually economically impracticable. Consequently, actual atmospheric conditions in an industry resulting from the application of practical methods of dust control can be used as temporary standards by that industry (*6*).

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(*3*) Bloomfield, J. J., and DallaValle, J. M.: The determination and control of industrial dust. Pub. Health Bull. No. 217. Govt. Printing Office, Washington, D. C. 1935.

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(*5*) Unpublished data. United States Public Health Service.

(*6*) Higgins, E., Lanza, A. J., Laney, F. B., and Rice, G. S.: Siliceous dust in relation to pulmonary disease among miners in the Joplin District, Missouri. Bull. 132, U. S. Bureau of Mines, 1917.

(*7*) Page R. T.: Note on a new ocular micrometer for use in dust counting. Pub. Health Rep., *52*: 1315–1316.

DEATHS DURING WEEK ENDED NOV. 6, 1937

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 6, 1937	Corresponding week, 1936
Data from 86 large cities of the United States:		
Total deaths	7, 568	8, 282
Average for 3 prior years	7, 790	
Total deaths, first 44 weeks of year	378, 395	378, 537
Deaths under 1 year of age	452	578
Average for 3 prior years	538	
Deaths under 1 year of age, first 44 weeks of year	24, 280	24, 524
Data from industrial insurance companies:		
Policies in force	69, 899, 046	68, 553, 251
Number of death claims	10, 571	10, 197
Death claims per 1,000 policies in force, annual rate	7. 9	7. 8
Death claims per 1,000 policies, first 44 weeks of year, annual rate	9. 8	9. 8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none was reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Nov. 13, 1937, and Nov. 14, 1936

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936
New England States:								
Maine	2	2	------	1	35	10	0	0
New Hampshire	------	------	4	------	65	3	0	0
Vermont	4	------	------	------	107	1	0	0
Massachusetts	1	9	------	------	48	103	0	2
Rhode Island	1	2	------	------	------	54	0	2
Connecticut	4	1	3	5	7	22	0	0
Middle Atlantic States:								
New York	28	32	[1] 10	[1] 7	70	97	6	12
New Jersey	29	13	16	6	162	50	3	1
Pennsylvania	54	50	------	------	899	44	4	3
East North Central States:								
Ohio	56	57	23	32	237	16	3	4
Indiana	33	39	29	13	24	4	2	1
Illinois	49	43	10	19	260	11	3	6
Michigan	23	25	------	2	41	34	1	1
Wisconsin	4	5	36	31	59	21	0	0
West North Central States:								
Minnesota	12	14	------	1	6	41	0	1
Iowa	5	4	------	4	1	2	2	2
Missouri	55	32	36	56	436	4	2	0
North Dakota	------	5	------	6	1	1	0	0
South Dakota	6	------	------	------	------	4	1	0
Nebraska	6	5	1	------	2	3	0	1
Kansas	18	55	2	5	4	2	0	1
South Atlantic States:								
Delaware	------	1	------	------	------	5	0	0
Maryland [2]	25	26	9	3	7	28	5	5
District of Columbia	6	11	------	------	1	------	0	3
Virginia	66	60	------	------	35	23	5	7
West Virginia	23	35	28	59	85	23	5	3
North Carolina [3]	86	123	4	7	155	34	1	4
South Carolina [3]	21	19	220	313	5	6	0	2
Georgia [3]	37	64	------	------	------	------	2	0
Florida [3]	18	6	6	3	5	------	3	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Nov. 13, 1937, and Nov. 14, 1936—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936
East South Central States:								
Kentucky	38	29	2	15	25	7	6	6
Tennessee [3]	24	50	50	52	33	3	0	6
Alabama [3]	44	65	66	27	1	1	4	1
Mississippi [3]	25	19	-----	-----	-----	-----	0	1
West South Central States:								
Arkansas	30	16	19	12	11	1	1	1
Louisiana	19	17	16	10	-----	8	0	1
Oklahoma [4]	25	17	25	42	3	4	0	0
Texas [3]	65	30	170	121	19	15	2	3
Mountain States:								
Montana	2	2	-----	5	2	4	0	0
Idaho	2	-----	3	4	17	7	0	3
Wyoming	-----	-----	-----	-----	1	4	0	0
Colorado	8	9	-----	-----	13	2	0	1
New Mexico	8	4	2	-----	26	5	0	0
Arizona	10	5	37	58	2	37	0	0
Utah [2]	54	-----	-----	-----	59	13	1	2
Pacific States:								
Washington	5	-----	1	-----	18	6	0	0
Oregon	13	2	18	20	14	7	1	2
California	33	61	21	31	28	19	4	3
Total	1,077	1,064	867	970	3,029	789	67	93
First 45 weeks of year	22,738	23,249	281,108	146,089	256,563	272,921	4,861	6,639

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937
New England States:									
Maine	0	0	13	21	0	0	0	0	24
New Hampshire	0	0	2	4	0	0	0	0	3
Vermont	0	0	14	7	0	0	0	1	27
Massachusetts	2	0	125	105	0	0	3	0	79
Rhode Island	1	0	25	14	0	0	0	1	8
Connecticut	2	0	47	38	0	0	1	0	16
Middle Atlantic States:									
New York	5	7	266	271	0	0	9	14	397
New Jersey	3	1	54	53	0	0	5	5	75
Pennsylvania	4	6	331	324	0	0	21	44	-----
East North Central States:									
Ohio	1	10	317	270	0	1	9	30	181
Indiana	0	0	147	161	20	1	3	1	26
Illinois	4	25	382	286	9	1	12	24	92
Michigan	3	5	354	231	1	1	2	9	-----
Wisconsin	4	1	145	203	3	1	1	1	154
West North Central States:									
Minnesota	4	2	94	121	13	2	0	1	80
Iowa	3	2	135	67	20	6	5	7	34
Missouri	2	6	204	103	15	1	5	23	71
North Dakota	0	2	51	57	30	10	0	3	20
South Dakota	3	0	8	37	11	7	3	2	45
Nebraska	1	1	21	33	0	0	1	0	7
Kansas	1	4	98	90	4	1	1	6	46
South Atlantic States:									
Delaware	0	0	10	7	0	0	0	1	4
Maryland [2]	0	3	72	71	0	0	4	8	65
District of Columbia	0	0	9	12	0	0	0	0	4
Virginia	1	1	35	53	0	0	10	7	47
West Virginia	0	0	100	72	0	0	4	7	33
North Carolina [3]	2	0	72	94	0	0	11	4	160

Footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for week ended Nov. 13, 1937, and Nov. 14, 1936—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937	Week ended Nov. 14, 1936	Week ended Nov. 13, 1937
South Atlantic States—Con.									
South Carolina [3]	1	1	12	8	0	0	2	2	38
Georgia [3]	2	7	36	32	0	0	18	12	16
Florida [3]	1	1	5	2	2	0	0	0	5
East South Central States:									
Kentucky	0	3	107	47	2	0	8	19	67
Tennessee [3]	0	10	42	68	0	1	10	22	33
Alabama [3]	1	1	29	31	0	0	1	6	6
Mississippi [2]	5	3	20	26	4	0	5	3	-------
West South Central States:									
Arkansas	3	7	34	19	3	0	13	14	51
Louisiana	5	2	11	17	1	1	9	6	3
Oklahoma [4]	1	25	68	23	4	1	19	9	340
Texas [3]	9	3	101	47	4	1	50	10	128
Mountain States:									
Montana	1	0	37	50	18	8	3	5	15
Idaho	0	0	33	31	11	1	0	7	11
Wyoming	0	1	6	15	2	1	0	0	23
Colorado	0	10	19	42	2	1	0	0	3
New Mexico	1	1	36	14	0	0	8	5	58
Arizona	0	1	7	29	0	0	1	1	-------
Utah [2]	0	0	50	13	1	1	0	0	14
Pacific States:									
Washington	5	1	45	46	29	0	2	1	75
Oregon	4	0	31	37	30	0	4	0	34
California	14	8	133	211	1	0	7	6	221
Total	99	161	3,993	3,613	240	48	270	327	2,839
First 45 weeks of year	9,102	4,055	191,424	202,398	9,101	6,416	13,879	13,247	-------

