

A-215952—winter 1932-33) was taken on December 3, December 26th, February 2nd, and February 21st, and when caged for several days, experienced no difficulty in partaking of all kinds of foods.

Ohio State University, Columbus, Ohio.

A STUDY OF STARLINGS BANDED AT COLUMBUS, OHIO

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IN February, 1927, the writer and some companions conceived the idea of capturing and banding flocks of European Starlings (*Sturnus vulgaris vulgaris* Linnæus) at their roosts by means of flashlights. This appears to be the first recorded instance of capturing Starlings by this method in the United States. Over one thousand Starlings were thus banded in 1927 at their roosts in barns in central Ohio, and fifteen hundred were banded in 1928. In 1929, we discovered a large roost of the birds in the towers of the Columbus State Hospital and were successful in capturing over four thousand birds, including 840 repeats and 31 returns from previous years.

The main tower of the State Hospital building was remodeled in 1930, cutting off this fruitful source of supply, but 750 birds were banded in other places. No birds were banded in 1931, but in the last three years the work has been renewed under the direction of L. E. Hicks, until more than thirty thousand Starlings have been banded to date.

Almost the entire membership of the Wheaton Club of Columbus immediately joined in the Starling-banding activities. Although the bands are credited principally to George Wolfram, L. E. Hicks, R. W. Franks, and the writer, the work soon came to be considered a Wheaton Club project.

The present study is based upon a total of 7062 birds banded in 1927, 1928, and 1929 and the returns and recoveries from them up to April 4, 1932. The large amount of material accumulated since that date is being studied by Dr. Hicks with the view of publishing additional papers.¹

Our technique has not changed materially from that described by the writer in the *Wilson Bulletin* in 1927. Briefly,

¹See article in this issue of *Bird-Banding*.

we ascend to the cupolas or towers by means of ladders, armed with bright flashlights. The bright lights seem to befuddle the birds so that they flutter about in a bewildered manner and are easily captured. They are then lowered in gunny sacks to coöperators waiting below, who band and release the captives.

There were a number of reasons which impelled us to undertake the study of the Starling. The first was an effort to ascertain whether the birds were migratory. At the time the work was begun almost all the available literature agreed that the European Starling was non-migratory in the United States, although given more or less to desultory wandering. Even so recently as 1931, Bissonette (1931, p. 282) makes the statement that the species does not migrate in New England, this belief causing him to make the Starling, as a presumed non-migratory species, subject of experimentation relative to the effect of varying periods of light upon the gonads of the birds, similar to the studies made by Rowan (1931) on those highly migratory species the Junco and the Crow.

We were well aware of the fact that the Starling performed long migrations in continental Europe, though being non-migratory in Great Britain (Wynne-Edwards, 1929), and our observations in the field had convinced us that our birds were migratory.

Furthermore, in 1927 we felt we were witnessing for the first time in America the spread of an introduced migratory species throughout the eastern United States and we believed that the banding of a large number of the birds might shed light on the method of dispersal. We felt, also, that this was a unique opportunity, which might never again be presented, of gaining an insight into some of the underlying principles of that vexing problem, the migratory instinct.

Further, certain undesirable habits of the species had raised the question of the possibility of controlling its numbers, and the first step in the scientific control of an organism is the careful study of its habits and its movements.

From the 7062 banded birds covered in this study we have received 172 recoveries or 2.4 per cent. This is a much lower percentage than may be obtained from some species of birds which are systematically trapped at their nesting or wintering grounds; or from game-birds and birds of prey, the shooting of which is conducive to a high percentage of returns. Our results are closely comparable with those from Starlings banded at Washington, D. C., Kalmbach (1932) reporting 2.6 per cent of returns from 4516 birds banded at that place. Geoffrey Gill, (1931), quotes the Biological Survey to the effect that, of

18,421 Starlings banded in the entire United States up to March 25, 1931, they had received 352 returns or 1.9 per cent.

During 1927 and 1928 the birds banded at their roosts in barns usually deserted and did not return in subsequent years. The birds in the State Hospital towers, however, did not abandon the roosts (as Kalmbach's birds did at Washington), and work at this station on successive years should yield a much higher percentage of returns.

