3-1940

The Educational Leader, Vol. 3, No. 3: Physical Sciences and Geography Number

Kansas State Teachers College

THE EDUCATIONAL LEADER

PHYSICAL SCIENCES and GEOGRAPHY
NUMBER

Published by the Faculty of the
KANSAS STATE TEACHERS COLLEGE
PITTSBURG, KANSAS

Vol. 3 MARCH, 1940 No. 3

Science Hall and College Auditorium.

THE EDUCATIONAL LEADER

PHYSICAL SCIENCES and GEOGRAPHY
NUMBER

Published by the Faculty of the
KANSAS STATE TEACHERS COLLEGE
PITTSBURG, KANSAS

Vol. 3 MARCH, 1940 No. 3

The Educational Leader

MELLICENT MCNEIL, *Editor*
WILLIAM T. BAWDEN, *Associate Editor*
Contributors to this issue:
Physical Sciences Faculty directed by L. C. HECKERT
Geography Faculty directed by EULALIA E. ROSEBERRY

VOL. 3 MARCH, 1940 NO. 3

CONTENTS

Published four times a year, in November, January, March, and May, by the Kansas State Teachers College of Pittsburg, Kansas.
Entered as second-class matter, January 29, 1938, at the Post Office at Pittsburg, Kansas, under the Act of August 24, 1912.

The EDUCATIONAL LEADER

Vol. 3 MARCH, 1940 No. 3

The Carbonization of Pittsburg Coal

L. C. HECKERT

The exploitation of any natural resource best serves man when a maximum of economic labor can be expended on it to convert it into commodities, the value of which are sufficient to justify the expenditure of this labor. Thus the value of a hair spring does not lie in the iron of which it is composed, but almost entirely in the labor involved in its manufacture. On the other hand, one might expend hours of labor in polishing a brick, and at the end have added little or no value to the brick. The labor involved must be of a sort that adds to the value.

Coal is no exception to this general rule. As long as it is burned raw, a minimum of expense in mining and conditioning are necessary, and its value as fuel alone will not justify the expenditure of much labor. Recent competition of other fuels, especially oil and gas, with respect to convenience and control, has reduced the value of raw coal as a fuel in that its use has been and is being curtailed, and other fuels substituted. It is possible, by the expenditure of labor and capital investment, to convert coal into other types of fuels and into numerous by-products. If the labor and investment involved in the processing obtain adequate returns in the way of increased salability and price, then one not only has maintained labor and production in the mines, but has added to the number of jobs by the amount of labor required for the processing, and wealth has been created. With the present unemployment situation obtaining, it is highly desirable to create labor in any way and to as great an extent as possible, but always with the understanding that it must be economic labor.

Among the several possible methods of adding economic labor to coal, the manufacture of by-product coke has long been practiced. The coke has found a reasonable market in metallurgical and thermal processes, the gas was economically used domestically or in processing, and the by-products were utilized economically in many ways. The

labor expended was well repaid in the increased value of the products.

For many reasons, this process has not been applied to Pittsburg (Kansas) coal. Until more or less recently, its market as a raw fuel was reasonably satisfactory, and it was easier to dig it and burn it than to process it. Further, the high ash, sulfur, and volatile content seemed to indicate that satisfactory coke and gas could not be made and that the by-products would be less valuable and harder to recover. While there seems to be good and sufficient reason to agree generally with these conclusions, it must be remembered that most of the work on coal processing has been done on types of coal which were judged to be satisfactory for coking purposes, and that no serious effort has apparently been made to modify the processes to permit the use of other coals. Thus it has always been thought that high sulfur coal was not suitable for gas manufacture; yet any chemical engineer knows that there is no more practical difficulty in removing 1000 grains of sulfur than in removing the customary 250 to 300 grains. It is the removal of the last 50 grains that offers the difficulty, and they are just as hard to remove in one case as in the other. Again, in metallurgical coke, a high ash coke would not be considered; yet the metallurgist shovels in limestone and other ashing materials in quantity. The presence of a little sulfur is not even objectionable in some metallurgical processes. The rub of the whole matter lies largely in the fact that sufficient coal suitable for coking purposes by the usual process has been available, and it has not been necessary to use coal whose coking qualities were unknown or which could not be coked in the usual manner, in order to meet the demand for coke, gas, and tar.

Recently, however, low value bituminous screenings have been converted into a high-grade domestic fuel by the application of a coking process, with the simultaneous production of a good tar and gas. Clear evidence of the economic success of this coking process is given by the fact that the capacity of the plant processing low value screenings has been more than doubled, and several new plants are under construction. There is a rather large quantity of low-grade slack coal available in the Pittsburg area for which there is not a suitable market. Properly washed, this coal might prove a suitable raw material for by-product coking operation, and thus create an economic, job-producing industry.

The Natural Resources Committee of the Pittsburg Chamber of Commerce cooperating with the College and with interested coal producers, arranged to have some local coal processed at a commercial coking plant, under the usual conditions of operation in order to determine, if possible, whether local coal could be carbonized economically to a satisfactory coke, and to determine the nature and yield of by-products. Two cars of washed slack coal, one from the Mackie Clemens Fuel Company and one from the Alston Mine of the Klaner

Coal Company, were shipped to the carbonizing plant of the Radiant Fuel Corporation at West Frankfort, Illinois, where they were carbonized in one of the ovens in the regular commercial bank, with provision, however, for collecting the coke and tar separately and for measuring and analyzing the gas before mixing it with the gas from other retorts.

The Radiant Fuel Corporation operates a Knowles oven, which consists of a bank of horizontal retorts built of silica refractories over a regenerative set of flues. Each oven is 30 feet long, 7½ feet wide, and approximately 4½ feet high at the top of the arch. A charge of 5 tons of fine screenings is introduced into the oven through eight charging holes in the top of the retort by two lorry cars, each having four discharge hoppers. The eight cone-shaped piles of coal on the oven floor area are spread into a uniform layer 10 to 12 inches thick by running the pusher arm, with the pusher head removed, over the mass. The doors are then closed, luted with mud, and the charging holes covered and sealed with mud.

Heating is accomplished by burning some of the oven gas in the flues immediately under the oven floor. The heating system is duplicated on the two ends of the ovens permitting reversals of gas, air, and burned gases. The ovens are fired from alternate sides during successive 30-minute periods. The gas flame is stretched out as long as possible in order to give uniformity of heating along the length of the oven floor. This is accomplished by reducing the primary air and feeding secondary air at several points along the sole flue. During reversals, the recuperator action of the refractory checkerwork of the flues functions just as in the more elaborate checkerwork of a high temperature oven. Waste heat regenerators are provided for each flue, located directly underneath. The waste flue gases leaving these regenerators enter the stack at a temperature of 450° to 500°; the carbonizing temperature of Illinois coal is approximately 2500° F., measured in the flue.

The gas, volatile matter, and tar leave the oven through an off-take pipe located at the front end of the oven and connected with a collector main. The pressure in the oven is maintained at approximately atmospheric by means of an exhauster pump pulling through a mushroom damper. The exhauster pulls the gas directly from the raw gas main and pushes it through shaving scrubbers for the removal of tar, thence to a Seaboard tower for removal of the bulk of the sulfur. It then enters the oxide boxes to remove the last of the sulfur, from which it goes to the gas holder. Fuel gas for heating the ovens is drawn from the line after tar removal, but before sulfur purification. The surplus gas is sold for public utility distribution in a group of nearby towns.

Tar from the shaving scrubbers and traps flows to an open concrete tank where it separates from the water, settling to the bottom. The water overflows into a pump from which it is recirculated to the scrub-

ber. This re-use of the water minimizes the water requirement of the plant and also prevents steam contamination by tar or oil. No provision is made for the recovery of ammonia or light oil at this plant. Considerable benzol condenses out of the gas in the lines and in the gas holder and is used as motor fuel for the various units around the plant, after mixing with about 20 per cent of gasoline.

After complete carbonization of the charge, the coke is pushed from the oven by a ram into a pan-like receiving device where it is quenched. The receiving pan contains about an inch of water on the floor when pushing commences, and a spray mounted above the end of the receiving tray nearest the oven furnishes additional water to speed up the quenching. The receiver is then run to the coke wharf, where, by tilting the pan, the coke is emptied into the hopper, at the bottom of which is a chain conveyor. This carries the coke to a single roll crusher, from which it falls onto a belt which conveys it to the screening and loading plant. Three sizes of coke are prepared—furnace, nut, and braize.

For processing the Pittsburg coal, one of the ovens in a bank of eight was used. The damper in the gas main was closed and sealed shut with mud, and a header attached by which the gas and tar were pulled to a small tar scrubber where the tar could be isolated. The remaining gas was then sampled, measured, and mixed with the gas from the remainder of the ovens. The charge of coal was pulverized and placed in sacks which were carried to the top of the ovens under the coal storage bin. Just before charging, it was loaded into the lorry cars by hand and then dropped into the oven. Because the coal was so very volatile, and the ovens so hot, it was found practically impossible to hold the gas long enough to spread the charge and seal the doors unless the charge was wet down with enough water to absorb the heat. About 15 gallons of water a ton were required. Because of excessive swelling of the coal during the early stages of carbonization of the coal, as was indicated by the results of the first four runs, and which resulted in rather spongy, friable coke, it was decided to try adding varying amounts of braize and sponge to the coal in order to take up this swell. From 8 to 10 per cent of sponge or braize practically completely eliminated the swell and yielded a much improved coke, without material increase in the net amount of braize.

Samples of gas were taken hourly and analyzed, the gas was measured continuously throughout the coking period, and the tar was collected in a separate tank. At the end of the coking period, indicated by a virtual cessation of gas, the doors were opened, the coke pushed out, quenched, and subjected to the same treatment as the Illinois coke. After sizing, the yields of various sizes were determined by loading into tared trucks and weighing. After settling, the tar was sampled, the moisture and specific gravity determined, and the tar subjected to a

TABLE 1. Record of Coking Tests on Pittsburg Coal.

Test No.	Charge		Temp.	Gas	Tar		Coke		Character
	Coke	Braize		Cu Ft-Ton	Gal-Ton	Fur.	Nut	Braize	
1	10,000	.....	2550	10,474	9.1	6865	710	440	Spongy
2	10,400	.....	2550	9,972	9.0	7450	400	740	
3	10,400	.....	2400	9,948	16.0	7300	560	800	Spongy
4	10,400	.....	2300	10,050	16.4	7025	560	800	Spongy
5	10,000	200	2300	11,304	14.4	6700	500	700	Fair
6	9,600	400	2250	9,572	11.7	6100	450	875	Good
7	9,000	1000	2200	11,508	16.0	6040	340	850	Very Good
8	9,000	1000	2271	10,344	13.1	5356	251	688	Good
9	9,000	800	2170	10,452	12.6	4975	281	688	Good
10	9,800	.....	2180	10,704	12.4	4447	732	730	Fair
11	9,250	750	2175	10,032	13.1	5733	284	572	Fair
Bledsoe	10,000	.....	2440	8,945	7.2				
Old Ben	10,000	.....	2430	8,723	12.6				

standard distillation test. A shatter test was made on the coke. The data were then collected and a complete report of the the test made up.

A summary of the results of these tests is given in the accompanying table. The gas and tar yields of two Illinois coals are given for comparison.