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Typhus fever, week ended Nov. 13, 1937, 39 cases, as follows: North Carolina, 2; South Carolina, 3; Georgia, 13; Florida, 2; Tennessee, 1; Alabama, 13; Texas, 5.
[4] Figures for 1936 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
September 1937										
Colorado	4	33	-------	-------	45	-------	95	54	8	9
Puerto Rico	3	28	198	3,212	48	-------	0	-------	0	20
October 1937										
Alabama	8	183	138	700	11	16	9	88	9	25
Arkansas	6	135	70	763	19	29	37	96	1	75
Idaho	1	4	22	1	38	-------	4	92	32	14
Indiana	3	113	124	-------	55	-------	19	576	10	16
Iowa	4	14	1	-------	12	-------	46	309	20	33
Michigan	8	103	4	26	135	-------	63	1,157	1	26
New Jersey	2	39	31	4	305	-------	35	203	0	17
North Carolina	6	504	16	204	276	34	11	301	1	46
Pennsylvania	13	109	-------	-------	1,413	1	50	821	0	121
Tennessee	13	209	92	195	128	13	18	208	23	94
Wyoming	1	-------	-------	-------	12	-------	2	39	0	4

Summary of monthly reports from States—Continued

September 1937

	Cases
Colorado:	
Chicken pox	24
Dysentery	2
Encephalitis, epidemic or lethargic	2
Mumps	12
Undulant fever	1
Whooping cough	50
Puerto Rico:	
Chicken pox	47
Dysentery	16
Filariasis	1
Leprosy	1
Mumps	5
Puerperal septicemia	1
Tetanus	7
Tetanus, infantile	1
Trachoma	1
Vincent's infection	1
Whooping cough	59

October 1937

	Cases
Botulism:	
Tennessee	1
Chicken pox:	
Alabama	35
Arkansas	13
Idaho	56
Indiana	93
Iowa	106
Michigan	610
New Jersey	551
North Carolina	198
Pennsylvania	1,013
Tennessee	41
Wyoming	42
Conjunctivitis:	
Idaho	6
Dysentery:	
Alabama (amoebic)	3
Arkansas (amoebic)	2
Arkansas (bacillary)	6
Iowa (bacillary)	2
Michigan (amoebic)	3
Michigan (bacillary)	1
New Jersey (amoebic)	1
New Jersey (bacillary)	1
Pennsylvania (amoebic)	1
Pennsylvania (bacillary)	3
Tennessee (amoebic)	8
Tennessee (bacillary)	27
Encephalitis, epidemic or lethargic:	
Alabama	2
Idaho	3
Indiana	1
Iowa	2
Michigan	1
New Jersey	3
Pennsylvania	3
German measles:	
Iowa	3
Michigan	41
New Jersey	26
North Carolina	15
Pennsylvania	43
Tennessee	1
Wyoming	3
Impetigo contagiosa:	
Michigan	11
Tennessee	9
Mumps:	
Alabama	33
Arkansas	5
Idaho	56
Indiana	19
Iowa	63
Michigan	221
New Jersey	141
Pennsylvania	730
Tennessee	38
Wyoming	17
Ophthalmia neonatorum:	
Alabama	1
Arkansas	1
New Jersey	11
Pennsylvania	4
Tennessee	3
Paratyphoid fever:	
Michigan	3
New Jersey	3
Tennessee	11
Puerperal septicemia:	
Tennessee	1
Rabies in animals:	
Alabama	48
Indiana	43
Michigan	7
New Jersey	9
Rocky Mountain spotted fever:	
Idaho	1
North Carolina	1
Septic sore throat:	
Arkansas	9
Idaho	7
Iowa	2
Michigan	41
North Carolina	20
Tennessee	17
Wyoming	3
Tetanus:	
Alabama	6
Michigan	8
New Jersey	3
Tennessee	2
Trachoma	
Arkansas	5
Michigan	1
Tennessee	2
Tularaemia:	
Idaho	1
Indiana	1
Michigan	1
Typhus fever:	
Alabama	67
North Carolina	5
Undulant fever:	
Alabama	6
Arkansas	2
Idaho	3
Indiana	5
Iowa	7
Michigan	1
New Jersey	5
Pennsylvania	5
Tennessee	1
Vincent's infection:	
Idaho	3
Michigan	28
Tennessee	6
Whooping cough:	
Alabama	66
Arkansas	51
Idaho	55
Indiana	107
Iowa	188
Michigan	680
New Jersey	311
North Carolina	401
Pennsylvania	1,060
Tennessee	183
Wyoming	56

CASES OF VENEREAL DISEASES REPORTED FOR SEPTEMBER 1937

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,602	5.59	429	1.50
Arizona [1]				
Arkansas	855	4.23	328	1.62
California	1,825	3.01	1,897	3.13
Colorado [1]				
Connecticut	266	1.53	181	1.04
Delaware [1]				
District of Columbia	209	3.38	214	3.46
Florida [2]	1,627	9.91	194	1.18
Georgia	1,515	4.95	370	1.21
Idaho	32	.66	47	.97
Illinois	1,919	2.45	1,526	1.95
Indiana	296	.86	70	.20
Iowa [2]	446	1.75	284	1.12
Kansas	132	.70	76	.40
Kentucky	589	2.04	403	1.40
Louisiana	887	4.18	171	.81
Maine	55	.64	56	.66
Maryland	793	4.74	379	2.26
Massachusetts	427	.96	510	1.15
Michigan	843	1.76	674	1.41
Minnesota	320	1.21	358	1.36
Mississippi	1,968	9.80	2,630	13.10
Missouri	370	.93	257	.65
Montana [2]	55	1.04	69	1.30
Nebraska	83	.61	98	.72
Nevada [3]				
New Hampshire	15	.30	9	.18
New Jersey	700	1.62	359	.83
New Mexico	95	2.25	38	.90
New York	1,432	1.11	837	.65
North Carolina	3,314	9.59	578	1.67
North Dakota	29	.41	57	.81
Ohio [2]	1,521	2.27	482	.72
Oklahoma [2]	502	1.99	428	1.69
Oregon	102	1.00	242	2.38
Pennsylvania [4]	1,672	1.65	294	.29
Rhode Island	67	.98	58	.85
South Carolina [1]				
South Dakota	34	.49	35	.51
Tennessee	694	2.42	353	1.23
Texas	649	1.06	227	.37
Utah [1]				
Vermont	12	.32	44	1.16
Virginia	990	3.71	348	1.30
Washington	281	1.71	378	2.30
West Virginia	284	1.55	167	.91
Wisconsin	48	.17	149	.51
Wyoming [3]				
Total	29,555	2.38	16,304	1.31

See footnotes at end of table.