Of our 172 recoveries and returns, 80 of the birds were recovered at a distance of more than twenty miles from the place of banding, and 92 were recaptured within twenty miles. Of the distant recoveries, 52 were recovered outside of Ohio, and 28 within the State. Seventy-six of our local returns consisted of "recaptures"—birds taken at the roosts by our own members at a later date. It is remarkable that there were but 16 birds picked up by other persons locally, as compared with 80 individuals so captured twenty miles or more from the place of banding. At Washington, on the other hand, 70 of the 120 returns were local.

The foregoing data constitute a vindication of our early conviction that the Starling is highly migratory in this region, as is further shown by the accompanying map (Fig. 1). Our most distant recovery to the northeast is from a bird banded by Wolfram at Canal Winchester, thirteen miles southeast of Columbus, on January 10, 1929, which was recovered on March 22, 1930, at St. Marie de Beauce, Quebec, seven hundred miles to the northeast. On the other hand, a bird banded at Columbus on March 17, 1928, was killed in the following December at Merigold, Mississippi, 665 miles to the southwest. If this bird should have nested only 335 miles to the northeast (as our recoveries show that many of them do) it would have performed a migration of not less than one thousand miles.

We had hoped that we should secure some short-time long-distance recoveries which would give an indication of the speed with which the Starling migration takes place. In this, we were only partially successful. A bird banded at Lawrenceburg Junction, Indiana, by C. J. Goetz of Cincinnati on February 19, 1930, was recaptured at Canal Winchester by Wolfram six days later, having made an average of at least 21 miles a day for the 125 miles. Similarly, a bird banded at Columbus on March 8, 1929, was recovered at Avon, New York, 16 days later, having averaged a minimum of 20 miles a day for the 325 miles. These data may be representative of the normal

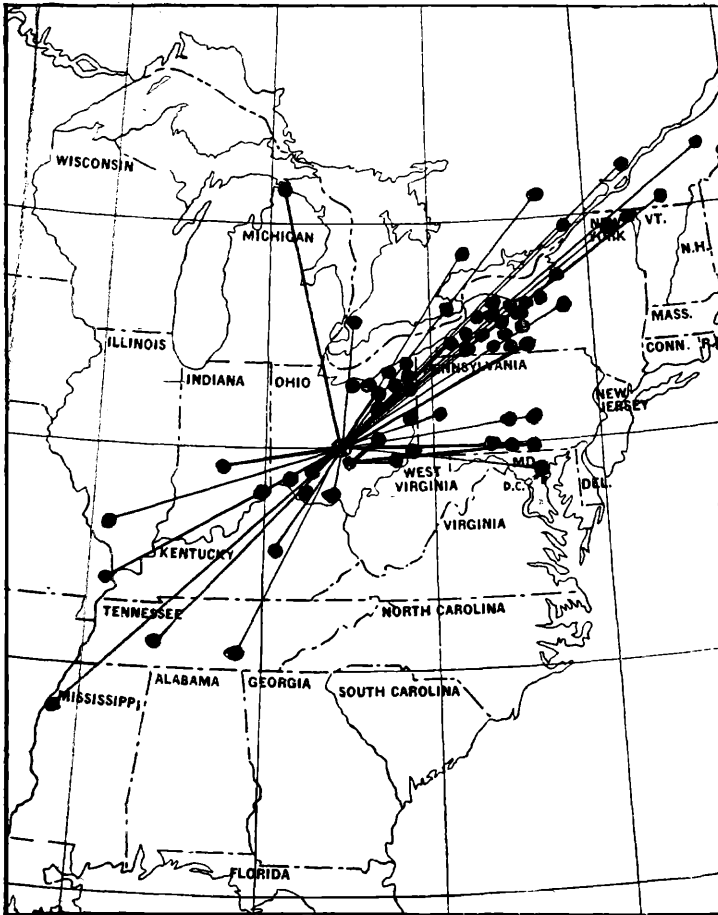


Figure 1. Recoveries of Starlings banded at Columbus, Ohio.

rate of migration. Certainly, however, they do not indicate the great speed in flight of which the Starling is capable.

It is a striking fact that the great majority of Starlings of continental Europe, along with some other species, migrate in a northeast and southwest direction, instead of the conventional north and south migration which is usually associated with migrating birds (Thomson, 1926). This northeast-southwest migration is paralleled in most graphic manner by the Columbus birds.