The coke obtained under optimum conditions in these tests shows a more or less regular gradation of coke structure from a small-celled, much shrunken, highly devolatilized, high temperature coke on the bottom next to the source of heat to a large-celled very thin-walled coke on the top. Because of the rapid removal of volatile products from the oven, secondary cracking of the tar oil and vapors has not occurred in the midst of coke after formation and there is little graphitization of the surface. The coke, therefore, probably has combustion characteristics somewhat like low-temperature coke, notably, ease of ignition and facility for supporting combustion at moderate fuel-bed temperatures. Analysis of one sample of coke shows 13.04 per cent ash, 4.0 per cent volatile matter and 3.02 per cent sulfur. Samples of coke from Illinois coal showed ash content ranging from 12 per cent to 17 per cent, volatile matter from 1.6 per cent to 7 per cent and sulfur from 1.36 per cent to 2.17 per cent. Shatter tests indicate a satisfactory resistance to breakage in handling comparable with other cokes. A point which still needs to be determined is the behavior of the ash at fuel bed temperatures.

The tar, averaging from 12 to 14 gallons a ton of coal, apparently has a slightly different composition from that of the tar from Illinois coals. In general, this tar has a slightly higher specific gravity and a somewhat greater tendency to hold up water. This may be an indication of somewhat higher tar acid content. A careful study of the tar should be made to determine its composition. There is a ready market for the tar

as such, or it could be made the raw material of another industry in Pittsburg.

The gas yield is somewhat greater than that from Illinois coals, averaging about 10,000 cubic feet of 500 B t u gas against 8,000 to 9,000 cubic feet, on the same basis, for Illinois coal. It appears to run somewhat higher in hydrogen than the gas from Illinois coals, although sufficient data for comparison are not available. It has a somewhat higher calorific value as was indicated by the fact that when the gas from this oven was added to the gas from the other twenty-six ovens, the heating value was raised from an average of about 485 B t u/cu. ft. to 520 B t u/cu. ft. for a period of some three or four hours. This probably was due to the presence of considerable benzol, which is not scrubbed out at this plant. The high hydrogen content of the gas may be of some interest in the development of hydrogenation and synthetic processes.

The capital investment required for this type of plant is considerably less than half of that necessary for a high-temperature installation of comparable capacity. The design has the distinct advantage that the ovens, because of the simple refractory construction can be shut down and started up again with much more flexibility than other types of high-temperature installation. The operating expense for the ovens is probably a little higher than that of the larger high-temperature ovens, but proper mechanization would probably reduce this somewhat. The plant at West Fankfort appeared to be very inefficient from a mechanical standpoint.

CONCLUSIONS

1. An apparently fairly satisfactory coke can be made from Pittsburg, Kansas, coal in this type of oven.

2. A good yield of both tar and and gas are obtained of a quality seemingly superior to that obtained from Illinois coal.

Some Uses of Weather Forecasts and Records

EULALIA E. ROSEBERRY

The Federal Weather Bureau was established in 1870 with the sole function of telegraphing the approach of storms within a comparatively small area.[1] In the beginning the Bureau was under the jurisdiction of the army signal service and had a staff consisting of thirty inland telegraph operators. Today there are more than two hundred major weather stations scattered over the United States and possessions and between fifty and one hundred auxiliary stations each having from one to fifteen employees. Today, the Federal Weather Bureau and its records are consulted by shippers on three oceans, by operators of eighteen thousand miles of airways, by watchmen against earthquakes, volcanic eruptions, the ebb and flow of tides, floods, and the intensity of sun heat. Each day a vast mass of data is carefully assembled from which weather maps are constructed, predictions made, and forecasts broadcast. These predictions are increasingly approaching accuracy, and despite the criticisms and jibes directed toward the "weather man," more and more business interests and the general public are depending not only on the forecasts but the weather records as well. Dr. C. C. Clark at one time acting chief of the Weather Bureau is quoted as saying "Practically every line of business in the country could and should use the weather forecasts to advantage. Every business in every state is a potential beneficiary of this information."

The shipping industry is one of the great business interests that has benefitted widely from the services of the Weather Bureau. The rapid transit lines are guided invariably by weather reports as to the amount of heat they will prepare for their trains in the next twenty-four hours. Railroad and steamship companies, which handle perishable goods, keep constantly in touch with the Bureau and increase their refrigeration or their heating facilities according to its predictions. The importance of such information was once commonly overlooked, and many a rich shipment was lost because nobody took the trouble to ascertain recorded facts about the temperature, humidity, and other meteorological circumstances of the prospective market.

One of the United States Weather Bureau's odd jobs is looking after bananas in transit on the railroads. Bananas are received at New Or-

[1]Much of the material for this paper was gathered from the reports and records of the American Meteorological Society.

leans, Mobile, and other southern ports and shipped all over the country in ventilator cars. As they are subject to injury from cold, in recent years shipping routes have been divided into zones under the supervision of local Weather Bureau offices. Whenever a drop to temperatures injurious to bananas is expected within 24 to 36 hours, a telegram is sent, at the fruit company's expense, to the agents in the area involved, and the bananas are protected. A ship captain, within a day of making a cargo of bananas from the South, wanted an exact prediction of the next day's temperature. If it should be under sixty-five degrees, he would leave his bananas in the hold. If over that figure, he would raise his hatches and get the cargo on deck for a quick unloading, for bananas are extremely perishable in cold winds.

The significance of weather information for commercial airline flying is interestingly illustrated in an advertisement by the United Air Lines in the New York Times, Jan. 12, 1938. To rid the reader of any fears about the safety of flying in a United plane, there appears in large print beside a picture of a pilot consulting a weather man and a weather map the caption, "I study the weather reports for at least an hour before every take-off." Below this is given a brief description of the careful and thorough meteorological preparation for a flight. Beside another picture of a pilot is a paragraph headed, "I'm the captain of a United mainliner" and ending with "And I'm constantly studying all phases of air-line operation—especially meteorology, the science of forecasting the weather." After the reader has seen this assurance of safety based on the knowledge of meteorology, he looks at the comfortable big swivel lounge chairs in an attractive drawing of the interior of a passenger plane at the bottom of the advertisement; and, with much less fear and uncertainty haunting the background of his consciousness and spoiling the comfort of the scene, he can enjoy in imagination a ride in such an appealing environment. The aviator McLaren called from Hampton Roads to know if good weather lay along his route to Bermuda and the Azores. He was warned to stay where he was, but later he flew and was lost.

The mere problem of the timely advertising of many wares is a momentous one, calling urgently for expert advice. Ice, domestic fuel, umbrellas, electric fans, and bathing suits are examples of commodities whose sale is more or less dictated by the weather. Warmth after Labor Day favors bottled drinks. Sales for September are dominated by the temperatures immediately after Labor Day, manufacturers of bottled drinks have found. A warm week will carry over the summertime soft drink sales well through September. But cool weather after Labor Day shuts down on the summer habits of people, and later warmth cannot restore the summer rate. A knowledge of the coming weather is helpful to the dealer in knowing what to keep in stock and how much. Stormy days favor fur-

niture sales, 80 per cent being made in such weather; hence, it is to the interest of the furniture dealer to know the forecasts. Substantial business in jewelry is also favored by stormy weather, especially by rainy, slushy weather in December; so the jewelry dealer should be weather conscious. In the sale of cake, a large baking company for some forty plants has now found that after two days of rain in summer and after two days of storm in winter the demand for sweet cakes will go up 35 per cent. After a rise of temperature in summer the first day's sale of cake drops off slightly after the noon hour, but shows no change during the morning (the chief buying period of the day); however on the second day of hot weather the sales will decrease fifteen per cent and will drop another like amount the third day. Sales will, however, rebound instantly with a drop in temperature. Now the bakery chain watches the prediction and advertises cakes for the coming cool weather, and cookies for warm weather. A fish merchant made a call on the United States Weather Bureau in New York, wanting to know if he should buy fifty thousand pounds of sunfish; that is, he wanted to know if the next day would be a good fishing day, for if it was this large stock would be left on his hands. He was told that few fish would be caught for the next few days. Many such calls were reported as coming to this particular office.

In addition to the value of weather knowledge in transportation, Capt. Sherry of the Signal Service cites instances of the importance of weather in major military crises. He refers to Victor Hugo's attributing Napoleon's defeat at Waterloo to his hesitation because of an unexpected rain and with diagrams shows the behavior of military projectiles when influenced by wind and air density not only near the guns but along the paths the projectiles follow to the targets. He describes methods of securing information as to wind movement in the upper air by pilot balloons and air density by calculations from the surface conditions or by airplane flights. The methods now have been so highly systematized, he says, that the required information as to atmospheric conditions is made known to the artillery with the shortest possible delay so that the important corrections to the aim of the guns may be made before those upper air conditions change.

The building engineer can take advantage of the weather broadcast that is given through the cooperation of the Bureau staff without special training. Builders, working with concrete, tell their workmen to stay at home when the prophecy is for a cold wave. It is estimated that a half-million dollars is saved in New York with every cold wave or severe wind and rain storm through accurate advance knowledge of its coming. Exposed water mains are hurriedly sheltered to prevent freezing, industrial processes that are affected by severe cold are suspended in advance, and countless other precautions are taken.

Meteorology plays an important part in air-conditioning. The meteorologists make a business of forecasting the weather as it will be in the great out-of-doors. The air-conditioning engineers make a business of forecasting the weather as it will be inside of some enclosure. When they finish, they both have the comforting knowledge that it is impossible to find any one set of air conditions which shall satisfy young and old, robust and weakling, office girl and laborer, all at the same time. Consequently they know that they will be damned by a part of the public, no matter what they do. In the winter, air-conditioning involves the replacement of heat which leaks through walls, roof, windows, floors, and other parts of the building structure. Air-conditioning must also take into account the addition of moisture and heat to outside or cold air which enters the building. The control of circulation and the cleaning of the air are present also, but are not affected by outside conditions. Here meteorology is important, as it concerns the temperature outside of the building and the moisture content of the air entering the enclosure from outside. In the summer air-conditioning involves the consideration of five sources of load. Heat which leaks through walls, windows, roof, etc., must be removed; radiant heat from the sun's rays must be removed; heat and moisture resulting from the body heat, perspiration and the breath of people, must be removed; heat and moisture resulting from such things as lights, steam tables, coffee urns, etc., must be removed; outside air entering the enclosure must be cooled and must have its dewpoint lowered. Once more meteorology is important in making available records from which may be determined the outdoor conditions at the time of the maximum load upon the system. Radiator heating contractors, through their national association, have divided the United States into thirty-three temperature zones and formulated tables for the estimating of radiating requirements on the basis of these zones. From the United States Weather Bureau the association obtained accurate data on high, low, and average temperatures and also on prevailing winds and wind velocities. Thus a heating and piping contractor in Minneapolis, when estimating the amount of radiation required in a certain room with a northern exposure, would turn to the table for this particular temperature zone and would allow a certain number of feet more because of temperature and wind than, say, a contractor in Louisville or Oklahoma City. By taking into consideration this temperature factor as well as the heating capacity of boilers, insulating qualities of different types of houses, etc., the guess work has been taken out of the work of estimating heating installations.

