pieces or three equal pieces or any other number of equal pieces.

A thorough drill on these two operations will help to make clear much of the work in fractions. This drill may be given as follows: Take a stick, say 24 inches long, cut it into 24 equal parts. Stick two of those pieces together and do the same with the whole 24 pieces. You will then have 12 pieces which will be called twelfths. By putting 3 twenty-fourths together you get eighths; 4, you get sixths; 6, you get fourths; 8, you get thirds; 12, you get halves. Deal in the same way with other fractions using lines on the board, and lastly using imaginary pieces of apples. It will be found that when any object has been cut into 3, 5, 7, 11 or any other prime number of pieces they cannot be made into larger pieces and have the larger pieces all alike.

Next give a drill in cutting pieces into smaller pieces. Place a line on the board. Divide it into halves. Cut each half into two equal pieces, then into three, four, five, etc., and thus lead the pupils to see that halves can be made into quarters, sixths, eights, tenths, etc., that is, that halves may be made into any number of equal pieces that can be divided by the denominator, which is 2.

In like manner show that quarters can be made into eighths, twelfths, sixteenths, twentieths, etc. Thus with a variety of fractions show that any kind of pieces may be cut into smaller pieces and have those pieces all equal if the number of pieces into which the larger pieces are cut can be exactly divided by the denominator of the fraction used, that is, that the denominator of any fraction may be changed so long as the new denominator is a multiple of the denominator of the fraction used. Going back to the question $\frac{3}{4}+\frac{4}{5}$ question as follows:

Q. What kind of pieces may be made out of quarters by cutting them? A. Eighths, twelfths, sixteenths, twentieths, twenty-fourths, etc. Q. What kind of pieces may be made out of fifths? A. Tenths, fifteenths, twentieths, twenty-fifths, etc. Q. What kind of pieces may be made out of both fourths and fifths? A. Twentieths.

Take the two fractions $\frac{3}{4}$ and $\frac{4}{5}$ and change them into twentieths as follows: Place on the board two lines each 20 inches long. Point to a line and question as follows: Q. How long is this line? A. 20 inches. Q. If I divide the line into four equal parts, that is, into quarters, how many inches will be in each quarter? A. 5 inches. Divide the line into quarters by short cross lines at the end of each quarter. Count three quarters and make the cross line a little longer at the end of the three quarters. Q. If I want to make this line into twentieths how many equal pieces must the line be divided into? A. 20 equal pieces. Q. Into how many equal pieces must each quarter be cut so that there will be twenty equal pieces, that is, so that the pieces will be twentieths? A. Each quarter must be cut into five equal pieces. Proceed to divide each quarter into five equal pieces. Make the cross marks at the end of each quarter a little longer than those at the end of each twentieth so there will be no difficulty in seeing how many twentieths each quarter contains. Q. How many twentieths are there in one quarter? (Point to the divided line). A. Five twentieths in one quarter. Q. How many twentieths are there in the three quarters? A. Five twentieths, three times, or fifteen twentieths. Thus it will be seen that $\frac{3}{4}=\frac{15}{20}$. In the same way show that $\frac{4}{5}=\frac{16}{20}$. Thus to add $\frac{15}{20}$ and $\frac{16}{20}$ is the same as to add $\frac{3}{4}$ and $\frac{4}{5}$. $\frac{3}{4}+\frac{4}{5}=\frac{15}{20}+\frac{16}{20}=\frac{31}{20}=1\frac{11}{20}$.

Proceed to add other fractions in the same way, gradually leading the pupils to discover the following steps in the process leading up to the rule for adding fractions with different denominators. To bring fractions to a common denominator so that the pieces may be alike, it is necessary to find a common multiple of the denominators. The least common multiple is the best. By questioning lead the pupils to see that the common denominator is divided by the denominator of the fraction to be changed, and the resultant quotient and the numerator are multiplied to find the new numerator. At first use such fractions that the least common multiple can be found mentally. When such large numbers are used for the denominators of the fractions to be added that the L. C. M. cannot be found mentally, a thorough drill should be given on the terms multiple, common multiple, least common multiple, and on the method of finding the L. C. M. of numbers. I have found many classes who when adding mixed numbers reduce the mixed numbers to improper fractions, add, then reduce the result back to a mixed number. This is a waste of time. It is much more convenient to add the fractions separately, thus:

$24\frac{3}{4}$	$\frac{3}{4}+\frac{5}{6}+\frac{7}{8}$
$15\frac{5}{6}$	$=\frac{18}{24}+\frac{20}{24}+\frac{21}{24}=\frac{59}{24}=2\frac{11}{24}$
$19\frac{7}{8}$	To the sum of the whole numbers add the
	$2\frac{11}{24}$ which is the sum of the fractions.
$60\frac{11}{24}$	

I have found some classes using the following form:

$24\frac{3}{4}\times\frac{6}{6}=\frac{18}{24}$
$15\frac{5}{6}\times\frac{4}{4}=\frac{20}{24}$
$19\frac{7}{8}\times\frac{3}{3}=\frac{21}{24}$

$60\frac{11}{24}$ $\frac{59}{24}=2\frac{11}{24}$

The sign of equality is used between quantities, which are not equal in the above form.

(Continued in January)