I feel that it is entirely within the possibilities that the birds introduced into the United States, after maintaining (presumably) a non-migratory existence in New York city for a number of years, later gave expression to the migratory instinct and, further, that this instinct directed them in a northeast-southwest direction similar to that of their European ancestors. While a most plausible theory, and an important one, as concerns the underlying principles of the migratory instinct, it must be confessed, however, that it is far from proved. It should also be noted that the birds banded at Washington, D. C., (Kalmbach *l. c.*) show more nearly a north-and-south direction of flight. Support seems to be lent to the theory, however, by the interesting experiment reported in *Bird-Banding*, where eggs of the non-migratory English Mallards (*Anas p. platyrhynchos*) were transported to Finland, and the birds hatched from them migrated like the Finnish Mallards (Nice, 1934).

It is obvious from our data that many birds which presumably migrated as far southwest as Columbus from northeastern localities have, in subsequent years, wintered far to the northeast. Of 21 December and January returns, 14, or exactly two thirds, were recovered to the northeast of Columbus, while 7 were taken to the southwest. It would thus seem unquestionable that a large number of Starlings, after once having migrated at least as far south as Columbus, fail to do so in some subsequent years, remaining as permanent residents in the north. Similar behavior is shown by Mrs. Nice (1933) to obtain with the Mississippi Song Sparrow (*Melospiza melodia beata*) at Columbus.

This behavior is extremely puzzling. How an individual can be migratory one year and resident the next or *vice versa*, it is difficult to understand on the basis of our present knowledge of bird instinct, particularly the migratory instinct.

Our present theories lead us to believe that migration is brought about by an inflexible instinct, entirely beyond the bird's control and, indeed, without its own consciousness.

Rowan (1931) has produced evidence that in certain species, at least, and under certain conditions, the bird is a complete slave to the varying lengths of daylight as they affect the activity of the gonads. What conditions, then, would cause a species to migrate one year and fail to do so the next? Rowan's theory of varying lengths of daylight seems entirely inadequate to explain this behavior of the Starling, as it is inadequate to explain a number of other phenomena of bird migration.

A study of the gonads of migratory and resident Starlings, nevertheless, might prove enlightening. It is difficult to believe however, that the failure to migrate is due to disease or other physiological defect, in view of the great numbers of Starlings which regularly spend the winter in the Northeast. The age of the individuals, furthermore, does not seem to be a factor, since the proportion of one-, two- and three-year winter recoveries to the northeast and to the southwest are roughly comparable.

Figure 2 shows a map of recoveries taken during the nesting season. The nesting season has rather arbitrarily been fixed at the months of April, May, June, and July. The last month might well be omitted, since the birds do not ordinarily nest in July. Thus, the only record to date not in the northeast-southwest line of flight is that of an individual recovered at Les Cheneaux Islands, Michigan, on July 17th, which very possibly may have nested some distance to the east. Similarly, three of the seven distance recoveries from Ohio were taken in July and may well have been birds which had nested farther to the northeast and which may have already begun their autumnal migration.

The data show conclusively, however, that the great majority of the birds banded at roosts at Columbus nest to the north and east of that locality. Similarly, we have very little definite evidence that many of our nesting birds are permanent residents. We have but 16 local returns (exclusive of recaptures at the roosts) out of our total of 172, and, of these, 7 individuals were recovered shortly after banding, apparently injured during the banding process. Of the remaining nine local returns but four were recovered during April, May, and June, and we have no positive evidence that these did not winter to the south or southwest of Columbus. At any rate, a very small proportion of the birds banded at the large winter roosts at Columbus would seem to be local residents, certainly a much smaller percentage than the 23 per cent estimated by Kalmbach (*loc. cit.*, p. 68) at Washington. Such apparent difference in the behavior of the Starling in different sections of the

United States would seem to make it highly desirable for banders in a number of localities to conduct similar studies.

The foregoing should not necessarily be taken to indicate that none of the central Ohio Starlings are permanent residents. On the contrary, observations seem to indicate that scattered pairs or small groups which roost in barns throughout the area in winter may be birds which also nest in the region. Banding of these individuals would quickly prove or disprove the correctness of this opinion.

The most significant feature of our returns during the nesting season, however, is the fact that not a single one of the first seven thousand banded Starlings has yet been taken more than eight miles southwest of Columbus during the months indicated. This, I believe, provides an answer to the problem of the medium by which the Starling spread throughout the Mississippi Valley.