"The special agricultural service of the Weather Bureau consists largely in the publication of bulletins containing weather data and reports on the effect of the weather on the condition and progress of crops. Bulletins of temperature and

rainfall are issued daily during the growing season at various stations, and weekly summaries of weather conditions and crop responses are published at the section centers for their respective districts. The central office at Washington publishes a *Weekly Weather and Crop Bulletin* throughout the year, with reports and summaries for all parts of the country. During the winter this bulletin also contains reports of the depth of snow on the ground, and the thickness of ice in rivers and harbors. In addition to the reports from first-order stations, the daily bulletins contain reports from the crop sub-stations, and are named according to the principal crops grown in the areas represented. There are bulletins for the corn and wheat region and for the cotton, fruit, sugar, rice, and cranberry regions. The horticultural service is organized especially to give warnings of frosts likely to be injurious to fruits in those regions where fruit growing is a major industry and where protective measures are practicable. There are fruit-frost stations in California, Oregon, Washington, Texas, and Florida."[2] Fickle weather and the boll-weevil have made it possible to predict as early as the first of September almost exactly how much cotton will be harvested in the United States during the following fall months. This forecast gives cotton growers, buyers, and investors accurate information on production far in advance of the harvest and should enable them to sell and buy more profitably. To make these calculations, such weather information as the amount of rainfall, the number of rainy days, relative humidity, the amount of sunshine, and the average highest and lowest temperatures was used. Weevil damage is estimated from the weather of the preceding summer, which determines the number of insects that hibernate during the winter; from the severity of the winter, because they might be killed by the cold, and from growing season weather, as dry weather keeps the weevil in check and damp weather greatly increases its family. From this information a weevil index is worked out by mathematical relations to be combined with the weather-yield relation for the final result. The predictions can be made for each state as well as for the entire cotton belt.

"The fire-weather service is conducted as an aid to the fire protection forces of government, state, and private agencies. The control of forest fires is a difficult problem involving heavy expenditure of time and money and often the services of large forces of men. The efficiency of fire control is largely dependent upon forestry officials' being prepared for emergencies as they arise.

"Since weather, more than any other factor, is responsible for the degree of the fire hazard, forecasts covering those elements directly bearing upon the fire control problem are invaluable. It is evident that wind is an important factor in the spread of forest fires, and it is found that the relative humidity of the air

[2]T. A. Blair, *Weather Elements*, p. 359. New York, N. Y. Prentice Hall Inc., 1936.

is also very important, because of its influence on the inflammability of the forest litter. Many forest fires originate in the occurrence of lightning without heavy precipitation. The plan of operations is to maintain meteorological sub-stations within the forested areas, in many cases manned by Forest Service employees. During the seasons of hazard, reports from these stations are transmitted daily by telephone or telegraph to the headquarters of the forecaster for the district. These reports, in conjunction with the general weather map, are used as a basis for the formulation of specialized forecasts which are promptly distributed to fire-control officers. This service is in operation in all the principal forest areas of the country. In some places an automobile truck has been provided and fitted with meteorological and radio equipment capable of sending and receiving messages. This proceeds to every large forest fire, accompaned by a forecaster and a radio operator. Thus the forecaster is able to keep in close touch with the situation and to issue forecasts and advices closely localized and adapted to immediate needs."[3]

Along all the important rivers in the United States that are subject to overflow with extensive damage, the Weather Bureau maintains a river and flood service. Daily forecasts of river stages are made where they serve a useful purpose, especially where they are in aid to navigation. They cover as long a period as is consistent with reliability. Some of the factors determining the height of the flood are the present stages of the river, the changes of stage in progress, the amount, time and rate of fall of recent precipitation, and the geographic distribution of the rain. The flood warnings enable people to escape from the danger zones, to remove livestock and other property, and to take various precautionary and protective measures. It is certain that they result in the saving of property worth many times the cost of the service.

In one case weather records were used in a bandit roundup. The *Detroit Free Press* of Dec. 10, 1933, contained a special article concerning the apprehension and capture of the gangsters who kidnapped Charles Urschel, July 22, 1933, that shows a unique use of Weather Bureau records. Urschel was blindfolded at a home in Oklahoma City and taken for a ride of about twelve hours in an automobile to a house entirely unfamiliar to him, where he was held until the ransom was paid. Agents of the Bureau of Investigation interviewed him carefully upon his release in order to obtain, if possible, a clue to the place where he was held. The fact that the ride was about twelve hours and made rather slowly on back roads indicated the place was within a radius of 300 miles of Oklahoma City. The fact that the days and nights were uncomfortably warm indicated it was not among the mountains or hills and the passage of a plane over the place at 10:30

[3]T. A. Blair, *Weather Elements*, pp. 361-362. New York, N. Y. Prentice Hall Inc., 1936.

a. m. gave an important clue. Urschel was able to recall one heavy rain on a certain day. The Weather Bureau checked up the records for the nine days of Urschel's detention, which helped eliminate place after place. Finally, there was only one place that fitted every condition and that was Paradise, Texas. Following an investigation of suspicious places near this locality, the bandits, including Harvey Bailey, Machine Gun Kelly, his wife, and the Shannons, were rounded up and given life sentences early in October.

The individual who perhaps gets the most nearly continuous services of the Weather Bureau is the "American motorist." He is vitally interested in the weather; with his radio in his automobile, he welcomes the information that he receives relative to weather and traveling conditions. The motorist does not want to know particularly about the dew point or the wind velocity, but what he is interested in is to know whether there is going to be ice on the roads, if it will be dusty, or muddy, when the sun will shine, or whether he should just put the "old crate" in the garage and decide to stay at home over the week-end.

Dr. Kirk of the California Institute of Technology recently established a mail service with Stellar-Millar, a Los Angeles advertising agency, handling, publishing, and sales. Among the subscribers electric and gas utilities have been warned of approaching storms and have been able to spot repair crews in threatened districts. They have used the forecasts, also, to calculate fluctuations in load demand. A large utility group in the Great Lakes area got a two-day warning of violent and unusually severe ice storms which broke on a Sunday and were able to mobilize ahead of time for trouble. Hotels plot fluctuations in their tourist business and use the warnings as a guide in buying food for their restaurants. Movie producers learn how weather will affect conditions for photography and sound on "location" and where and when desired cloud effects can be found.

An outstanding feature of the work of the Weather Bureau is the extent of its cooperative activity. It works with many other agencies, both public and private, in the collection and distribution of meteorological and climatological data. In the forecast and warning service, Army and Navy radio stations aid in the collection of reports and the broadcasting of information, and telephone companies are essential in the prompt distribution of weather news. An important role is played by cooperative observers in the collection of climatological data. The marine work is largely dependent on the cooperation of shipmasters.

The fruit-frost work of the Weather Bureau has the active assistance of the fruit growers and their associations; these organizations share the expense of this service. The fire-weather work is carried on in association with the Forest Service, whose employees act as observers. The Forest Service also aids in the collection of mountain-snow-

fall data, the data being useful in the conduct of their work as well as for other purposes. The Army and Navy departments contribute to current knowledge of upper air conditions by making daily airplane observation flights at a number of their flying fields. Along the principal airways of the country there is close and effective cooperation in the observation and communication work between the Weather Bureau and the Department of Commerce; and the air transport companies, chiefly through their pilots, furnish, as well as receive, valuable information. River-gage readings are of importance in the work of the United States Engineer Corps and the United States Geological Survey, and these two organizations cooperate with the Weather Bureau in the installation and maintenance of river gages. In many cases the Weather Bureau works with other governmental and non-governmental agencies to their mutual advantage, resulting in both increased efficiency and decreased cost of service.

Internationally, the science of meteorology affords one of the finest existing examples of friendly cooperation among nations. Since the weather knows no national boundaries, the needs of meteorology require that methods of observation and publication be on comparable basis throughout the world. This has long been recognized by meteorologists; ever since 1879 there has existed a wholly voluntary unofficial commission, known as the International Meteorological Organization, composed of the directors of all the large national meteorological services. The organization meets every six years for the discussion of problems connected with the international exchange of weather data, involving the standardization of observations, definitions, symbols, and codes of transmission. The resolutions and reports of the Organization and its subcommissions are not binding on the several countries of coordinated action. Exchange of daily observations has reached considerable proportions throughout the world, and progress is being made toward the prompt distribution of monthly mean values of pressure, temperature, and precipitation. There is a high degree of cooperation between the United States and Canada. The United States has exchange arrangements also with Mexico, the West Indies, the Philippines, and the Far East. Weather conditions affect the comfort, convenience, and work of every family in the country. The services of the Weather Bureau are, therefore, indispensible, and in performing them the Weather Bureau's efficient organization makes a very large economic return to the country for the money expended upon it.

A Case of Bigamy?

Observation of a Strange Cardinal Family in Austin, Texas

MARION ISABELLE WHITNEY

In the early spring of 1936 I was often awakened at dawn by the high, beautiful trill of the cardinal. It was the mating song which is sung by the male for only a brief period and usually at a very early hour of the day. In a few weeks the male cardinal and his four offspring took up their residence on our lawn.

We first saw them hopping about on the ever-urgent mission — the quest of food. The young birds would hop upon the walls and sit with mouths opened wide and cry plaintively until the father put in a seed, a grasshopper, or a fat caterpillar. He made sure that his efforts were not wasted, for if he found that the morsel of food had not gone down far enough he would give it a series of vigorous pushes, and his red bill would almost be lost from sight down the throat of the young bird. Scarcely would he remove his bill before the greedy little infant would begin to wail for more. The young birds seemed to have endless appetites and the father bird, tireless energy and devotion.

After about two weeks the young birds were practically as large as their parent, but they still demanded service. The mother bird, which did not appear at first, returned to the family group, and the six birds feasted on cantaloupe seeds which we threw onto the lawn. The outer coat of the seed was always removed before the seed was swallowed or fed to the young. One day as I contemplated the family, I noted that the young birds were as large as the parents; yet they made no effort to gather food for themselves.

One day a change took place in the routine of the family. The parent birds brought the brood to the cantaloupe seeds but refused to feed their young. The young birds shook and quivered their wings, cried, and sat with opened mouths, but neither parent made any attempt to pick up a seed. The female cardinal made several dives behind the young as though to drive them closer to the seeds on which they were almost standing. The young birds only fluttered and cried. Then the father cardinal rushed at them from behind also and many times pecked at them and flapped his wings, but they kept their mouths open, cried, and refused to help themselves. The parent birds were equally resolute; after many apparent efforts to make the young birds feed themselves, they flew away and the young ones followed. Later that same day the six birds returned to the cantaloupe seeds, and they all helped themselves with no further ado as though they had always done so. Perhaps hunger

is the most successful teacher after all![1]

A few days after the observation of weaning, my mother observed a cardinal's nest in the cypress tree just outside my window, but it was so well hidden in the branches that I could not look into it. I climbed up onto three different walls near the tree, and I tried to peek into it from the terrace porch above and from the rooms upstairs but finally gave up. Even though it was near enough to be touched by standing on one of the walls by the tree, still I could not see inside. Mother Cardinal did not appreciate my prying into her affairs, and she told me so quite plainly; so I quit trying until one day I heard her infants crying and then I made several attempts again, still in vain. Fortune turned my way on June 27, however. I had gone to the front yard to read under the elm tree. From this point the yard drops off abruptly so that the back yard is about thirteen feet below the level of the front yard and the nest in the cypress tree was about six feet above the ground and about twenty-five feet away from the elm tree. As I sat reading, I could hear the cries of the baby birds down the hill from me and now and then see a streak of red dart in and out of the cypress tree. Suddenly the sound of the cries seemed to shift and to come from two directions at once. I got up and examined the elm tree. Almost at the end of a branch which hung over the eves of the south side of the house were bits of grasses and straw about ten feet above the ground. I could not see the nest well, for a mass of mistle-toe was below it and a myriad of short branches surrounded it. I did not have to wait long to find out whose happy home it was, for a pair of cardinals came home noisily —the father saying, "tsip, tsip," and the mother singing her short, sweet song as she flew over my head.