CASES OF VENERAL DISEASES REPORTED FOR SEPTEMBER 1937

Reports from cities of 200,000 population or over

Akron, Ohio [1]				
Atlanta, Ga	193	6.72	135	4.70
Baltimore, Md	437	5.30	251	3.04
Birmingham, Ala	207	7.33	125	4.43
Boston, Mass	194	2.45	198	2.50
Buffalo, N. Y	116	1.96	82	1.39
Chicago, Ill. [5]	804	2.25	909	2.55
Cincinnati, Ohio	194	4.16	77	1.65
Cleveland, Ohio	268	2.88	100	1.07
Columbus, Ohio	91	2.98	33	1.08
Dallas, Tex	214	7.39	67	2.31
Dayton, Ohio	83	3.95	18	.86
Denver, Colo	63	2.12	32	1.08
Detroit, Mich	361	2.09	322	1.86
Houston, Tex. [1]				
Indianapolis, Ind	18	.48	26	.69
Jersey City, N. J. [1]				
Kansas City, Mo	82	1.95	15	.36
Los Angeles, Calif	558	3.90	520	3.63
Louisville, Ky	229	7.07	143	4.41
Memphis, Tenn	242	9.06	115	4.31
Milwaukee, Wis. [1]				
Minneapolis, Minn	90	1.85	107	2.20
Newark, N. J	262	5.65	177	3.82
New Orleans, La. [1]				
New York, N. Y	7,187	9.84	1,805	2.47
Oakland, Calif	37	1.22	29	.96
Omaha, Nebr	41	1.86	38	1.72
Philadelphia, Pa	510	2.57		
Pittsburgh, Pa	114	1.67	43	.63
Portland, Oreg. [3]				
Providence, R. I	37	1.43	38	1.47
Rochester, N. Y	43	1.28	78	2.31
St. Louis, Mo	276	3.30	193	2.31
St. Paul, Minn	22	.78	36	1.28
San Antonio, Tex	130	5.17	62	2.47
San Francisco, Calif	211	3.15	275	4.10
Seattle, Wash	121	3.19	166	4.37
Syracuse, N. Y	84	3.85	57	2.62
Toledo, Ohio	154	5.06	57	1.87
Washington, D. C	209	3.38	214	3.46

[1] No report for current month.
[2] Incomplete.
[3] Not reporting.
[4] Only cases of syphilis in the infectious stage are reported.
[5] Figures taken from "Monthly Report, Form VM-684."

WEEKLY REPORTS FROM CITIES

City reports for week ended Nov. 6, 1937

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	817	164	35	289	506	1,034	7	352	49	834	------
Current week [1]	180	109	33	875	447	794	20	348	37	769	------
Maine:											
Portland	0	------	0	0	3	3	0	0	0	18	24
New Hampshire:											
Concord	0	------	0	1	0	1	0	1	0	0	9
Manchester	0	------	1	0	0	3	0	0	0	0	16
Nashua	0	------	------	0	------	0	0	------	0	4	9
Vermont:											
Barre	0	------	0	31	0	0	0	2	0	0	5
Burlington	0	------	0	0	0	0	0	0	0	3	8
Rutland	0	------	0	1	0	2	0	0	0	1	6
Massachusetts:											
Boston	0	------	1	24	13	38	0	11	1	3	205
Fall River	2	------	0	0	1	2	0	1	0	23	24
Springfield	0	------	0	0	1	5	0	1	0	10	23
Worcester	0	------	0	0	3	0	0	1	0	4	50
Rhode Island:											
Pawtucket	0	------	0	1	0	2	0	1	0	0	9
Providence	3	1	0	0	1	8	0	3	0	18	52
Connecticut:											
Bridgeport	0	------	0	0	0	0	3	2	0	1	29
Hartford	1	------	0	0	1	10	0	0	0	3	33
New Haven	0	------	0	0	1	1	0	0	0	0	40
New York:											
Buffalo	0	------	1	3	6	8	0	9	0	14	140
New York	26	16	4	32	69	58	0	77	9	88	1,278
Rochester	1	------	0	2	2	1	0	1	0	2	63
Syracuse	0	------	0	1	1	16	0	1	0	9	44
New Jersey:											
Camden	1	------	0	0	2	4	0	0	0	0	33
Newark	1	3	0	1	3	4	0	2	1	22	101
Trenton	0	------	0	84	3	2	0	0	0	0	37
Pennsylvania:											
Philadelphia	5	1	1	11	36	30	0	22	10	38	461
Pittsburgh	2	3	3	170	14	35	0	6	0	20	158
Reading	0	------	0	6	2	7	0	1	0	0	29
Scranton	1	------	------	1	------	2	0	------	0	0	------
Ohio:											
Cincinnati	------	------	------	------	------	------	------	------	------	------	------
Cleveland	8	10	0	41	15	46	0	6	1	28	158
Columbus	3	------	0	1	10	12	0	6	0	0	96
Toledo	5	1	0	1	0	7	0	4	0	12	71
Indiana:											
Anderson	0	------	0	0	3	9	0	4	0	9	15
Fort Wayne	0	------	0	2	0	0	0	0	0	0	26
Indianapolis	7	------	0	2	8	12	0	6	1	19	83
Muncie	1	------	0	0	1	0	0	0	0	0	13
South Bend	0	------	0	0	0	1	0	1	0	1	13
Terre Haute	2	------	0	0	0	1	1	0	0	0	25
Illinois:											
Alton	0	------	0	31	0	2	0	0	1	0	11
Chicago	14	9	5	76	25	92	0	38	0	31	619
Elgin	0	------	0	0	0	1	0	0	0	0	11
Moline	0	------	0	0	1	3	0	0	0	5	10
Springfield	0	------	0	1	1	2	0	0	1	0	18
Michigan:											
Detroit	7	------	0	26	24	57	0	18	2	50	260
Flint	5	------	0	2	2	15	0	1	0	5	22
Grand Rapids	0	------	0	3	5	23	0	0	0	5	49
Wisconsin:											
Kenosha	0	------	0	0	0	2	0	0	0	0	7
Milwaukee	0	------	0	20	1	11	0	2	0	18	76
Racine	1	------	0	0	0	9	0	1	0	2	13
Superior	0	------	0	2	0	0	0	0	0	0	5

[1] Figures for Cincinnati, St. Joseph, Topeka, and Wheeling (deaths), estimated; reports not received.