We have three alternatives: the astonishingly rapid dispersal of the species may have taken place through the agency of (1) birds of the year, (2) the older birds, or (3) both. Our data seem to present convincing evidence that the young of the year were responsible for the dispersal. No banded Starling which has visited as far northeast as Columbus in the spring or winter has yet been taken south or west of Columbus during the nesting season. Or, stated in another manner, no banded bird which has once nested as far northeast as Columbus has yet been proved subsequently to have nested south or west of us. If this is true of the known records of adults, the conclusion seems irresistible that the pioneers which accomplished in so short a time the invasion of the Middle West were birds of the year, which, having scattered to the south and west and having established a nesting territory, never again returned to the northeast. If the adults (and undoubtedly a certain percentage of the young) which migrate through Columbus toward the northeast had subsequently established a residence to the south or west, it would seem certain that the one or more of our seven thousand banded birds would have produced a return from that section of the country.

This conclusion is directly contrary to that of Kalmbach (1928, p. 2), who implies that some of the banded birds at Washington were instrumental in extending the range of the species.

Our conclusion, however, is strictly in accord with previous results obtained by banding other species, which furnish abundant evidence of the tendency of adult birds to return year after year to the same locality to nest, and, on the other

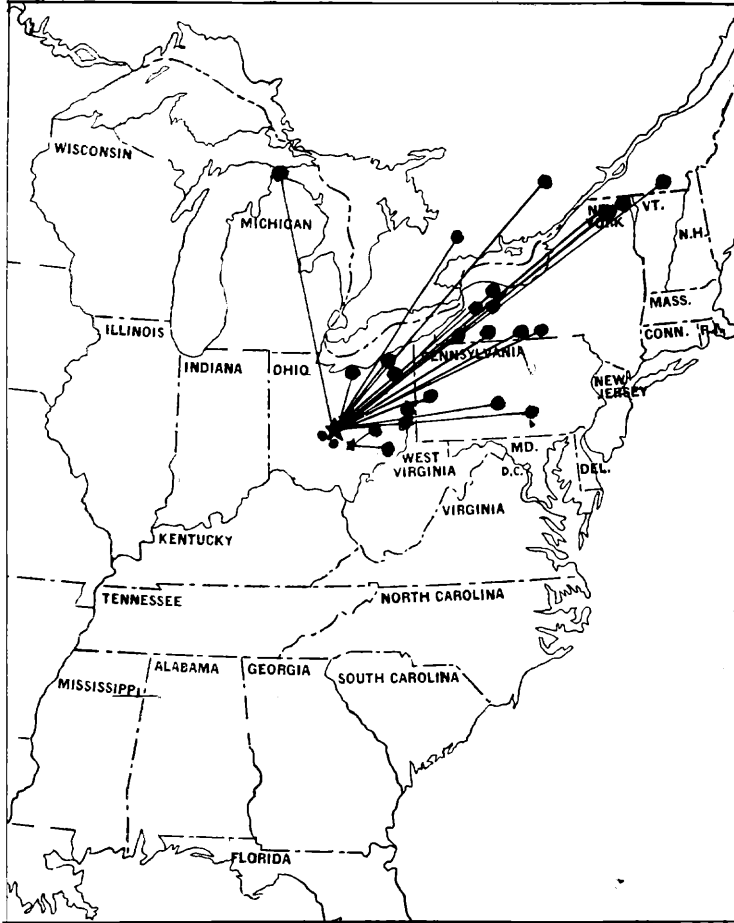


Figure 2. Starling Recoveries during April, May, June and July.

hand, indicate the failure of many of the young of the year to return to their birthplace.

The probable age attained by the Starling, as shown by the returns, has proved of considerable interest. In so sturdy and vigorous a species, one which, in spite of the handicap of normally rearing but one brood a year, has showed such a phenomenal increase in numbers, one might expect to find the individuals relatively long-lived. Such appears not to be the case. Of the returns and recoveries, 67 are birds which were taken less than one year after banding, 67 were returned between one and two years; 19 between two and three years, and but 3 between three and four years. We have waited in vain for a return from a single one of the twenty-five hundred individuals banded in 1927 and 1928 which would indicate that it had lived for four years after banding.