Well, this was news! I had been told by an ornithologist that a male bird chose his territory, declared it by song, and drove out all males of his kind. Here were two cardinal nests within eye-shot of each other —not thirty feet apart! What could it mean? I stepped to the head of the stone stairs which lead down to the back yard and end almost under the cypress tree. From this point I could see both nests without turning more than half way around. This was the vantage point from which I observed most of the following procedure, much of which was as commonplace to me as cardinals themselves, but some of which I had never seen before and which also was unknown to the zoologists with whom I later talked.

The following morning I went out with a pair of very fine field glasses to peek into Mrs. Cardinal's window and to find out how many children she had. The branches above the nest in the cypress tree were very tantalizing, for I could not get a good view; so I committed the imprudent act of cutting them off. I knew that the redbirds would not be scared away even by that much tampering, but both parents

[1]Observation of weaning by Mrs. F. L. Whitney, Austin, Texas.

fluttered and scolded considerably. I made a hasty retreat to the top of the stairs and after a few minutes the mother quieted down and flew away. As she left, the male came in, jumped about on the near-by branches and gave his characteristic "tsip" at every jerk of his stiff little body. Finally no little heads went up, no mouths opened. He seemed as surprised as I was, for every time the parents had come before the two little heads came up and the babies began to cry. Without doubt, my hand above their heads and the scolding and fluttering of the female had frightened them. He cocked his head, arched his neck, said "tsip" several times, hopped to the other side of the nest and finally to a near-by branch. Then he gave them a last look and flew straight towards me. To my astonishment he flew to the nest in the elm tree, and the two little heads there went up. I saw him put the pieces of bread he was carrying first into one mouth and then into the other. This was the strangest thing I had ever heard of in bird lore. A bird might make more than one nest in a season, but to be running two houses at once was new to me.[2] This was not all of the wonders that this strange and interesting family had for me to to see.

From that time on the birds had no privacy. I peered into their windows from dawn till dark. For hours at a time I sat in the sun watching every move they made at their nests. It was on June 28 that I made two more important discoveries. First of all the female had a peculiar looking head. As I observed her through the field glasses, I saw that the entire right side of her head was devoid of feathers. The entire orbital region was bare and of a dull dark color, her crest ragged and a tawny, yellowish shade with a red tint to it. These marks made her easily recognized. The second important observation I made was to see this same bald-headed female at the second nest as well as at the first one, but it was not her special sphere of interest, and she did not spend much time there, but she did bring food occasionally.

June 29 was a very exciting day for the bird family as well as for me. I began my observations before six o'clock in the morning and stayed at my post nearly all the light hours of the day. The first surprising thing I saw was a fresh looking female at the nest in the elm tree. I was very close to her and got a good view of her face, which had all the feathers present on the right side. She also had a neat looking reddish crest. That complicated matters considerably, for the night before it had been the bald-headed female which came to this nest. Hour after hour the bald-headed female went to her nest in the Arizona cypress tree. Each time I watched to see that it was she who came and went, always through the same port of entry—the side away from me. Then suddenly the new female alighted upon the edge of the nest and filled first one mouth, then the other. This was excting enough, but to further

[2] I had given birds very little study at that time and did not then know that bigamy was common to some kinds of birds.

complicate matters, she flew out of the nest straight to the nest in the elm tree. I could scarcely believe my eyes. Here were two females and a male feeding babies in two nests. Many times after that the second female came to the nest in the cypress tree where I could easily see her. She was very neat and had a reddish crest and a full set of feathers on the right side of her head. She also sang a great deal. Although I saw the bald-headed female hundreds of times, I never heard her sing. The new female also had several small dark specks on her breast and one rather large dark speck below the fore part of her wing. From this I judged that she was the younger of the two females. Her attentions to the little ones were, on the whole, much briefer than those of the bald-headed female which seemed to be a most adoring mother. For five or ten minutes she would sit on the edge of the nest looking at her young; she almost always lingered with them when she brought food, but the other female lingered only a few times. Sometimes the two females came at once or closely followed each other. Usually this resulted in what looked like a game of chase. The baldheaded female would fly out of the nest and go straight to the creek with the younger female close behind her. Once I saw the male enter into the chase. There did not seem to be any quarrel. They separated peacefully and did no scolding during the game.

The young female flew from the nest in the elm tree to the nest in the cypress tree, the reverse of what I had seen her do previously. She found a tense situation that needed attention. One of the babies had decided to view the world. It pulled itself to the rim of the nest and fluttered its wings a little as it tried to balance itself. For a long time it sat in one spot. Then it made a leap and landed a few inches out on a limb. There it sat for many minutes with the younger female watching from below. Finally she left and the other female came in. She showed no concern about the baby on the limb. Her task seemed at the moment to feed those in the nest. When the feeding was over, the baby bird fairly stood on its head and the mother pulled from its anus excreta which she appeared to swallow. She sat for an instant looking at her baby; then the other little one felt that it was missing something; so with a flying leap it landed on top of the first baby and sat there until long after the mother was gone. Now the younger female returned with a long white caterpillar. She put it first in one mouth, then the other. This she did several times finally left it in one mouth. She must have been squeezing out juices from the body of the caterpillar into the mouths. It was so long that it stuck out of the mouth of its final receiver, and she put her bill in and pushed it down as the father bird had done with his big babies.

There was more room out in the world; so up crawled the more precocious infant and jumped to its limb. This time the bald-headed female came back and did a great deal of scolding in a neighboring tree

and then on a branch above. Finally the young adventurer jumped back into the nest for the second time but not for long. Soon it was on the edge of the nest where it received a big green insect. After it had swallowed the insect, it seemed to spit out something and then hopped back into the nest. I went close to see what it had spit out, and my presence frightened it. With a terrified little screech it jumped out of the nest and fluttered to the ground with the father and the younger female almost on top of it They rushed at it several times and the female rushed at me. Fearing that I had frightened it out of the nest too soon, I finally took courage to pick up the screeching little thing and put it back in the nest, but it simply would not stay. I fully expected a series of pecks, which I right royally deserved but did not get. I could not have made so bold with a mocking bird baby and gotten off with all my skin. The red birds were very much excited, however. The bald-headed female came back and the three sat in the neighboring woods and scolded for a half hour, while the baby sat on a limb of its tree and kept up a continual, "t-t-t-t-tsip, t-t-t-t-tsip," which it continued at intervals of about three seconds for days afterwards. It was a different cry than when the bird was on the nest and seemed to be a signal to keep the parents informed on its whereabouts.

During the period when the birds were scolding over my intrusion, no bird went near the nest in the elm tree. The father had been making trips there at intervals of about five minutes for several hours. He never seemed to take much time after that to visit that nest. His attentions had to go to the young ones that were trying out their wings. The second baby finally got out of the nest and for several hours the two young birds kept up their crying in the cypress tree. Then one went to a thicket at the edge of the yard, and the other got across the gorge. I was away for a while; so I do not know how it managed the high cliff nor just where it finally rested, but I could tell from its cry the approximate position of its resting place. Both the bald-headed female and the male went back and forth from one baby to the other. The babies remained in these approximate locations for about three days. The male made only a few trips to the other nest late in the afternoon of the first flight of the babies.

The following day I did not get many observations because of almost continual rainfall. The younger female was attending to the nestlings, however. On July 1 she was almost sole attendant to them. The father, which had spent almost three-fourths of his energy on them before the others tasted the freedom of the world, was very neglectful of them now. He had other tasks.

At noon on July 1, I heard a pecking sound behind me and I discovered that it came from the younger female trying to break a katydid in two on the wall. When she had cut it into two parts, she picked up both parts at once and flew to the elm tree. That afternoon I counted

seventeen visits to the nests in one hour and twenty-nine in two hours. She did not have the spirit of leisurely adoration so characteristic of the other female. She was very hasty. Scarcely would she arrive at the nest before she was gone. Many times she thrust her head down only once—it was getting late and there was no time to waste dividing the food as the father and the other female usually did. She stopped only once to give the nest an inspection and cleaning. Each time she came, she hastily thrust her head down once and left food in a baby's mouth and flew away. Now and then I saw her take excreta from the young, but most of the time she flew away with nothing. The father visited the nest only one time while I watched all afternoon. He was nearby, however, for the baby in the thicket had moved up the hill and stayed quite near the elm tree for a while. It was more of a care than ever now, for it could use its wings quite well at the end of three days' liberty and was getting into danger zones where cats could easily locate it. I saw it fly a distance of about thirty feet. Perhaps it could have gone farther.

On July 2 the younger female was still feeding the nestlings almost entirely by herself. I did not see the male go to the nest at all, but he was very busy close by. Now the baby in the thicket was not waiting for him to come to it. Wherever the father went, it tagged along. However, it did not follow him beyond the edge of the thicket.

Almost seventy hours after the first adventurer stepped upon the edge of the nest, a very small baby in the second nest stretched its wings and hopped upon the limb by the nest. There it sat for a few minutes and then jumped back into the nest. For several hours it was content to stay there, but before the afternoon was over this baby bird had found its way to the thicket where the older baby was now making flights of fifty feet or more; and the very smallest bird of all dropped down three and a half feet from the nest and remained all night on the edge of the eavestrough with its head under its wing. The father, which had seemed so neglectful of them for these three days, now came back to them and divided his time among all four babies. In the late afternoon of July 2 the younger female did not seem to be on duty. She had worked hard while the babies were on the nest, especially the afternoon before from five to eight o'clock, but now it was the father's turn: and he took up his task as though he had never left off. He brought a large piece of bread to the baby on the eaves and put it all in the wide mouth at once. The baby gave a choked little cry and he pulled the bread out. This he did four times until it was broken into small enough bits to be swallowed.

During all this time from Monday morning until Thursday night I saw very little of the bald-headed female. She kept herself in the gorge attending to the baby that had flown there; but with the retirement from active duty on the part of the younger female she also divided her time among the four small

birds. I never definitely recognized the younger female again, a point which I regret very much, for it leaves open a question which arose and was never answered; namely, what was her true place in the family? Was she a second mate or a member of the first family pressed into the line of duty by her parents? Perhaps continued observation of the family would have helped to unravel the story, but birds are elusive and this time they took their young out of the yard into the thicket and elsewhere for feeding; so I was not able to continue my observation.