City reports for week ended Nov. 6, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	2	1	0	0	0	15	13
Minneapolis	0	------	1	1	5	19	0	1	0	15	90
St. Paul	2	------	0	0	4	2	0	2	0	3	51
Iowa:											
Davenport	1	------	0	0	0	2	0	0	0	0	------
Des Moines	0	------	0	1	0	10	0	0	0	0	31
Sioux City	0	------	------	1	------	4	0	------	0	4	------
Waterloo	0	------	------	0	------	6	0	------	0	0	------
Missouri:											
Kansas City	1	1	0	1	7	19	0	4	0	3	92
St. Joseph	------	------	------	------	------	------	------	------	------	------	------
St. Louis	19	------	0	280	9	41	1	5	1	6	117
North Dakota:											
Fargo	0	------	0	0	2	4	0	0	0	6	16
Grand Forks	2	------	------	0	------	5	0	------	1	0	------
Minot	0	------	0	0	0	2	0	0	0	7	3
South Dakota:											
Aberdeen	3	------	------	0	------	0	0	------	0	0	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	8
Nebraska:											
Omaha	0	------	0	0	5	3	0	1	0	0	56
Kansas:											
Lawrence	0	1	0	1	0	1	0	0	0	1	4
Topeka	------	------	------	------	------	------	------	------	------	------	------
Wichita	2	------	0	0	4	3	0	1	0	10	23
Delaware:											
Wilmington	0	------	0	0	3	6	0	1	0	2	35
Maryland:											
Baltimore	3	------	0	1	20	22	0	10	5	51	181
Cumberland	0	------	0	0	2	0	0	0	0	0	10
Frederick	0	------	0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	5	------	0	3	13	9	0	12	1	3	156
Virginia:											
Lynchburg	8	------	0	0	1	0	0	0	0	3	6
Norfolk	0	------	0	0	3	3	0	0	0	0	18
Richmond	1	------	0	0	3	2	0	0	0	0	41
Roanoke	4	------	0	1	0	2		0	0	3	19
West Virginia:											
Charleston	1	1	0	0	5	1	0	2	0	0	56
Huntington	3	------	------	4	------	0	0	------	0	0	------
Wheeling	0	------	------	0	------	5	0	------	0	12	------
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	1	------
Raleigh	0	------	0	1	1	2	0	0	0	22	9
Wilmington	0	------	0	0	1	0	0	0	0	5	8
Winston-Salem	2	1	0	1	1	2	0	1	0	2	18
South Carolina:											
Charleston	1	12	1	0	1	1	0	0	0	0	14
Florence	0	------	0	0	1	3	0	1	0	0	11
Greenville	1	------	0	0	1	0	0	0	0	0	7
Georgia:											
Atlanta	2	17	2	18	10	14	0	5	0	9	92
Brunswick	0	------	0	0	0	1	0	0	0	0	4
Savannah	5	16	1	0	2	2	0	1	0	2	36
Florida:											
Miami	1	3	1	18	3	0	0	1	0	3	25
Tampa	0	2	2	0	0	0	0	0	0	0	16
Kentucky:											
Ashland	0	------	0	0	2	0	0	0	0	0	23
Covington	0	------	0	0	1	0	0	1	0	0	15
Louisville	4	2	0	0	4	18	0	5	0	14	56
Tennessee:											
Knoxville	2	------	0	2	3	3	0	1	0	0	32
Memphis	2	2	0	3	4	0	3	7	0	16	87
Nashville	0	------	0	0	7	1	0	1	0	0	48
Alabama:											
Birmingham	1	2	0	3	7	1	0	5	0	0	81
Mobile	1	------	1	0	3	2	0	1	0	0	22
Montgomery	2	------	------	0	------	1	0	------	0	3	------
Arkansas:											
Fort Smith	0	------	------	0	------	6	0	------	0	2	------
Little Rock	1	------	0	0	1	1	0	2	0	0	4
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	6
New Orleans	6	1	2	0	6	5	0	14	0	10	140
Shreveport	0	------	0	0	5	3	0	0	1	0	26

City reports for week ended Nov. 6, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	1	------	0	0	5	4	0	1	0	0	43
Tulsa	0	------	------	0	------	10	0	------	0	17	------
Texas:											
Dallas	6	1	1	0	4	11	0	2	0	3	68
Fort Worth	2	------	0	0	1	9	0	0	1	2	19
Galveston	0	------	0	0	1	2	0	0	0	0	11
Houston	4	------	0	0	6	3	0	4	0	0	86
San Antonio	1	------	1	0	3	0	0	8	0	0	56
Montana:											
Billings	0	------	0	2	0	0	0	0	0	0	7
Great Falls	0	------	0	0	0	1	12	0	0	4	6
Helena	0	------	0	0	0	1	0	0	0	5	6
Missoula	0	------	0	0	3	0	0	0	0	0	8
Idaho:											
Boise	0		0	0	2	0	0	0	0	0	4
Colorado:											
Colorado Springs	0	------	0	0	0	2	0	0	0	0	10
Denver	2	------	1	12	5	15	0	6	2	10	76
Pueblo	0	------	0	0	0	3	0	1	0	0	9
New Mexico:											
Albuquerque	2	------	0	9	1	4	0	1	0	1	15
Utah:											
Salt Lake City	0	------	0	2	0	13	0	1	0	4	34
Washington:											
Seattle	0	------	1	0	5	2	0	1	0	12	72
Spokane	0	------	0	0	3	2	0	0	0	3	33
Tacoma	0	------	0	0	0	2	0	1	0	4	20
Oregon:											
Portland	4	------	0	3	3	3	0	1	0	1	87
Salem	0	------	------	0	------	1	0	------	0	0	------
California:											
Los Angeles	5	8	1	1	8	28	0	14	0	35	226
Sacramento	1	------	0	1	2	2	0	0	0	15	24
San Francisco	1	2	1	1	5	6	0	7	0	34	157

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Maine:			
Portland	0	0	1
Massachusetts:			
Boston	1	0	0
Springfield	1	0	0
Connecticut:			
New Haven	0	0	1
New York:			
New York	5	2	4
Pennsylvania:			
Philadelphia	2	1	0
Pittsburgh	1	0	0
Ohio:			
Cleveland	2	0	0
Indiana:			
Indianapolis	1	1	0
Illinois:			
Chicago	0	0	8
Michigan:			
Detroit	0	0	1
Wisconsin:			
Milwaukee	0	0	1
Racine	0	0	1
Minnesota:			
Minneapolis	0	0	2
St. Paul	0	0	1
Iowa:			
Des Moines	0	0	1
Missouri:			
St. Louis	0	0	1
Maryland:			
Baltimore	1	1	0
District of Columbia:			
Washington	1	0	0
West Virginia:			
Wheeling	1	0	0
Kentucky:			
Ashland	0	1	0
Tennessee:			
Knoxville	0	1	0
Memphis	0	0	2
Alabama:			
Birmingham	1	1	0
Louisiana:			
New Orleans	0	0	2
Texas:			
Houston	0	0	1
Colorado:			
Denver	0	0	1
Pueblo	0	0	1
Washington:			
Spokane	1	1	0
California:			
Los Angeles	0	0	5
Sacramento	0	0	1
San Francisco	1	0	0

Dengue.—Cases: Savannah, 1.

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Baltimore, 1; Birmingham, 1.

Pellagra.—Cases: Wheeling, 2; Charleston, S. C., 5; Atlanta, 3; Brunswick, 1; Memphis, 1; Mobile, 2; Montgomery, 2; New Orleans, 1.

Typhus fever.—Cases: Norfolk, 1; Charleston, S. C., 3; Savannah, 2.

FOREIGN AND INSULAR

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	June 27–July 31, 1937	Week ended—												
						August 1937				September 1937				October 1937				
						7	14	21	28	4	11	18	25	2	9	16	23	30
China:																		
Canton	C	------	------	------	62	32	48	------	------	------	------	------	------	------	------	------	------	------
Hoihow	C	------	------	------	100	------	------	------	------	------	------	------	------	------	------	------	------	------
Hong Kong	C	------	------	------	7	21	136	433	374	203	205	106	66	24	29	13	14	4
	D	------	------	------	7	19	82	177	219	126	116	66	36	26	16	4	13	4
Kwangchow Wan	C	------	------	------	------	7	45	52	------	------	------	------	------	20	13	23	6	------
	D	------	------	------	------	------	34	47	------	------	------	------	------	20	------	------	6	------
Macao	C	------	------	------	------	------	35	108	143	64	72	38	16	9	12	6	------	------
Manchuria:																		
Dairen	C	------	------	------	------	------	------	------	------	------	------	------	------	3	1	------	------	------
Kwantung Leased Territory	C	------	------	------	------	------	------	------	------	------	------	------	3	------	------	------	------	------
Shanghai	C	------	------	------	------	------	------	------	8	29	394	726	655	513	333	359	110	99
Swatow	C	------	------	------	------	------	------	4	4	8	10	6	------	------	13	9	------	------
Tientsin	C	------	------	------	------	------	------	------	------	------	------	------	------	1	7	------	------	------
Chosen	C	------	------	------	------	------	------	------	------	------	------	------	[1] 1	------	------	------	------	------
Dutch East Indies—Celebes	C	------	------	------	------	------	------	------	------	------	------	------	6	------	------	------	------	------
Federated Malay States	D	------	------	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------
India	C	17,023	14,149	11,113	13,893	4,119	5,003	4,137	5,000	4,316	2,754	2,834	------	------	------	------	------	------
	D	8,324	7,366	5,454	6,495	1,891	2,123	1,774	2,188	1,939	1,257	1,422	------	------	------	------	------	------
Assam	C	1,823	2,554	435	63	------	8	3	24	18	10	11	5	13	6	8	12	25
	D	728	1,205	274	34	------	6	2	15	6	5	1	4	3	4	5	6	7
Bassein	C	86	97	6	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Bombay Presidency	C	557	3,259	1,713	2,936	1,281	1,573	1,419	------	1,143	890	762	571	391	430	------	------	------
	D	237	1,457	674	1,098	580	579	560	------	467	374	448	282	202	212	------	------	------
Bombay	C	[2] 1	[2] 2	------	[2] 1	------	------	------	------	[2] 1	------	------	------	------	------	------	------	------
Calcutta	C	247	732	173	92	22	18	19	18	14	10	13	19	16	23	13	21	10