The great majority of our birds have been banded during the height of the migration in late February and early March, when the preceding year's birds would be nine or ten months, or a little less than one year, of age; the adults, of course, at least one year older. It will therefore be seen that many Starlings live to an age of at least three years; a fair number of them attain the age of four years. But the drop in the returns after that age is positively startling. Out of our 172 returns we have but three birds which we can be reasonably certain to have reached the age of five years. This, once more, is confirmation of the evidence adduced by bird-banding, that the average life of birds, especially of passerine birds, is of brief duration. How remarkable it is, then, that the Starling, under this handicap, should nevertheless have been able to increase at such an astonishing rate as to populate in a few short years almost the entire eastern United States!

SUMMARY

1. The European Starlings banded at Columbus, Ohio, are highly migratory.
2. A large portion, if not the great majority of the birds banded at roosts at Columbus nest in northeastern Ohio, Pennsylvania, New York, eastern Ontario, and Quebec.
3. Many of them winter to the southwest of Columbus, one of them at least, as far as Merigold, Mississippi.
4. The evidence indicates that a very small percentage of the birds banded at the large roosts at Columbus are permanent residents.
5. The individuals passing through Columbus migrate in a northeast-southwest direction, closely paralleling the direction of flight of the species in continental Europe.

6. The evidence indicates that the dispersal of the species throughout the Middle West took place through the medium of the birds-of-the-year and not by the subsequent dispersal of adults which had previously nested to the northeast.

7. Many Starlings apparently migrate one year and fail to do so in other years. The underlying causes of this behavior are difficult to explain.

8. The returns indicate that a very small proportion of Starlings attain an age of five years, though a fair number reach an age of four and many attain the age of three years.

TABLE OF ESPECIALLY INTERESTING RECOVERIES

<i>Number</i>	<i>Where Banded</i>	<i>Date Banded</i>	<i>Where Recovered</i>	<i>Date Recovered</i>
400659	Columbus, O.	Feb. 26, '27	Dublin, O.	May 4, '27
483077	"	March 4, '27	Columbus, ²	Dec. 22, '27
"	"	"	"	Feb. 29, '28
483392	"	March 12, '27	Franklin, Ind.	Jan. 3, '28
483294	"	March 11, '27	Charleston, Mo.	Jan. 28, '28
474556	"	Feb. 26, '27	Dunkirk, N. Y.	March 5, '28
625377	Hooker, O.	March 3, '28	Bedford, Pa.	March 24, '28
483911	Columbus, O.	Jan. 14, '28	Brunswick, O.	May 15, '28
625091	"	Feb. 29, '28	Circleville, O.	May 31, '28
426438	"	March 2, '27	Wilmington, O.	Feb. 12, '28
625520	Hooker, O.	March 3, '28	Dresden, O.	June 25, '28
625829	Columbus, O.	March 17, '28	Grove City, O.	May 15, '28
483870	"	Jan. 14, '28	Les Cheneaux Islands, Mich.	July 17, '28
625667	Hooker, O.	March 3, '28	Macksburg, O.	June 3, '28
625170	Columbus, O.	Feb. 29, '28	Elmira, N. Y.	Sept. 30, '28
625736	"	March 17, '28	Merigold, Miss.	Dec. 13, '28
483167	"	March 4, '27	Lakeville, O.	Jan. 7, '29
474592	"	Feb. 26, '27	Delaware, O.	Jan. 7, '29
483986	"	Jan. 4, '28	Strathroy, Ont.	Dec. 1, '28
A204337	Canal Winchester, O.	Jan. 10, '29	Moundsville, W. Va.	Dec. 17, '29
A204256	"	"	Three Rivers, Can.	Dec. 21, '29
A204239	"	"	Manchester, O.	Jan. 29, '30
641264	"	"	Lawrenceburg Jct., Ind.	Feb. 19, '30
641263	"	"	Brockville, Ont.	Feb. 23, '30
A204504	"	"	Ste. Marie de Beauce, Que.	March 22, '30
A204218	"	"	Humberstone, Ont.	Feb. 25, '30
A209594	Columbus, O.	March 6, '29	Beardstown, Tenn.	Nov. 6, '29
A209766	"	"	Waterfall, Pa.	March 23, '29
A212967	"	Feb. 16, '29	Willard, N. Y.	Jan. 12, '30
A213376	"	"	Martville, N. Y.	Jan. 20, '30
A213988	"	Feb. 28, '29	Oneida, N. Y.	Jan. 18, '30
A213557	"	Feb. 16, '29	Simcoe, Ont.	Jan. 22, '30
625585	Hooker, O.	March 3, '28	Interlaken, N. Y.	Jan. 27, '31
640046	Columbus, O.	March 8, '29	Bluff Point, N. Y.	March 7, '31
A304761	"	March 9, '29	Thornville, O.	Jan. 18, '31
A213578	"	Feb. 16, '29	Baltimore, Md.	Jan. 15, '32
483364	"	March 12, '27	Corunna, Ont.	Jan. 2, '31
625103	"	Feb. 29, '28	Bath, N. Y.	Feb. 21, '29
483142	"	March 4, '27	Falconer, N. Y.	Feb. 23, '29
625992	"	March 17, '28	Ashtabula, O.	Feb. 12, '29
400697	"	March 4, '27	Holmesville, O.	Feb. 25, '29
A213163	"	March 8, '29	Cincinnati, O.	Feb. 12, '30
A304101	"	March 8, '29	Roseville, O.	Feb. 4, '30
625162	"	Feb. 29, '28	Warsaw, O.	Feb. 27, '30
A304288	"	March 9, '29	Jefferson, O.	Feb. 28, '30
625134	"	Feb. 29, '28	Bohon, Ky.	Feb. 16, '29
A213714	"	Feb. 16, '29	Pierrepont Manor, N. Y.	Feb. 13, '32
625976	"	March 17, '28	Perry, N. Y.	Feb. 10, '31

