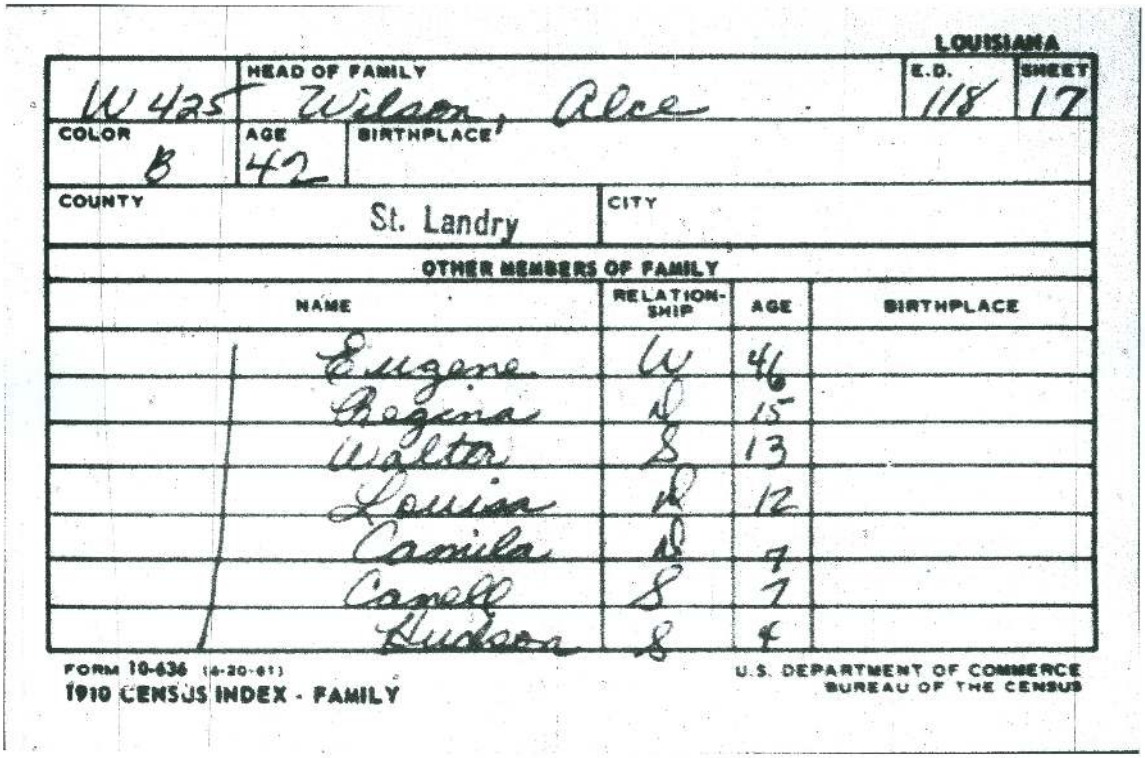
Problem 3 (20 points). Soundex is an algorithm for coding names. It was developed in the USA in 1918–1922 by Robert C. Russell and Margaret King Odell in order to facilitate searching for similar-sounding surnames. In the middle of the 20th century, Soundex was extensively used in the USA to analyze results of 1890–1920 censuses.

Below is a sample card with data from the 1910 census. You can see the Soundex code for *Wilson*, which is `W425`.



LOUISIANA

W 425	HEAD OF FAMILY: Wilson, Alce	E.D. 118	SHEET 17
COLOR: B	AGE: 42	BIRTHPLACE:	
COUNTY: St. Landry	CITY:		

OTHER MEMBERS OF FAMILY

NAME	RELATION-SHIP	AGE	BIRTHPLACE
Eugene	W	46	
Regina	D	15	
Walter	S	13	
Louisa	D	12	
Camila	D	7	
Carell	S	7	
Hudson	S	4	

FORM 10-636 (6-20-61)
1910 CENSUS INDEX - FAMILY

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

Source: `https://familysearch.org/learn/wiki/en/Soundex`

Here is a list of surnames, with the corresponding Soundex codes in arbitrary order. Some characters are missing:

Allaway, *Anderson*, *Ashcombe*, *Buckingham*, *Chapman*, *Colquhoun*, *Evans*, *Fairwright*, *Kingscott*, *Lewis*, *Littlejohns*, *Stanmore*, *Stubbs*, *Tocher*, *Tonks*, *Whytehead*	`S312`, `T␣6␣`, `␣5␣3`, `C42␣`, `T520`, `L␣42`, `A536`, `C155`, `␣623`, `S356`, `␣252`, `␣152`, `␣330`, `A251`, `A400`, `L2␣0`

(a) Describe how a Soundex code is produced, step by step.

(b) Match the surnames with the corresponding Soundex codes and restore the omitted characters.

(c) Generate Soundex codes for the following surnames:

Ferguson, *Fitzgerald*, *Hamnett*, *Keefe*, *Maxwell*, *Razey*, *Shaw*, *Upfield*.

—Alexander Piperski