Central Provinces and Berar	C	5	83	318	62	32	45	44	55	85	90	59	52	154	214	177	211	104
Chittagong	C	13	143	34	5													
Madras Presidency	C	3,270	1,839	1,048	2,794	869	1,139	1,139	1,063	666	475	393	310					
	D	1,855	1,103	544	1,182	369	464	427	399	276	208	157	130					
Madras	C	5	1	6	16	17	7	16	24	20	25	25		17	15	35	23	16
	D	1		3	6	4	5	9	8	5	6	7		7	4	14	13	5
Negapatam	C		2	20				1			1	2				1		
	D			12	1							1						
Northwest Frontier Province	C						100	92	11			31	1	2	17			
Orissa Province	C	368	181	188	295	42	71	67	67	60			51	16	40	23	55	
Punjab	C	2	3	16	24	17	19	46	38	16	6	1	6					
Rangoon	C	6	12	7														
Sind State	C		1				1			1								
Tuticorin	C		2	10														
India (French):																		
Chandernagor Territory	C	5	8	2	2										2			2
Karikal Province	C										1							
Pondichery Province	C		1															
Indochina (French): [3]																		
Annam—Nghiloc	C															4	1	32
Haiphong	C												56	120	204	169	68	16
	D												30	75			82	
Hanoi	C													5	35	71	86	87
Tonkin Province	C												320	683	1,029	973	759	735
Japan:																		
Hiroshima	C												32					
Kobe	C													1				
Okayama Prefecture	C														1			
Taku	C											1			3			
Tokuyama	C														10			
Tokyo	C														1			
Philippine Islands: **Manila**	C	1																
	D	1																
Siam:																		
Bangkok	C	948	338	28	5	1												
Provinces	C	1,646	796	255	151	12	16	10	4	8	5		3	2	2	2	1	
Straits Settlements: **Penang**	C			1														

On vessels:

S. S. *Kedah* at Singapore from Penang	1 case	Apr. 6, 1937
S. S. *Kedah* at Belawan-Deli	1 case	Apr. 10, 1937
S. S. *Hellas* at Bangkok from Swatow	3 cases	Apr. 16, 1937
S. S. *Ellenga* at Penang from Negapatam	15 cases	June 2, 1937
S. S. *Aronda* at Rangoon from Calcutta	1 case	June 3, 1937
S. S. *Badahur* at Rangoon from Calcutta	1 case	June 11, 1937
S. S. *Talamba* at Port Swettenham from Madras	2 cases	June 27, 1937
S. S. *Chungking* at Bangkok from Hoihow	1 case	July 15, 1937
S. S. *Kwantung* at Hong Kong from Hoihow	1 case	July 21, 1937
S. S. *Kiangsu* [4] at Singapore from Hong Kong	1 case	July 22, 1937
S. S. *Eagle* at Hong Kong from Kongmoon	1 case	July 27, 1937

On vessels—Continued.

S. S. *Muinam* at Singapore from Hong Kong	2 cases	Aug. 16, 1937
S. S. *Sandviken* at Hong Kong	Present	Aug. 18, 1937
S. S. *Haiching* at Hong Kong	Present	Do.
S. S. *Talma* at Singapore from Hong Kong	1 case	Aug. 20, 1937
S. S. *Cremer* at Singapore from Amoy, Hong Kong, and Swatow	1 case	Aug. 24, 1937
S. S. *Tyndareus* at Kobe from Hong Kong and Dairen	1 case	Aug. 27, 1937
S. S. *Manila Maru* at Moji from Hong Kong	1 case	Aug. 31, 1937
S. S. *Anking* at Singapore from Hong Kong	1 case	Sept. 10, 1937
S. S. *Sphinx* at Singapore from Hong Kong	1 case	Sept. 15, 1937
S. S. *Kiungchow* at Hong Kong from Shanghai	3 cases	Oct. 3, 1937

[1] El Tor strain.
[2] Imported.
[3] For reports prior to Mar. 28, 1937, see previous issues of PUBLIC HEALTH REPORTS.
[4] In addition for week ended July 28, 3 cases with 2 deaths in contacts.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE [1]

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	June 27–July 31, 1937	Week ended— August 1937: 7	14	21	28	September 1937: 4	11	18	25	October 1937: 2	9	16	23	30
Algeria: Algiers	C				[2] 1													
Argentina. (See table below.)																		
Belgian Congo	C																	[3] 2
Bolivia. (See table below.)																		
British East Africa:																		
Kenya	C	5	7	24	42	4	5		7	4	3	3	1	10	1	1		
Tanganyika	C	29	11	6		1												
Uganda	C	24	48	39	47	4	10	8	10	6	5	26	13	12	9	12		
	D	22	43	38	43	4	10	8	10	6	5	26	11	12		12		
Ceylon:																		
Central Province—Nuwara Eliya District	C			1														
Chilaw District	C		1															
Colombo	C		2	2					1									1
	D		2	2					1									1
Plague-infected rats		2	1	3	1							2			1	1	1	
China: [4]																		
Amoy	C	2																
Fukien Province [4]	D	130																
Hsiatangchi: [4]																		
Manchuria. [4]																		
Dahomey. (See table below.)																		
Dutch East Indies:																		
Java and Madura	C	259	260	205	226	54	60											
	D	255	255	205	224	54	60											
Java—Batavia	C	1																
Pasoeroean	C				1													
Ecuador (see also table below):																		
Guayaquil	C	17	8	4				1						1		1		
	D	16	3	3	1			1						1			1	
Plague-infected rats		37	27	13	2		2			1						2		
Egypt:																		
Asyut Province	C	48	9	1														
Dakahliya Province	C	1																
Girga Province	C	1	3	1														1

Hawaii Territory: Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector [5]							5	2	1	3			1		1			2
Honokaa Sector					3													
Paauhau Sector		4	4	7	1				1	1								1
Maui Island—Makawao District—Omaopio [5]										1								
India	C	6,094	2,502	316	558	212	232	187	331	370	356	483						
	D	3,467	1,690	203	356	116	121	119	166	192	172	200						
Bassein	C	8	7	6	1		2											
Plague-infected rats		2	2	2	1													
Bombay Presidency	C	68	35	24	33	8	7	17	11	21	8	22	11	17	18			
	D	37	16	9	20	9	4	7	5	11	9	12	10	13	10			
Central Provinces and Berar	C	1,103	363	7	10	2	8	33	42	35	50	59	141	31	121	96	48	286
Cochin	C											2						
Karachi	C	5	1							4	4	4						
Plague-infected rats		1																
Madras Presidency	C	53	23	6	106	46	41	65	51	24	33	41						
	D	30	12	3	63	24	24	25	25	14	20	17						
Punjab	C	1	2				17											
Rangoon	C	3	2		[6] 2		2	3										
Sind State	C	6	2							4	4							
Indochina (French) (see also table below):																		
Pnom-Penh	C			1														
Sadec	C				1						1							
Madagascar. (See table below.)																		
Malta	C	1	4															
Peru. (See table below.)																		
Senegal:																		
Dakar	C	1		1	1							1						
Thies	C		2	4														
Tivaouane	C		1		1													
Syria: Ras el Ain region	D			[7] 12														
Tunisia: Tunis	C		1		2													
Plague-infected rats		17	5		1													
Union of South Africa (see also table below)	C	[8] 1									[8] 1						[8] 1	