²A return.

A250674	Lawrenceburg Jct., Ind.	Feb. 19, '30	Canal Winchester, O.	Feb. 27, '30
A304115	Columbus, O.	March 8, '29	Avon, N. Y.	March 24, '29
A212498	"	Feb. 16, '29	Victor, N. Y.	March 27, '30
483962	"	Jan. 14, '28	Otto, N. Y.	March 11, '30
A213978	"	Feb. 18, '29	Butler, Co. Pa.	March 5, '30
623818	"	March 17, '28	Belleville, Ill.	March 15, '29
A212859	"	Feb. 28, '29	Rochester, N. Y.	March 6, '31
A213403	"	Feb. 16, '29	Cincinnati, O.	March 2, '31
437473	"	March 6, '29	Friendship, N. Y.	Apr. 6, '29
483488	"	Dec. 22, '27	Malone, N. Y.	Apr. 28, '30
A212989	"	Feb. 16, '29	Chazy, N. Y.	May 5, '29
A212819	"	Feb. 28, '29	Albion, N. Y.	May 19, '29
A304063	"	March 8, '29	Conewango, N. Y.	May 24, '30
A304791	"	March 9, '29	Batavia, N. Y.	May 5, '29
623274	"	Feb. 29, '28	Duncannon, Pa.	May 28, '30
625584	Hooker, O.	March 3, '28	West Bronie, Que.	May 14, '30
A212985	Columbus, O.	Feb. 16, '29	Millport, N. Y.	June 3, '30
A304186	"	March 8, '29	Rosenthal, Ont.	June 5, '29
A304516	"	March 9, '29	Ontario, Co., Ont.	June 17, '29
A304577	"	March 9, '29	Butler Co., Pa.	June 9, '31
A304558	"	March 9, '29	Columbiana, O.	July 11, '30
A304133	"	March 8, '29	"	July 4, '30
A304279	"	March 9, '29	Berlin Hts., O.	July 14, '31
A304259	"	March 8, '29	Johnstown, O.	Sept. 21, '29
625973	"	March 17, '28	Spangler, Pa.	Oct. 26, '28
483383	"	March 12, '27	Baltimore, O.	Nov. 4, '29
400641	"	Feb. 26, '27	Indianapolis, Ind.	Nov. 8, '29
A304375	"	March 9, '29	Dansville, N. Y.	Dec. 31, '29
A304269	"	March 8, '29	Huron, O.	Dec. 9, '29
A213295	"	Feb. 16, '29	Portsmouth, O.	Dec. 11, '29
A304747	"	March 9, '29	Warren, O.	Dec. 12, '29
A213755	"	Feb. 16, '29	Bellbuckle, Tenn.	Dec. 31, '29

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