In speculating on the presence of two females, two nests, four young, and one male, I was led to ask these questions, which I can not definitely answer; but, in view of all the facts, they may be answered by an ornithologist. Why were there only two babies in each nest when cardinals usually have four? Does this mean that one female, probably the bald-headed one, laid the eggs in both nests, and one of the first brood was designated to care for the nest in the elm tree? Is this a common procedure or at least an occasional procedure among cardinals?[3] If one bird laid all the eggs, why were the second pair off the nest three days after the others? On the other hand, if the male had one mate why should they use two nests? The thought which has intrigued me is this: could it be a case of bigamy? If this were so, why were the two females interested in both nests? We human kind are prone to speculate with prying interest upon all such matters, but I noticed that no other bird was a bit nosey about the whole affair.

[3]Recently a zoologist told me that polygamy is rare among cardinals.

Navigation on the Ohio and Mississippi Rivesr in the Early Steamboat Period, 1811-1824

ETELKA HOLT

Those who live near the Ohio and Mississippi rivers and see only the occasional passing of a steamboat can scarcely picture the scenes on these rivers before the day of railroads. Stage roads existed in but few localities. The best of them, even between important cities, were frequently almost impassable. Horses could seldom trot and passengers often had to walk. Under such conditions, transporting heavy merchandise, such as flour, lumber, and wood, was so slow and expensive it was nearly prohibitive. It cost from twenty to thirty times more to ship goods by wagon or pack animal than by boat. A hundred dollars a ton, for even a short distance, was common. Consequently, the surplus wheat, pork, and furs produced in the region west of the Appalachians, found their easiest outlet to markets by going down the river to New Orleans.

Undoubtedly our western rivers will never again play as important a part in the life of the nation as they played during the growth of river traffic. The introduction of this era of steam navigation is portrayed in a paragraph from *The Navigator* in 1811:

> There is now on foot a new mode of navigating our western waters, particularly the Ohio and Mississippi rivers. This is with boats propelled by the power of steam. . . . A Mr. Rosevelt, a gentleman of enterprise, and who is acting it is said in conjunction with Messrs. Fulton and Livingston of New York, has a boat of this kind now on the stocks at Pittsburgh, of 138 feet keel, calculated for 300 or 400 tons burden . . . . It will be a novel sight, and as pleasing as novel to see a huge boat working her way up the windings of the Ohio, without the appearance of sail, oar, pole, or any manual labour about her—moving within the secrets of her own wonderful mechanism, and propelled by power undiscoverable![1]

The *New Orleans,* launched at Pittsburgh, Pennsylvania in 1811, was the third steamboat to be built in the United States but the first one on the Western Waters.[2] She left Pittsburgh in the fall of 1811, arriving at Natchez, January 1, 1812. For two years the boat plied between New Orleans and Natchez with an average run of seventeen days. She was wrecked near Baton Rouge in January, 1814. On her maiden trip the boat carried neither freight nor passengers. Those on board were Mr. Rosevelt, an asso-

[1]Quoted in *Historic Highways of America,* Vol. IX, p. 137 by Archer Butler Hulbert.

[2]The *Clermont,* the first steamboat built by Fulton, sailed up the Hudson from New York to Albany, 150 miles, in 1807. In 1811 the *Clermont* and the *North River,* both plying on the Hudson, were the only other steamboats on the continent.

ciate of Fulton, with his wife and family; Mr. Baker, the engineer; Andrew Jack, the pilot; six hands; and a few domestics. The following record of her stop enroute at Louisville is given:

> Louisville, Nov. 15, 1811.
> Arrived at this place on the 28th ult. Mr. Rosevelt's steam boat *New Orleans.*[3]

No steamboats were built the following year (1812) but between 1813 and 1816, eight were launched. In the next three years (1817-1820) there were thirty-two. A new era in river travel had dawned. Previous to this time, the flatboat was the principal means of moving heavy freight downstream. Upstream traffic was small and was mainly carried in keel boats and barges, propelled by poles, oars, or sails, and sometimes towed by ropes.

The steamboats built in those early days were short-lived, however; snags, sawyers, and sunken boats made travel insecure, and by 1815 several attempts had been made to chart the Mississippi and its tributaries so that there would be fewer casualites. In 1819 the following advertisement ran in a local paper:

> PROPOSALS,
> for publishing by subscription,
> A SERIES OF CHARTS
> From New Orleans to the mouth of the Ohio; thence to Louisville.
>
> The windings of the river taken by compass—the Islands, Bars, Shoals, and Distances carefully laid down on a scale of one inch to a mile; taken during the seasons of low water in the years 1815, 1816, 1817, 1818, and 1819
> By Captains
> ROBESON DEHART & H. PENISTON
> The price to subscribers will be
> ONE HUNDRED DOLLARS,
> payable on delivery,
> Subscriptions received at this office.[4]

The greatest hindrance to navigation on the Ohio and Mississippi systems in the trip from Pittsburgh to New Orleans was the "Falls of the Ohio," the one spot in all of its course of nearly a thousand miles where steamboat navigation was impossible. Steamboating was impracticable here save only when the river was at flood-tide. In a distance of two miles and one-half, the Ohio makes a fall of about twenty-five feet, caused by a ledge of rocks extending across the river.

At either end of the falls a city grew up: Louisville above the falls, and Shippingport below. These cities owed their early growth to the fact that boats coming downstream from Pittsburgh or upstream from New Orleans would have to stop, while passengers and cargo were transported "around the falls."

A portage path connected the two towns and over this road passengers and cargo were carried. As navigation increased, the road between Louisville and Shippingport was an important thoroughfare, a tax beng imposed on the inhabitants for keeping the road in good repair. Slaves did much of the work of transporting merchandise between the boats and the warehouses in the towns and between the Upper and Lower Landings. Hackney coaches

[3] *Niles Weekly Register,* Vol. I, p. 272 (Dec. 14, 1811).

[4] *Kentucky Herald and Mercantile Advertiser,* Vol. II, No. 34 (June 30, 1819).

met the boats to carry passengers and their luggage around the falls.

Boats plying between New Orleans and the Falls landed at Shippingport; those coming from Pittsburgh landed at Louisville. Consequently, these Kentucky towns were more frequented by steam-boats than any other ports on the Ohio. Packet boats, carrying passengers and mail, arrived almost daily except in winter when the upper river was icebound from six to eight weeks. During the shipping season scarcely a day passed without offering steamboat conveyance to New Orleans.

> Shippingport: Passage for the Arkansas and New Orleans,
>
> The Steam-Boat *Hecla,* Capt. F. Honore, WILL leave Shippingport for the above places on the 30th instant, if a sufficient number of Passengers can be obtained.[5]
>
> Shippingport: The *Manhattan* arrived at Shippingport From New York, via N. Orleans (March 1, 1820).[6]
>
> Shippingport: The *Providence* sailed for Havana.[7]

Although the Falls added great inconvenience and expense to shippers and merchants, they were a source of much profit to the people in the towns and the mercantile and manufacturing pursuits of their people were intimately related to the river. During the navigation season many found work in the river trade, on the boats or handling the cargoes in port. Many others were employed in the shipyards or in hauling merchandise around the Falls. In the town the warehouse men, the auctioneers, and the storekeepers who handled boat supplies, carried on a lucrative business while shipping was under way. The rising and falling of the river was therefore watched with interest, for its waters continually brought to their doors for reshipment many tons of merchandise.

> The steam-boats, which ascend as far as Shippingport, below the Falls, are of no less than 3 to 500 tons burthen, and are handsomely fitted up for the accommodation of passengers. Sometimes they descend to New Orleans in eight or ten days, affording a facility of communication heretofore unprecedented.[8]

Quite as important to the development of these towns as the merchandise brought to their doors by the boats was the interest created by the coming and going of travelers from many ports. The capacious common room of the Tavern of Louisville was usually frequented by numerous strangers evidently engaged in buying and selling and by a few immigrants from Europe, who had broken their long stage or boat journey westward in search of a home. An account speaks of the

> polished military and mercantile gentlemen of New Orleans, many of whom are waiting for the troubling or rising of the waters, and consequent movement of the steam-boats.[9]

It is interesting to note that as early as 1818 direct trade with Europe and the interior river cities had

[5] *Kentucky Herald and Mercantile Advertiser,* Vol. II, No. 34 (June 30, 1819).

[6] *Western Monitor,* Vol. VI, No. 32 (March 7, 1820).

[7] *Ibid.,* Vol. VII, No. 34 (Mar. 20, 1821).

[8] Thomas Nuttall, *A Journal of Travels,* p. 67 (1818).

[9] W. Faux, *Memorable Days in America;* Thwaites' Travels, Vol. XII, p. 197 (1819).

begun. The easiest outlet to market was down stream to New Orleans. From here much of the cargo was taken to cities along the Atlantic seaboard, some of it being even reshipped to more distant ports. Auction rooms and general stores in Louisville frequently announced new stock in hand or large invoices and bills of lading for goods expected daily by boat. They also listed merchantable items.

VERNON, BLAKE, & CO.

HAVE made arrangements with some of the first Commercial Houses in Europe, for the shipment of Merchantable

TOBACCO, COTTON, & FURS

And will advance on account of such consignments as may be placed in their hands, from 1-2 to 2-3 the amount of valuation on its arrival at New Orleans to be estimated by one of the most respectable houses at that place. They will also advance liberally on PORK & LARD consigned for Sale, either at Orleans, or any of the Atlantic States. . .

Wanted to Purchase for Cash

500 Hhds. of Prime Tobacco,
1,000 Bbls. of Pork,
10,000 lb. Ginsang,

Delivered at Louisville, or on the Ohio at any port below Louisville, Jan. 1, 1818.[10]

In the following year (1819) a Louisville newspaper gives the interesting news report:

March 6 (1819)

Louisville: The Steam Boat *Sea Horse* had arrived at New Orleans, 10 days from N. York; the *Maid of Orleans* arrived at the same port, from Philadelphia, on the 1st ult.

They are probably the first steamboats, that ever performed a voyage by sea, and we are induced to believe that the experiments they have made will increase the use of steam engines—perhaps they may form a new and important era in the navigation of the country.[11]

An account of a traveler gives this information:

European goods are imported directly from that continent; those from the East Indies and from the Atlantic States, are received [at Louisville] from Philadelphia, Baltimore or New Orleans, and owing to the facility of transportation by means of steam boats, principally from the latter.[12]

The same account also states that it was necessary to enlarge landing facilities at Shippingport for the accommodation of the boats from downstream:

The whole front of the town will be improved this summer by the addition of wharves, which will facilitate the loading and unloading of steam boats that are constantly arriving from below.[13]

Consignments by river boats (from 1818-1824) include the following items and give an idea of the extent of trade even in the early part of the steamboat period.

Best Holland Gin;
Swedish, Old Sable and best Crowley Steel;
Invoice of $10,000 value of British goods;
German, India, and French goods;
Damascus razors;
Old Jamaica Rum;

[10] *Western Monitor*, Vol. IV, No. 182 (Jan 24, 1819).

[11] *Western Monitor*, Vol. V, No. 33 (Mar. 13, 1819).

[12] H. M. McMurtie, *Sketches of Louisville*, p. 56 (1819).

[13] *Ibid.*, pp. 161-162.