[1] Including plague in the United States and its possessions.
[2] Suspected.
[3] Includes 1 case of pneumonic plague.
[4] Plague has been reported in China as follows: Information dated Aug. 18 reports an outbreak in West Hsingan (Khingan) and Southern Lungkiang Provinces. Under date of June 1, estimated deaths from plague in Fukien Province reported to be 3,000 to 4,000. According to a report dated May 10 several hundred deaths from bubonic plague occurred in Hsiatangchi. Information dated Sept. 2 states that 115 cases and 105 deaths occurred in Manchuria, China.
[5] Plague has also been reported in Hawaii Territory as follows: Week ended Aug. 14, 1 lot of 5 rats and 1 lot of 3 mice, by mass inoculation in Hamakua Mill Sector, Hamakua District, Island of Hawaii; week ended Nov. 20, 10 rats by mass inoculation in Omaopio, Makawao District, Island of Maui.
[6] Imported.
[7] Pneumonic plague.
[8] For 2 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place	Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	June 27–July 31, 1937	Week ended— August 1937				September 1937				October 1937				
					7	14	21	28	4	11	18	25	2	9	16	23	30
United States: [9]																	
California: [9 10 11]																	
Eldorado County—Plague-infected fleas.																	
Fresno County [10] C									1								
Plague-infected fleas.																	
Plague-infected ground squirrels												3					
Placer County [11]—Plague-infected fleas.																	
San Bernardino County—Plague-infected fleas.																	
San Mateo County—Plague-infected fleas, lice, and ticks.																	
Idaho: [9] Bannock County—Plague-infected ground squirrels			(12)														
Montana:																	
Beaverhead County—Plague-infected ground squirrel				1													
Madison County—Plague-infected squirrels							1	1									
Nevada: [9]																	
Douglas County C			1														
Ormsby County—Plague-infected fleas and lice.																	
Oregon: [9]																	
Grant County—Plague-infected ground squirrel		1															
Lake County—Plague-infected fleas.																	
Wallowa County—Plague-infected ground squirrels		1	1														

Utah: [9]																	
Morgan County — Plague - infected fleas.																	
Wasatch County — Plague - infected ground squirrels							1										
Washington: [9] Adams County—Plague-infected fleas and lice.																	

Place		April 1937	May 1937	June 1937	July 1937	August 1937	September 1937
Argentina:							
Cordoba Province	C						1
Mendoza Province	C				[13] 9		
Salta Province	C					[13] 1	
Santiago del Estero Province	C				[13] 6		
Bolivia:							
Chuquisaca Department	C	[13] 2					
La Paz Department	C		[13] 2	[13] 2			
Oruro Department	C	[13] 1					
Potosi Department	C	[13] 1					
Dahomey	C			1			
Ecuador (see also table above):							
Manabi:							
Bahia	C	2					
Manta	C	13					

Place		April 1937	May 1937	June 1937	July 1937	August 1937	September 1937
Indochina (French) (see also table above):							
Cambodia	C	4	4	4	2		
Cochinchina	C				2		1
Madagascar (central region)	C	57	45	23	25	22	
	D	57	43	22	24	22	
Peru	C	9	12	4	7	3	5
Huancabamba Department	C	3					
Lambayeque Department	C	1	1	1	1	2	2
Libertad Department	C	4	3	2	4	1	
Salaverry	C				3		
Lima Department	C	1	2	1	2		8
Piura Department	C		6				
Union of South Africa (see also table above)	C	1					

[9] Plague infection proved in insect hosts as follows: *California*—Eldorado County, Aug. 31; Fresno County, Oct. 7-Nov. 5; Placer County, June 22; San Bernardino County, July 12-Sept. 8; San Mateo County, July-Aug. 27. *Idaho*—Bannock County, July 8. *Nevada*—Douglas County, July 29-31; Ormsby County, July 2-Aug. 20. *Oregon*—Lake County, May 7; Wallowa County, June 25. *Utah*—Morgan County, reported Aug. 10. *Washington*—Adams County, Apr. 29, 1937.

[10] For 3 weeks ended Oct. 23, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County.

[11] For week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels, in Placer County.

[12] Number unspecified.

[13] Pneumonic plague.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	June 27–July 31, 1937	Week ended— August 1937: 7	14	21	28	September 1937: 4	11	18	25	October 1937: 2	9	16	23	30
Algeria:																		
Algiers Department	C	-	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Oran Department	C	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Territories	C	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil:																		
Bahia (alastrim)	C	15	10	2	16	4	4	2	-	1	4	1	-	3	-	-	-	-
Porto Alegre (alastrim)	D	3	1	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Recife (alastrim)	C	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
British East Africa:																		
Kenya	C	-	1	-	116	-	-	-	-	-	-	-	-	-	-	-	-	-
Tanganyika	C	72	93	57	65	131	-	52	3	76	-	44	1	-	-	-	-	-
Canada:																		
Alberta	C	[1] 1	-	[1] 1	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Saskatchewan	C	-	-	-	-	-	-	-	[1] 1	-	-	-	-	-	-	-	-	-
China:																		
Amoy	C	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Canton	C	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dairen	C	8	2	5	2	1	-	-	1	-	-	-	-	-	-	-	-	-
Foochow	C	P	P	P	P	-	P	-	P	-	P	-	P	-	P	-	-	-
Hangchow	C	3	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Hankow	C	11	11	4	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Hong Kong	C	32	16	7	9	3	2	76	1	-	-	-	-	1	-	-	-	-
Nanking	C	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shanghai	C	55	54	18	29	1	-	1	-	1	-	-	-	-	-	-	-	-
Swatow	C	4	5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tientsin	C	3	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chosen. (See table below.)																		
Colombia (see also table below): **Barranquilla**	D	1	-	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-
Dahomey. (See table below.)																		
Ecuador: **Guayaquil**	C	34	31	48	37	6	2	7	5	-	1	2	-	1	-	3	5	4