St. Domingo mahogany;
Logwood, Green Coffee and sugar from the West Indies by way of New Orleans;
Baftas [a fine cotton fabric] and Calicos from the Orient;
Chintz from India;
Cossas [muslin] from the East Indies;
Persian and Grecian prints;
Domestic goods from Philadelphia—shirtings, sheetings, checks, stripes, ginghams, sattinets;
Domestic manufactured goods from Providence;
Cotton from Mississippi and Alabama;
First quality Coast cotton;
A variety of goods selected with much care in the New York market;
Groceries, sole leather, and calf skins from Baltimore;
Boston Bay mackerel;
Loaf sugar from the Boston Refinery;
Ground Mustard, by the keg or pound, from Cincinnati;
New England cheese;
Paper, and best merino wool from Steubenville (Ohio);
Window glass and Patent cut nails from Pittsburgh;
Shot and lead from Herculaneum (Missouri).

Many famous ports have gained renown by sending out adventurers to search for riches, but the towns along the Ohio and Mississippi rivers sat quietly at home while steamboats, moving up and down the waters at their feet, brought to them the treasures of the world.

The Federal Food, Drug, and Cosmetic Act

OLIVER W. CHAPMAN

Prior to 1906 there existed no effective government regulation of the production and sale of foods and drugs.[1] At that time, due largely to the efforts of Dr. Wiley, an act was passed by Congress to provide regulations governing the manufacture and sale of foods and drugs. The passage of the law was bitterly opposed by unscrupulous manufacturers and dealers who were more concerned with their profits than with the welfare of their customers. Enforcement of the law brought about many needed reforms, one of which being the changing of statements on labels to conform with the actual contents of packages.

It was not long before weak points in the 1906 act became obvious. The bill did not provide suitable punishment for many misdemeanors, nor did it have any power to regulate the manufacture and sale of devices and cosmetics. Under the law, in order to obtain judgment, it was necessary to prove intent to defraud, an exceedingly difficult accomplishment. In 1933 a bill was introduced into Congress by Senator Copeland designed to correct these and other faults. The bill was passed, but not until Congess was stirred to action by the well known Elixir of Sulfanilamide and Cancer Serum cases.[2] Three sections of the act, relating to new drugs, dangerous drugs, and poisonous cosmetics became effective immediately, and the entire act was to go into effect on June 25, 1939. The effective date for certain labeling provisions has been postponed to July 1, 1940.[3]

The new statute keeps the valuable features of the act of 1906, but has been extended to include devices and cosmetics. Definitions of adulteration and misbranding have been changed. No longer is it necessary to prove intention of fraud in actions against drug preparations bearing therapeutic claims. New drugs must be tested and approved before introduction into interstate commerce. Coal tar colors must come from certified batches before use in any food, drug, or cosmetic. Labels must declare the presence of any habit forming drugs or any substances that may deteriorate. Foods must meet certain standards and be prepared under suitable conditions of sanitation. Poisonous and dishonest containers are outlawed. Devices that do not measure up to the claims made for them are subject to the

[1] *Federal Food, Drug, and Cosmetic Act and General Regulations for its Enforcement.* United States Department of Agriculture, Food and Drug Administration, Service and Regulatory Announcements. Food, Drug, and Cosmetic No. 1.

[2] Radio address by W. G. Campbell, Chief of the Federal Food and Drug Administration, Aug. 23, 1938. N. B. C.

[3] *Jour. Ind. Eng. Chem.*, News Edition, 17, 775. Dec. 20, 1939.

provsions of the law. These represent some of the improvements of the present act over that of 1906.

To a person uninformed on the conditions existing prior to 1906, and even in the past few years, there may appear to be little need of the Food, Drug, and Cosmetic Act. That there is need of such a bill becomes evident upon learning of the practices of certain manufacturers of foods, drugs, and cosmetics such as have been disclosed by the "Chamber of Horrors"[4] of the Food and Drug Administration and by various books and journal articles. Some of the most flagrant violations of the spirit of the old law will show the need of the modifications made in the present act.

Two general types of fraud have been prevalent: (1) economic, and (2) those endangering health. A few illustrations of these types of fraud as practiced prior to 1939 will suffice to show that the old bill was weak in many respects.

In 1906 the cosmetic industry was too insignificant to receive attention. Since that time it has grown until now it is one of the great industries of the nation. You are familiar with the advertisements of newspapers, magazines and radio extolling the virtues of certain preparations, thus creating a demand that makes it possible to sell them for high prices. Investigations have shown that often the high priced products are not superior to many less expensive brands. This harms only the purse of the buyer. Of more concern are the cosmetics that injure the health of the user. Many of these have appeared on the market, but should now, thanks to the new law, disappear.

Among the many harmful preparations that have been used to "beautify" are the eyelash dyes. Some of these have contained diphenylene diamine, various aniline dyes, or other harmful coal tar compounds. The best known of these is "Lashlure."[2,4] Application of this dye has caused blindness and even death. What price beauty! Other dangerous eyelash dyes found were Magic-di-Stik, Loris, Dark Eyes, and Roux.[2]

Hair dyes have been found to contain lead, silver or pyrogallol, or combinations of these substances, all dangerous because extended use may result in anemia, defective vision, and even paralysis. Hess Hair Milk, Odell Color Restorer, and Wyeth's Sage and Sulphur Compound are such preparations.[4,5]

Scalprite and Mahdeen for dandruff contained arsenic, which affects the skin, liver, and kidneys and which may cause paralysis. Preparations containing mercury have been common. This element affects the mouth, gums, jaws, and teeth. Some of these are Beaver's Hair Tonic, Othine Freckle Remover, O. J. Beauty Lotion, and Chernoff Whitening Cream.[5]

"Koremlu" is a depilatory that found its way to cosmetic counters

[4] *Chamber of Horrors.* Photographic and descriptive material arranged by the Federal Food and Drug Administration.

[5] *Why We Need a "Pure Food Law."* Mimeographed material prepared by the Federal Food and Drug Administration, Aug. 28, 1933.

at ten dollars a jar. It contained as high as seven per cent of thallium acetate, a rat poison.[4,5] Koremlu had one virtue—it removed hair where applied but unfortunately it also caused total baldness and severe nervous trouble. Other depilatories may contain sulfides of alkali metals, severe irritants to the skin.

Dentrifices that make therapeutic claims are frowned upon, not because of the nature of the preparations, but because of the claims made in the advertising. Many highly advertised mouth washes are ineffective because of high dilution and short contact time. Most creams are harmless, but well directed advertising appeal keeps their prices high. Lip stick and rouge are harmless provided no poisonous dye is used. Most powders are unobjectionable except to individuals allergic to certain ingredients. Deodorants designed to stop perspiration are not to be recommended.

It is in the field of the so called "Patent Medicines" that are found the most flagrant violations of the spirit of law. Many of these are out and out fakes. Some are injurious to health, others are only worthless. The chief harm in the worthless type is that they lull the users into a false sense of security, and so keep them from obtaining competent medical attention until too late. A few examples of offenders in the field of patent medicines will suffice to illustrate conditions that existed in this field before the passage of the present Food, Drug, and Cosmetic Act.

Reducing preparations have been seized, and some upon examination have been shown to contain thyroid extract, bladderwrack, Epsom salts, Glauber's salts, or cascara. Dinitrophenol, closely related to picric acid, has also been used.

Such habit forming agents as morphine have been found in soothing syrups. Cough preparations have contained opium, morphine, or chloroform. Cures for the booze habit have been made up to contain strychnin or tartar emetic.

Sedatives usually are barbituric acid derivatives or paraldehyde. Headache preparations may contain acetanilid, antipyrin, or phenactein, as well as the commonly used aspirin. Excessive use of acetanilid has been reported to have caused poisoning.[6]

Chief offenders among the patent medicines are the so called "cures." Many "cures" for tuberculosis have appeared on the market. One of these, B & M, was made up of ammonia, turpentine, water, and egg.[4,5] A cancer "cure" contained potassium iodide, a laxative, sugar, alcohol, and water.[4,5] "Banbar," advertised as a cure for diabetes was an extract of horsetail weed, originally a horse linament![4,5] A "cure" for gout, Radithor, although claimed to be harmless, caused death rather than cure.[5] Government agents have gathered testimonials extolling the virtues of these preparations and with them the death certificates showing that the users have died of the disease from which they believed themselves to have been cured.[4]

---

[6]Leslie, Alan. *Acetanilid Poisoning.* Jour. Amer. Med. Assoc., 113, 2229. 1939.

Devices that claim to accomplish wonderful things are also regulated by the new bill. An example of a device at one time offered for sale, apparently was modeled after the torture rack of Inquisition days. It was known as the "Pendiculator," and its use promised to add inches to the stature of the user.[4,5]

Consumers of foods find added protection in the present law. Care must be taken to prepare foods under sanitary conditions. Harmful colors and preservatives must be avoided and full measure must be given to avoid prosecution.

Advertising claims, other than those made on the label, are not covered by the Food, Drug and Cosmetic Act, but a separate bill, the so called Wheeler-Lea Act, passed March 21, 1938, delegates the regulation of advertising of foods, drugs, devices, and cosmetics to the Federal Trade Commission.[7]

Enforcement[8] of the provisions of the new Act by the department of Food and Drug Administration and by the Federal Meat Inspection department and others to whom the enforcement is entrusted no doubt will go far to remedy conditions that have existed.

---

[7]Klumpp, Theodore G. *The New Federal Food, Drug and Cosmetic Act.* Jour. Amer. Med. Assoc., 113, 2233. 1939.

[8]Dunbar, P. B. *The Federal Food, Drug, and Cosmetic Act from the Regulatory Officer's Viewpoint.* Jour. Ind. Eng. Chem., News Edition, 17, 225. Apr. 10, 1939.

Weather Proverbs: Scientific or Superstitious

ELSIE BROOME

What is it moulds the life of man?
The Weather
What makes some black and others tan?
The Weather
What makes the Zulu live in trees,
And Congo natives dress in leaves
While others go in furs and freeze?
The Weather.

Weather is the state of the meteorological elements at a given time and place. The meteorological elements are air pressure, temperature, moisture, cloudiness, precipitation, sunshine, wind direction and speed, and visibility. Some of the Greek philosophers, notably Hippocrates and Aristotle approached the study of weather and climate in a scientific spirit and made considerable progress in their interpretation of the atmospheric phenomena. Today our weather forecaster can predict the approximate weather conditions at any given place for a day or two in advance. Through the use of scientific instruments and the knowledge of how to use them, he knows the present and previous conditions over the continent. In many places the general weather forecasts may not be available in time for use, or they may not meet the needs of that particular locality. Under these conditions certain signs and phenomena may be valuable. Because of the great influence weather conditions have over human affairs, numerous rules for foretelling the coming of weather changes have been formulated in all ages and by all peoples.

Some weather proverbs are worthy of consideration, for they embody accurate description of phenomena and express the usual sequence of events, as: "John, when is it going to rain?" was asked, during a certain drought, of one known to be weather wise. "Well, sir, I just tell you, it is not going to rain till the ground gets wet; then we shall have plenty of it." Although the details of how the ground was to get wet before it rained was overlooked, the important fact that the weather goes by spells, each type tending to persist, is implied by the above proverb.

Clouds are among the most reliable of the natural phenomena to be considered in calculating changes of the weather. The height, extent, and shapes of clouds depend upon the humidity, the temperature, and the motion of the amosphere, and they often give reliable warnings of the coming weather. Warm air can hold more moisture than cold air. When the air is cooled, the gases of the water vapor tend to collect and become visible in the form of clouds or fog. Since the weather varies with the direction of the wind, the carry or current of the clouds often is good evidence of the kind of

weather on the way, commonly foul if from the east; fair if from the west.

"When the carry goes west
Good weather is past;
When the carry goes east,
Good weather comes neist."

Clouds moving apparently against a surface wind, in reality are moving with a upper current of air. Cross-winds commonly precede rain or snow.

"When'er the clouds do weave,
'Twill storm before they leave."

Some types of clouds are commonly used to foretell rain or clear weather. Cirrus clouds, the highest of all, are the delicate, fleecy wisps of vapor, that present a feathery whiteness against a blue sky, their beautiful shapes occasionally arranged in bands or they may spread out in long sheets if accompanied by high winds in the upper atmosphere forming what is known as the "Mackerel sky" or "Mare's tail."

"Mackerel's scales and Mare's tails
Make lofty ships carry low sails."

"Trace in the sky the painter's brush,
The wind around you will soon rush."

Cirrus clouds are the first indication of a change from fair to foul weather; if from the south or southeast, they may be flowing out from the top of an intense cyclone or low pressure area and may be accompanied by strong winds from that direction, if moving fast; if moving slowly toward the eastward, unsettled weather may be expected for a day or two.

Cirro-stratus are fine fibroid clouds composed of ice particles, forming a whitish veil or haze, which produces halos or rings around the sun and moon; they usually precede rain or snow.

"Red moon doth blow,
White moon doth neither rain nor snow."

"If the moon show a silver shield,
Be not afraid to reap your field;
But if she rises haloes round,
Soon we'll tred on deluged ground."

"Pale moon" and "haloed round" indicate thin clouds that precede a rainstorm. "Red moon" and "silver moon" indicate lack of clouds and a dry atmosphere. The number of stars seen inside the corona are supposed to indicate the number of days before the rain. The more stars seen inside the corona, the less moisture there is in the air. The larger the particles of water in the air, the smaller the ring and the sooner the rain will fall. A decreasing corona implies growing drops of moisture and probably rain; an enlarging corona shows evaporation of moisture and clearing skies.

Twinkling and dancing stars indicate mixed air currents in which colder layers of air are flowing over warmer layers and are signs of rain.

Cumulus or woolpack clouds pile high up in the air and have flat bases. They are caused by cooling and condensation of the moisture in the air. These clouds appear in the warmest part of the day when the sun heats the air sufficiently to create upward currents. In summer they are called dry weather clouds.

"The higher the cloud, the finer the weather."

In summer when the air is dry air, currents must rise to great heights

to cool sufficiently to cause condensation of the moisture; however, these cumuli or thunderheads may gather together and form enough moisture to give local thundershowers.

"In the morning mountains,
In the evening fountains."

"When the clouds appear like rocks and towers
The earth's refreshed by frequent showers."

If the decrease in temperature with the increase in elevation is such that large cumuli are formed during the forenoon, further heating of the surface during the day will cause more ascending air and will form large cumulo-nimbus or rain clouds. Nimbus clouds from west or northwest bring rain, while those seen in the east or northeast are moving away from the observer.

Certain conditions indicate degrees of humidity and therefore help to foretell the weather. Fog is a cloud on the ground. Fog forming in the morning is an infallible sign of a fair day, but if fog sets in during the night a misty or rainy day may be expected.

"Men judge by the complexion of the sky
The state and inclination of the day."

Moisture gathering in the air is an indication of unsettled weather. The colors of the sky are indications of the moisture content or dust particles. Joy or distress is often pictured on the face of those who follow the sea and are guided by these telltale colors indicating what the coming day is to be. The sailor trusts as much to color of the sky at sunrise and sunset as he does to his barometer. To those who can translate their meaning, each color possesses a distinct meaning of its own.

"Evening red and morning gray
Help the traveler on his way;
Evening gray and morning red
Bring down rain upon his head."

"When it is evening, ye say it will be fair weather, for the sky is red; and in the morning it will be foul weather, for the sky is red and lowering.—Matthew XVI, 2-3.

The condition of the atmosphere determines the colors of the sky. The longer the wave length of the color, the less it is weakened and scattered by the moisture and dust of the atmosphere. Red, the longest wave length, is weakened and scattered very little; yellow is scattered and weakened twice as much as red; green, four times as much; blue, six times; and violet, the shortest wave length, ten times. Since very little violet can get through the atmosphere and red is scattered very little, the controlling intensity of the sky light is some intermediate color which is generally blue. When the dust motes gather moisture and increase in size or number, the sky assumes some longer wave length color as green, yellow, or red. If the particles are large enough to reflect radiation of all colors, the sky is whitish.

"If the sunset is gray
The next will be a rainy day."

"If the sun goes pale to bed
'Twill rain tomorrow it is said."

During the warmer part of the afternoon the air is warmed and

rises; if it contains a great amount of moisture, all of the light rays are scattered and the sky is gray. If the air contains little moisture, condensation does not take place, even in the higher air, and the long red ray is seen as the sun sets. If the sky near the horizon is yellow, greenish, or some short wave length, great is the chance for clear weather.

"The weary sun hath made a golden set
And by the bright track of his firey car
gives token of a goodly tomorrow."
—Shakespeare

Morning red indicates rain.

During the night as the dust particles cool until their temperature is lower than the air, the moisture gathers upon them. When the morning sun shines on the droplets, the light is scattered, and the sky is gray; as soon as the air is sufficiently warmed, the moisture is again turned to gases and the sky is clear.

Very moist air holds heat to the dust or other objects and prevents radiation of heat to the surrounding air. If the long red ray can shine through the morning atmosphere, excessive moisture of the upper air has prevented radiation of heat from dust particles, and the particles have not collected moisture. When the upper air is moisture laden, slight cooling will bring rain or snow.

"Frost does not occur on cloudy nights."

Man is supposed to be somewhat of a human barometer in forecasting storms through attacks of aching joints or teeth, rheumatism, neuritis, and migraine. These afflictions even appear in hospitials where conditions are to a large extent controlled. Aching corns before a storm are possibly caused by swelling of the feet when the air pressure is less. Preceding a storm the air pressure drops below normal, a condition which appears to make children restless and unruly. These discomforts are probably due to the decreased pressure and the increasing moisture content of the air. The pressure within the human body is then greater than the pressure outside.

Some other objects that are influenced by decrease in air pressure and increased moisture content of the often cited as weather forecasts are:

Unusual clearness of atmosphere, making distant objects appear nearer.

The tightening of cordage on ships

Curly hair is more unruly.

Doors and windows swell and are hard to open.

Salt gathers moisture and refuses to pour.

"When the lock turns damp in the scalp house, most surely it will rain."—Indian Tradition.

"If metal plates sweat, it is a sign of foul weather."—Pliny

Cats rub their ears when it is likely to rain, because moist air is charged with electricity which produces an itching sensation.

When sheep lie around and are unwilling to go to pasture, it is a good sign of rain; damp air makes them listless and drowsy.

"A bee was never caught in a shower." When bees hover about their hives and refuse to take flight,

unsettled weather may be expected.

"When flies bite expect rain." The biting stable fly, however, seeks shelter indoors on the approach of stormy weather.

"Swallows fly low before approaching rain." Talman in his book, *Realm of the Air,* says that swallows fly low before a storm because their prey, the insects, fly low at such a time. The real weather prophet is said to be the insect, which is incommoded by the condensation of moisture on its wings or fine hair, causing it to fly low.

"Flowers are more fragrant previous to rain." Their perfume is prevented from escaping on account of excessive moisture in the air.

"The smoke from chimneys right ascends,
Then spreading back to earth it bends."

This is probably due to the fact that soot gathers moisure, becomes heavy, and settles.

"When the ditch and the pond offend the nose
Then look for rain and stormy blows."

"Very ancient and fish-like smell."
—Shakespeare

Stagnant pools, ditches, and swamps produce gas bubbles from decaying plant and animal organism. When the barometer falls and the air pressure is low, these bubbles expand and break, releasing the gases into the air and giving off foul odors.

"When leaves show their undersides,
Be very sure that rain betides."

Leaves hanging so that one can see their undersides when looking at them laterally is due to the absorption of moisture which causes a change in the leaf stems.

Dr. Erasmus Darwin, the grandfather of Charles Darwin, is given credit for the following poem which gives 31 symptoms of a coming storm:

The hollow winds begin to blow,
The clouds look black, the glass is low,
The soot falls down, the spaniels sleep,
And spiders from their cobwebs peep.
Last night the sun went pale to bed,
The moon in halos hid her head.
The boding shepherd heaves a sigh,
For, see! a rainbow spans the sky.
The walls are damp, the ditches smell,
Closed is the pink-eyed pimpernel.
Hark! how the chairs and tables crack;
Old Betty's joints are on the rack;
Her corns with shooting pains torment her
And to her bed untimely send her,
Loud quack the ducks, the peacocks cry,
The distant hills are looking nigh.
How restless are the snoring swine!
The busy flies disturb the kine.
Low o'er the grass the swallow wings,
The cricket, too, how sharp he sings!
Puss on the hearth, with velvet paws
Sits wiping o'er her whiskered jaws.
Through the clear stream the fishes rise
And nimbly catch th' incautious flies.
The glow-worms, numerous and bright,
Illumed the dewy dell last night
At dusk the squalid toad was seen
Hopping and crawling o'er the green.
The whirling dust the wind obeys,
And in the rapid eddy plays.
The frog has changed his yellow vest
And in a russet coat is dressed,
Though June, the air is cold and still,
The mellow blackbird's voice is shrill,
My dog, is altered in his taste,
Quits mutton bones on grass to feast.
And, see yon rooks, how odd their flight,
They imitate the gliding kite,
And seem precipiate to fall,
As if they felt the piercing ball—
'Twill surely rain—I see with sorrow
Our jaunt must be put off to-morrow.

Most meteorologists agree that conditions of plants and behavior

of animals are largely responsive to past and present weather influence but furnish no possible indication of future weather. The belief in such omens is suggestive of lingering superstitions. It may be true that certain plants and animals are sensitive to changes in pressure, temperature, and humidity, and for that reason their actions before a storm may give a few minutes' warning of an approaching change. This is more noticeable in winter before a severe cold wave, as animals seeking shelter before a blizzard or birds flying south; bird migration is probably due to food supplies being exhausted as it is now known that many birds will stay all winter if crumbs or other food is provided.

CAMPUS ACTIVITIES

Dr. Rowena Wellman, of the Commerce Department, attended the National Federation of Commercial Teachers, December 27-29, at Pittsburgh, Pa.

Richard Stone, President of Pi Omega Pi, National Honorary Fraternity for Commercial Teachers, attended the National Convention of Pi Omega Pi held at Pittsburgh, Pa. This convention is held in connection with the National Federation of Commercial Teachers.

Dr. C. B. Pyle, head of the psychology department, attended the meeting of the American Association for the Advancement of Science in Columbus, Ohio, on December 27, 28, and 29, 1939.

The following students were initiated into Sigma Phi Mu, honorary psychology fraternity, in November: Mary Margaret Coles, Pittsburg; Margaret Reed, Independence; Elmo Wintersteen, Ft. Scott; Edward C. Hood, Pittsburg; Nancy Dalton, Pittsburg; Nenetah Sunley, Paola; Clyde King, Pittsburg; and Carl Ryerson, Parsons.