Egypt: **Port Said**	C	4		1	1													
Eritrea	C	4	1	3	2								28					
Estonia	C	2																
France. (See table below.)																		
Greece: **Salonika**	C	30	37	5	24													
Guatemala. (See table below.)																		
Honduras: **Puerto Castilla**	C	1																
India	C	12,022	10,906	9,247	6,578	962	824	576	664	455	348	427						
	D	2,557	2,689	2,725	1,875	313	256	172	169	109	94	137						
Assam	C	204	384	238	107	21	33	16	28	14	19	12	13	18	7	9	6	5
Bombay Presidency	C	1,147	1,178	536	331	39	56	39	43	50	40	29	62	23	51			
	D	198	228	120	106	17	13	8	15	14	4	10	10	5	12			
Bombay	C	136	165	105	104		7	8	13	4	10	20	13	11	17	3	4	6
	D	68	105	72	69		7	3	8	4	3	7	9	3	10	3	4	3
Calcutta	C	57	106	21	14	22	2	6	10	10	4	7	7	3	3	4	4	6
	D	51	47	19	10	2	3	3	8	6	2	5	4	2		3	4	5
Central Provinces and Berar	C	505	452	202	153	33	5	17	6	5	13	3	23	10	5	2	4	5
Chittagong	C	12	1	[2] 2	2													
Cochin	C	47	3															
Delhi	C				12	4	2		1							1		
Karachi	C	28	19	5	2					[2] 2								
Madras Presidency	C	569	483	130	462	100	118	100	97	113	58	65	82					
	D	89	98	31	104	29	25	16	25	13	14	19	16					
Madras	C	24	49	43	95		26	38	38	27	14	21	14	19	5	18	19	13
Moulmein	C	8		[3] 1														
Northwest Frontier Province	C	49	30	46	171	12	25	36	3	8	2	17		1	35	17	87	14
Orissa Province	C	766	618	457	462	93	63	92	62	52			65	30	62	27	36	
Punjab	C	400	513	674	560	57	40	17	51	21		17	31	8	7		91	
Rangoon	C	9	3	1			[2] 1											
Sind State	C	263	188	254	279	86	43	24	56	30	17	17	32	31	10	17	8	12
Indochina (French) (see also table below):																		
Pnom-Penh	C	1	1	1														
Saigon-Cholon	C				1													
Tourane	C	3																
Iran	C	2		2					3									
Teheran	C		1				1											
Iraq	C	14	2		2	4			1									
Baghdad	C		1															
Italian Somaliland	C				1													
Japan:																		
Moji	C	10	3															
Osaka	C	1		[3] 1														
Yokohama	C	1																

[1] For 2 weeks.
[2] Imported.
[3] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	June 27–July 31, 1937	Week ended— August 1937				September 1937				October 1937				
						7	14	21	28	4	11	18	25	2	9	16	23	30
Mexico (see also table below):																		
Chihuahua	C				1						1							
Ciudad Juarez	D				1													
Durango	D	8	5	4	1									1				
Guadalajara	D	1	2	1														
Mazatlan	C			1	1													
Mexico, D. F.	C	10	36		10	2		2	4	1	1		4	1				
Monterrey	C	3	1		1		1					2						
San Luis Potosi	D		1											1				
Torreon	C	11	22	12	7		1	1	1			1						
	D				11	2	3	1	1		1	1	1	1	1		1	2
Morocco. (See table below.)																		
Nigeria	C	188	281	111	229				[3] 71									
Lagos	C	1																
Nyasaland. (See table below.)																		
Panama Canal Zone: Colon	C													2				
Portugal (see also table below):																		
Lisbon	C	1	1	6	6				1	1	1	3		2		1		
Oporto	C			1	1					1	1							
Salvador. (See table below.)																		
Senegal. (See table below.)																		
Siam: Tak Province	C	7		3	3		1											
Sierra Leone	C		2	1			[3] 5											
Southern Rhodesia	C	1																
Sudan (Anglo-Egyptian)	C	2	13	39	8	2		3	1	2	2	13	10	8	7	8	20	21
Tunisia	C			4														
Turkey. (See table below.)																		
Unfederated Malay States: Kedah	C				P													
Uruguay	C			3														

[3] For 4 weeks.

On vessels:
- S. S. *Daviken* at Hong Kong .... 1 case... Mar. 31, 1937
- S. S. *Talma* at Hong Kong .... 1 case... Apr. 1, 1937
- S. S. *Jalagopal* at Rangoon from Chittagong .... 1 case... Apr. 2, 1937
- S. S. *Taksang* at Hong Kong .... 1 case... Apr. 13, 1937
- S. S. *President Hoover* at Yokohama from Honolulu .... 1 case... Apr. 17, 1937
- S. S. *Hydri* at Karachi .... 1 case... Apr. 24, 1937

On vessels:—Continued
- S. S. *G. G. Pasquier* at Singapore from Saigon .... 1 case... May 7, 1937
- S. S. *Changte* at Thursday Island .... 1 case... June 26, 1937
- S. S. *Empress of Japan* at Kobe from Manila .... 1 case... Aug. 11, 1937
- S. S. *Northern Prince* at New York from Rio de Janeiro .... 1 case... Aug. 19, 1937
- S. S. *Empress of Asia* at Honolulu .... 1 case... Sept. 5, 1937
- S. S. *Castalia* at Suez from Karachi and Bombay .... 1 case... Oct. 5, 1937

Place		April 1937	May 1937	June 1937	July 1937	August 1937	September 1937
Belgian Congo	C	143	287		366	312	
Bolivia	C	25	48				
La Paz	C						30
China: Manchuria—Harbin	C	11	4		1		
Chosen	C	73	27	1			
Colombia (see also table above)	C	89	51	108		[4] 209	
Dahomey	C	2					
France	C	1	1				
Guatemala	C			2		1	
Indochina (French) (see also table above)	C	316	274	273	143	226	96
	D	46	95	50	30	63	12
Mexico (see also table above):							
Aguascalientes State—Aguascalientes	C	1	1				
Chihuahua State	C	1	2				
Colima State	C	4					
Jalisco State—Guadalajara	C	1		1			

Place		April 1937	May 1937	June 1937	July 1937	August 1937	September 1937
Mexico—Continued.							
Mexico State	C		1				
Mexico, D. F.	C	13	41	28	18		
Mexico City	D				3	1	2
Nuevo Leon State—Monterrey	C				1		
Queretaro State	C	1	10	8			
San Luis Potosi State—San Luis Potosi	C	1		1			
Yucatan State	C				1		
Morocco	C	6	1	1	4		1
Nyasaland	C	3					
Portugal (see also table above)	C	15	29				
	D	5	1				
Salvador	C	4					
Senegal	C	29	28	36	16		
Turkey	C	15	4	1			

[4] Includes July and August.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	Week ended— July 1937 3	10	17	24	31	August 1937 7	14	21	28	September 1937 4	11	18	25	October 1937 2	9	16
Algeria:																				
Algiers Department	C	96	78	79	15	8	34		[1] 140	4	6	13	7	6	1				20	2
Algiers	C	4	4	2	1	5	5		[1] 62	2		1								
Constantine Department	C	348	417	216	65	46	23		[1] 69	16	52	9	6	13	3		10	2	9	2
Bone	C	4	6	11			3		[1] 12	4										
Constantine	C						3		[1] 19	7							2			
Philippeville	C		1						[1] 1											
Oran Department	C	24	10	26	4		6		[1] 6	6		1		4						
Southern Territories	C	1	2	9	3	1							1							
Australia: Sydney	C		1																	
Bolivia. (See table below.)																				
Bulgaria	C																	12		
Chile	C	154	253	272	34	61	56	72	50											
Concepcion Province	C	14	3	1	3	12	1	12	4	7	3	3	3							
Iquique	C		1	2																
Linares Province	C					4	1	1	3	3	2	1								
Malleco Province	C				4			1		2	1	3	2							
Nuble Province	C				1	2		4			2	1								
Santiago Province	C	58	113	111	17	23	35	34	28	40	41	25	45							
Valparaiso	C	39	71	105	17	6	13		14	14	8	15	10	6	2	4	2	5	4	5
China (see also table below):																				
Hankow	C			1				1			1									
Nanking	C		4																	
Shanghai	C		4	4	5									2						
Swatow	C				1	2														
Tientsin	C	1	2	6		1							1		1	2				
Tsingtao	C	1	12		1															
Chosen. (See table below.)																				
Czechoslovakia. (See table below.)																				
Egypt:																				
Alexandria	C	5	20	5		1	1		4	4	5	3	1	1	1	1	1		2	2
Aswan Province	C	5	6																	
Asyut Province	C			5	1	1	2		2	2										
Beheira Province	C	53	74	14	10	7	5		1	1										