The members of the class in Applied Psychology are interviewing young people employed by the Crawford County unit of the National Youth Administration in connection with a vocational guidance program being carried out by that organization. The project is being supervised by Dr. Paul Murphy, instructor of the class, and Mr. S. W. Wendle, N. Y. A. supervisor in Crawford County.

Dr. Jarvis Burner and Dr. J. Gordon Eaker attended the meetings of the Modern Language Association at New Orleans on December 28-30.

Dr. S. J. Pease gave three addresses to the combined foreign language classes of the Wyandotte High School, Kansas City, Kansas, at their Christmas program on December 19. In all about 450 pupils were present.

A group of players under the direction of Dr. Jarvis Burner presented as puppet plays *Aucassin et Nicolette* and *La Farce de Cuvier* at the Modern Language tournament held at Coffeyville on November 25. The tournament was under the direction of Miss Ruth Perkins of the Junior College at Coffeyville. First place in the tournament proper was won by Fort Scott Junior

College students, coached by Miss Helen Kelso, alumna of the College, with a scene from Molière's *Le Bourgeois Gentilhomme.*

Two deaths occured in the faculty during the month of January. Professor David M. Bowen of the Department of Education died in a hospital in Indianapolis January 9 where he had been ill for some time. Professor Bowen will be remembered for his pioneering spirit in the field of education in Kansas and for his efforts to have the College recognized and maintained as a separate institution. He had served on the faculty since 1909.

Franklin H. Dickinson, assistant professor of Industrial and Vocational Education, died at his home on January 17 after a brief illness. Professor Dickinson had served on the faculty since 1914.

Dr. and Mrs. W. T. Bawden were hosts to the departmental faculty, their wives, seniors, graduate students and other guests at the fifth annual Industrial and Vocational dinner given at the Besse Hotel on Saturday, February 17. Reports were given by faculty members who had attended the Manual Arts Conference in Chicago and the American Vocational Association meeting in Grand Rapids. Out of town guests included members of the program committee for the Four State regional conference who met in Pittsburg that day to make plans for the conference which will be held in Pittsburg again on October 11, 12, 1940.

FIELD NOTES

Bennington Ross, who completed his M. S. degree in August, 1939, has continued collecting and mounting specimens of flowering plants. During the growing season of 1939, some 250 species were added to his collection from Missouri, Arkansas, Oklahoma, and Kansas.

Of the 251 species and varieties collected in Crawford County State Park, 87 had not been previously reported from Crawford County. These are being supplied to the state herbarium at Manhattan. Mr. Ross has been invited to become a member of the Missouri Resources Museum at Jefferson City, Missouri. He has promised to supply the museum about a dozen species from Barton County, Missouri, that do not appear in a "Check List of the Flowering Plants of Missouri" by Bill Bauer, 1937.

An abridged form of Mr. Ross's thesis is being published in "Transactions" of the Kansas Academy of Science. Mr. Ross is teaching in Raytown, Missouri, and is pastor of Jackson Avenue Methodist Church in southeast Kansas City, Missouri.

Dr. C. W. Street and Dr. Jane M. Carroll represented the Kansas State Teachers College at a meeting in Topeka, December 16, where plans were developed for continuing the program for the improvement of instruction in Kansas. This is the fifth year the Kansas Curriculum Program has been in progress. The meeting was called by Supt. Glenn A. Delay, Neodesha, Chairman of the Kansas Curriculum Program. The plan developed as stated by Mr. Delay is: "Starting with the second semester, six teacher training schools of Kansas will be available for consultative service to local schools which will be furnished as extensively as facilities permit. The University of Kansas will head this consultative service which will also be offered by Kansas State College of Manhattan, the Kansas State Teachers College of Emporia, the Kansas State Teachers College of Pittsburg, Fort Hays Kansas State College, and the University of Wichita."

The State Department of Education with the assistance of designated college representatives is making a study of secondary schools in the State of Kansas. The standards used as a basis for this study are recommended by the North Central Association. Dr. Ralph Fritz and Prof. W. E. Matter have been appointed as representatives of the College.

COMMENTS ON BOOKS

A Short History of the Americas
By R. S. Cotterill
Prentice-Hall, Inc., 1939

According to the preface, the aim of the author in *A Short History of the Americas* has been to give the student a general acquaintance with the entire field of American history and at the same time to supply sufficient information to serve as a foundation for advanced work in national or regional fields. After a careful reading of the text, I believe the author has accomplished his goal in a very commendable manner. Under the various historical periods, as discovery, exploration, and colonization, the author has discussed the significant events in the different countries and has given the reader an intelligent view of a cross section of what was taking place throughout the Americas in any of the periods. The reader can readily note the relative progress of the countries, any common trends, or hindering influences.

To know what is taking place in one country may explain the success or failure of a similar enterprise in another. Not only may such knowledge be illuminating, but knowledge begets interest and interest is a basis of friendship between nations; and that is one of the major feelings the peoples of the Americas are anxious to foster among themselves at this particular period. The volume merits a wide circulation as an agent of understanding and peace among the American nations.

The author has given a rather liberal interpretation to history by including the military, political, economic, educational, religious, social, and racial developments and conditions. While the discussions are necessarily brief, they do reveal the basic facts. While the United States looms large in the discussions, there is no noticeable plan to build around it the histories of the other countries. He has tried to stress the forces and influences common to all America and to retain only as much of local material as seemed necessary to explain national development.

There are no footnotes, but there is an ample bibliography of standard recent references at the close of each chapter. There are several excellent maps, one in colors, but there are no illustrations nor tables. The book is printed on heavy gloss paper in a very readable type, and it has a rather complete table of contents and a full index. The volume should prove very instructive not only to the general reader but to those who try to correlate the history of their

country with the histories of the other countries of the Americas.

—Oren A. Barr.

Education Moves Democracy Forward

[In place of a book review the following is an abstract of a very worth while speech delivered by John W. Studebaker, United States Commissioner of education at the Congress on Education for Democracy, New York City, August 15-17, 1939.]

The World Congress on Education for Democracy is one of the significant signs of rising determination to halt the retreat of popular self-government. We make bold to sound a call for a forward march of the democratic movement. Our institutions of education have a dominant role to play in preparing citizens for progress under the conditions of freedom.

We have a marvelous educational organization to help democracy move forward. We are the leaders among civilized nations. The constant demand of our leadership for better facilities for mass education is responsibile for our advanced position.

Education will not move democracy forward by merely teaching courses concerned with the democratic philosophy and principles. These courses are necessary but everyday teaching done in all sorts of fields from arithmetic to home economics, from physical training to psychology, is pertinent to our problem of making democracy work. Democracy is not an election-day matter concerned with local, state, and national government, but it is a way of living.

Our educational systems have taken over much of the responsibility for vocational training. People with skills and technical knowledge capable of functioning efficiently in industry, business, and agriculture are needed in any society, but most of all in a democracy.

Our schools are giving training to the handicapped and are seeking to raise their cultural level. Preparation of foreign-born people for naturalization is another function of our schools, which is a direct form of education for democracy. Democracy is being practiced more and more in our schools. Student self-government in school is training for participation in government after school.

If there is one area where institutions of education in America have made a more profound impact on life of mankind than another, it is in the field of science. During the past one hundred years, scientific research and study have revolutionized human existence. We made this scientific advance under the impetus of democratic freedom. Scientific research cannot flourish except under conditions of freedom. However, our remarkable success in the field of science has created a dilemma. We must now use this new knowledge to benefit the common man by creating a widespread and stable prosperity, or we lose our democracy, the very mother of science.

If we are going to achieve greater success in our plans for education

for democracy, we shall have to see clearly what threatens democracy. Self-government is being undermined by its failure to solve the crucial problems of the technological age. Unemployment, vast farm surpluses unused plant capacity, waste and destruction of surpluses, widespread and needless poverty are the factors that threaten democracy and democratic life.

People lose their freedom because they do not know how to employ themselves constructively. People do not choose to be dominated and regimented; they do not choose mere theories and ideologies; they choose leaders, and leaders can exercise power and establish dictatorships if the people are sufficiently divided, frightened, and ready to admit they do not understand their problems. Leaders can do most anything where people are not enlightened on modern problems.

Education for democracy is basically concerned with social and economic issues which have been put up to us by the machine empire. We must educate people to run the machines for the general welfare. An education for democracy must not be confined to children. It must reach adults as many of them were educated in the formal schools when the world and its problems were not what they are today.

Many school systems stay a safe distance from the matters which perplex people most. The result is a certain cynicism about education. They wonder what education is good for if it can't help us discover our troubles and dispel the growing confusion. Some educators fail to promote the vital study of modern problems as they fear criticism and attack from those who oppose free discussion.

Teachers should link up subject-matter courses with modern problems. They should keep uppermost in the minds of all of us—youth and adults—this fundamental question: "What is in the interest of the greatest number?"

It appears increasingly clear that either democracy must move forward or it will be pushed backward. If it pursues policies that progressively meet and solve basic problems, it will not only move forward in the nations where it now prevails, but it will begin to drive back the encroaching barbarism.

As there is no middle ground between a definite advance and further retreat, we must not only seek to halt the advance of anti-democratic forces but at the same time aim to put in motion the forward movement of democracy. Our task is to prove to the world that free people can catch up with science and harness it to their majority interests and that complex problems can be solved through deliberative methods and through free expression of public opinion.

—J. U. Massey

Contributors to This Number

L. C. Heckert (Ph. D., Iowa State College) served one year in the U. S. Army during the World War, in the Chemical Warfare Service. He came to Kansas State Teachers College in 1926 and became head of the department of physical sciences in 1933. He is directing the engineering research on coal utilization by the Kansas State Industrial Development Commission and the City of Pittsburg.

Eulalia E. Roseberry (A. M., University of Chicago) aided in securing for the College a branch station of the U. S. Weather Bureau, with considerable new equipment, and serves as director of the station. She was appointed professor and head of the department of geography in 1907. She served as president of the Kansas State Council of Geography Teachers and editor of the *Bulletin* for the past six years.

Marion L. Whitney (Ph. D., University of Texas) is assistant professor of geology, coming here from Austin, Texas, in 1937. She held a graduate fellowship in science at the University of Texas, and is a member of Phi Beta Kappa and Sigma Xi.

Etelka Holt (M.S., University of Chicago) was appointed assistant professor of geography in 1930. Her teaching experience includes service at Pennsylvania State College and at Western Kentucky State Teachers College, Bowling Green. She is a member of Sigma Xi and of the board of directors, Kansas Council of Geography Teachers.

Oliver W. Chapman (Ph. D., Iowa State College) has been a member of the College staff since 1928, and was appointed professor of organic and bio-chemistry in 1930. His teaching experience includes ten years in the department of dairy chemistry, Iowa State College. He is a member of the American Chemical Society and Secretary of the Southeast Kansas Section.

Elsie M. Broome (M. S., Kansas State Teachers College, Pittsburg) has been on the staff of the College since 1933, and was appointed to her present position in the department of geography in 1937. She served as member of the board of directors, Kansas Council of Geography Teachers for six years, and as editor of the *Bulletin* and secretary for two years.