Beni-Suef Province	C		1																	
Cairo	C	14	17	1												1				
Dakahliya Province	C	38	74	15	14	10	6		1	3										
Damietta Province	C			2																
Faiyum Province	C						1													
Gharbiya Province	C	59	135	55	17	19	1		4											
Girga Province	C		1	2	1	1														
Giza Province	C						2													
Minufiya Province	C	11	25	4		1			3											
Minya Province	C		2							1										
Port Said	C			1	1	1														
Qena Province	C	14	33	3																
Sharkiya Province	C	2	11	3		1														
Suez	C			1				1	1					1	1					
Provinces	C	243	709	307	45	40	17	15	13	14	6	6	11	9			1	1	1	1
Eritrea: Asmara	C	6	4	2			1													
Finland. (See table below.)																				
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: **Honolulu**	C	1			1		1	2					1			2		2		2
Hungary	C		1		1															
Iran	C	7	14	25												1				
Teheran	C		1	1																
Iraq:																				
Baghdad	C	[2] 5		1	1		1													
Diwaniyeh Province	C		6																	
Kirkuk Province	C	8	3	12	2															
Kut Province	C	1																		
Irish Free State: Kerry County—Caherciveen	C	4																		
Latvia. (See table below.)																				
Libya. (See table below.)																				
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Mexico, D. F	C	13	18					2		5	6	5	11	4	11	6	1	3		
San Luis Potosi	D			1																
Torreon	C	1																		
Morocco (see also table below)	C	120	352	174	31	15	13	19	7	7	3	9	2	6	7	3		1	17	11
Casablanca	C			200	2				3	3	2								4	
Palestine:																				
Haifa	C	1	6	1		2		1		1		2	1	4	3	4		3		7
Jaffa	C	4	6	3	1		2			1	4	1	3	4	5			1		6
Panama Canal Zone. (See table below.)																				
Poland	C	629	805	287	30	18	18	13	10	13	19	6	5	5	6	8	7	9	9	
	D	40	43	20			1			3	1									
Rumania. (See table below.)																				
Sierra Leone: **Freetown**	C		2																	
Straits Settlements: **Singapore**	C			1																
Switzerland	C					1													1	

[1] For 2 weeks.
[2] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	Week ended— July 1937: 3	10	17	24	31	August 1937: 7	14	21	28	September 1937: 4	11	18	25	October 1937: 2	9	16
Syria	C	1																		
Trans-Jordan	C	3	5			1														
Tunisia:																				
Tunis	C	4	20	19	1	1	1		1	2	6	1	1	5	1	1				2
Provinces	C	428	666	545	87	97	106		47	57	80	59	20	12	14		50	1	38	24
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				

Place		April 1937	May 1937	June 1937	July 1937	August 1937	September 1937
Bolivia	C	48	39	35			
China: Manchuria—Harbin	C	45	29	35	14	8	
Chosen	C	147	99	85			
Czechoslovakia	C	25	3				
Finland	C	1		1			
Greece	C	2	1	11	5	3	
Guatemala	C	13	12	8	16	10	6
Latvia	C	1					
Libya	C		13	34	10		
Lithuania	C	37	6	2	7		2
Mexico (see also table above):							
Aguascalientes State: Aguascalientes	C	1	2				
Guanajuato State	C		4		3		
Hidalgo State	C	5	1	2			
Mexico State	C		2		14		
Mexico (see also table above)—Con.							
Mexico, D. F.	C	16	14	14	16		
Mexico City	D				5	3	4
Queretaro State	C	1	2	2			
San Luis Potosi State: San Luis Potosi	C	2	2				
Morocco (see also table above)	C	190	283	182	89	25	16
Panama Canal Zone	C		2				
Rumania	C	832	557	177	61	26	
Turkey	C	39	155	72	30	7	14
Istanbul	C	3		3	2	2	
Union of South Africa:							
Cape Province	C	41	35	12	50	81	
Natal	C		7	13		2	
Orange Free State	C	3	27	35	11	2	
Transvaal	C		1	3	13		

YELLOW FEVER

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	Week ended— July 1937 3	10	17	24	31	August 1937 7	14	21	28	September 1937 4	11	18	25	October 1937 2	9	16	23	30
Brazil:																						
Amazonas State	D											1										
Matto Grosso State [1]	C	4	2																			
	D		4		1																	
Minas Geraes State [1]	D	13	1																			
Para State [1]	D	1			2	1	1		2			1				1						
Piauhy State	D			1																		
São Paulo State [1]	D	16																				
Colombia:																						
Boyaca Department	C		1	1	2							1										
	D		3				2	2				1	1							1		
Caldas Department	D															1						
Cundinamarca Department	D			2			1			1	1				1	1						
Intendencia of Meta—Villavicencio	D	3															1					
Santander Department	C													2								
	D	2	2		1					2			2			4	2					
Dahoney: Bohicon	C			1																		
French Equatorial Africa:																						
Bangui	D															1						
Brazzaville	D	1																				
Fort Archambault	C															[2] 2						
Libreville	C								1													
	D								1													
Gold Coast [3]	C		4	11	5		10	2	6	6	2		1		3			1	1		1	1
	D		1	11	4		10	2	3	4					2			1				
Accra	C			2	1		1						1		[2] 1							
Nugo	C		1																			
Ivory Coast:																						
Agboville	C										1											
Gaoua	C														2							
	D														1	[2] 1						
Touba	D																[2] 1		[2] 1			
Nigeria:																						
Aba	C											1										
Abeokuta	C														1							
Forcados	C							1														
Ibadan	C								1													

[1] See also reports of yellow fever in Brazil on pp. 463, 536, 657, 683, 762, 818, 912, 1134, and 1248 of the PUBLIC HEALTH REPORTS.

[2] Suspected.

[3] During the week ended Nov. 6, 1937, 2 cases of yellow fever with 1 death were reported in Gold Coast.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

[YELLOW FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Mar. 28–Apr. 24, 1937	Apr. 25–May 29, 1937	May 30–June 26, 1937	Week ended— July 1937					August 1937				September 1937				October 1937				
					3	10	17	24	31	7	14	21	28	4	11	18	25	2	9	16	23	30
Nigeria—Continued.																						
Jos	C																		2			
Maiduguri	C																					[3]1
Ogbomosho	C				3	1		1														
	D				1			1														
Ovim	C										3											
	D								1													
Sapele	C												1									
Shendam	C																1					
Paraguay [4]	C					P																
Peru: Perene region (Pampa Whaley)	C	[5]23																				
Senegal: [6]	D	8																				
Bambey	C			[3]1																		
Dakar [6]	C		[3]1																[3]1			
Diakhao	C		1																	1		
Diourbel	C													1								
Gade.[6]	D											1										
Gossas	C												1				1		3			
Kaolakh [6]	C																					[3]1
Malem Hodar	C		1																			
Rufisque	C																	1		1		
Tampa-Counda	C											[3]1										
Thies	C																			2		2
Thies Circle—Khombole [6]	C	1																				
Tilmaka	C	1	1																			
Tivaouane	C	1																				
Sudan (French):																						
Mahina	C		[3]1																			
Toukoto.[7]																						

[3] Suspected.
[4] A dispatch dated June 4, 1937, from the United States legation in Asuncion, Paraguay, states that yellow fever has been officially reported in the northwestern part of Paraguay
[5] Jungle type.
[6] Yellow fever has also been reported in Senegal as follows: Week ended Nov. 6, 1937, 2 imported cases including 1 suspected case at Dakar; 1 suspected case with 1 death in Gade; 1 suspected case in Kaolakh; 1 case with 1 death in Khombole, Thies Circle.
[7] During the week ended Nov. 13, 1937, 1 suspected case with 1 death was reported in Toukoto, French Sudan.

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