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The determination of the settling velocity of certain minerals common in ore-dressing

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THE DETERMINATION OF THE SETTLING VELOCITY OF CERTAIN MINERALS COMMON IN ORE-DRESSING

by

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A

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TABLE OF CONTENTS.

	Page
Title Page	1
Table of Contents and Bibliography	2
Table of Illustrations	3
Velocity of settling under free settling conditions.	5
The computation of grain sizes	7
Settling velocity of Marcasite and Chert	13
Summary	32

BIBLIOGRAHHY.

Transactions of the American Institute of Mining Engineers, Vol. 38, page 210 and Vol. 24, page 409 - 918.

LIST OF ILLUSTRATIONS, TABLES AND CURVES.

	Page
Table I and II, Specific Gravity of Marcasite	9
Table III, Computation of grain sizes	11
Settling tube	13
Tables IV to IX, Settling Velocity of Marcasite	16 to 21
Tables X to XV, Settling Velocity of Chert	22 to 27
Logarithmetic Curve for Marcasite	28
Velocity Curve of Marcasite	29
Logarithmetic Curve for Chert	30
Velocity Curve of Chert	31

The object of this thesis is to determine the settling velocity of certain minerals common in ore-dressing work. The minerals used in the experiments were marcasite and chert. These two minerals were chosen because there was a convenient supply of both from which pure and uniform particles could be obtained.

According to Prof. R. H. Richards (Transactions of the American Institute of Mining Engineers, Vol. 38, page 235), two quite different laws are followed by settling particles, depending on whether the velocity is above or below a certain transitional or critical point.

These laws are expressed by the following formulae:

1. Below the critical point it is expressed by the formula,

$$V = K(d-1)D^2.$$

2. Above the critical point it is expressed by the formula of Rittinger,

$$V = C\sqrt{D(d-1)}$$

In the above formulae,

V = settling velocity in mm.

d = specific gravity of the mineral.

D = diameter in mm.

C and K = constants.

To determine the law, Prof. Richards dropped galena and quartz into water and determined the settling velocity by taking different sized particles and timing them as they passed from one point to another.

Prof. Richards determined the size of particles by screen analysis. He chose the Double Rittinger Sieve Scale, and carefully measured each sieve he used.

From his data (Table V and VI, Vol. 38, pages 219 - 220, T. A. I. of M. E.) we noted that the weight of the particles of galena passing through the screen, 4.125 mm., and resting on the screen, 2.825 mm., ranged from .1 to .67 of a gram, and the particles of quartz on the same screen ranged from .03 to .18 of a gram.

To these particles he gives an average diameter of 3.47 mm., which is the average of the diameters of the holes of the two sieves.

Despite the difference in weights (galena ranging from .1 to .67 gr., and quartz from .03 to .18 gr.,) he assumes from this experiment that the average diameter of all particles on any one sieve is equal to an average of the diameters of the holes in the two sieves; namely, the sieve on which they lie and the sieve immediately above it in size.

In our experimental work, we found, by weighing every particle of marcasite on sieves of 3, 3-1/2, 5, and 6 mesh, the following number of particles weighing between 0.32476 gr., and 0.31511 gr., 8 particles on #3 mesh, 61 particles on #3-1/2, 27 particles on #5 mesh, and 2 particles on #6 mesh. There were no particles below number 6 mesh heavy enough to come inside the above weight limit.

From these two facts, the difference in weight of the particles on a screen and the distribution of particles of equal weight on a number of screens, we concluded that Prof. Richards' method of determining the average diameter is not satisfactory.

THE COMPUTATION OF GRAIN SIZES.

For this reason we determined the value of "D" in the following manner. Since the volume of any solid is a function of its three dimensions, and the volume of any solid times its density is equal to its weight, we assumed that the average diameter of any particle of a uniform density is equal to the diameter of a sphere whose weight is equal to the weight of the particle. Expressing this as an equation, $D = \sqrt[3]{\frac{6W}{\pi d}}$, or

$$W = \frac{3.1416 \times D^3}{6} \times d .$$

Reducing this

$$W = D^3 \times .5236 \times d$$

$$\log W = 3 \log D^3 + \log .5236 + \log d, \text{ or}$$

where D = diameter of mineral.

W = weight of mineral.

d = density.

By applying this formula, we determined the weight of particles of marcasite and chert whose diameters would be, respectively, .6cm., .5cm., .4cm., .3cm., .2cm., .1cm.

The density of marcasite and chert, as used in the preceding formula, was determined by means of a specific-gravity bottle. The bottle, filled with water at room temperature, was first weighed; then a piece of mineral which had been previously weighed in air was put into this bottle, the stopper carefully inserted, and after removing the moisture clinging to the bottle, the mineral, bottle and water were weighed. Great difficulty was experienced with air bubbles clinging to the marcasite. In order to avoid these air bubbles, the marcasite was immersed in hot alcohol contained in a 200cc. beaker for a few minutes, then boiled for ten minutes in water. Then as much of the excess water was poured off as could be, without exposing the mineral to the air, and the beaker refilled with boiled water. This was allowed to stand until it had reached room temperature; then the specific-gravity bottle was immersed in the beaker, the mineral placed in the bottle and the glass stopper inserted. After drying, the bottle was ready for the balances. This precaution was not necessary in case of chert, because we experienced no difficulty with air bubbles.

The following formula was used for calculating the densities.

$$\text{Density} = \frac{W}{W-(Q-P)}$$

where Q = wt. of bottle, mineral and water.

P = wt. of bottle and water.

W = wt. of mineral in air.

Tables 1 and 2 show the densities determined this method.

TABLE I.

The Specific Gravity of Marcasite.

Trial.	Temp. C°	"W"	"Q"	"p"	"d"
1	17 1/2	2.1850	41.5220	39.7775	4.960
2	18 1/2	1.4346	40.9182	39.7725	4.965
3	19	1.0316	40.5931	39.7689	4.971
4	20	1.0762	40.6250	39.7660	4.954
				Average "d" =	4.962

TABLE II.

The Specific Gravity of Chert.*

Trial.	Temp. C°	"W"	"Q"	"p"	"d"
1	27	.2203	39.8736	39.7409	2.514
2	27	.3005	39.9365	39.7554	2.516
3	27	.4332	40.0204	39.7621	2.476
4	27	.3094	39.9429	39.7575	2.495
5	26 1/2	.3253	39.9586	39.7640	2.488
				Average "d" =	2.499

* All clean pieces free from weathered material.

It would be almost impossible to obtain a sufficient number of particles exactly .6cm., .5cm., .4cm., .3cm., .2cm., and .1cm. in diameter; so to facilitate the weighing, the weight of particles .05cm. above, and .05cm. below each diameter were calculated, and the pieces chosen whose weights lay between these limits. The average of these weights would be very near the weights of the particles whose diameters are those sought.

The results of these calculations are given in Table III.

TABLE III.

Computation of Grain Sizes.

Diam.	Limit between which weights were taken.	Weight of these diameters for Marcasite.	Weight of these diameters for Chert.
.6cm.	.605cm.	.57534 grms.	.28988 grms.
	.595cm.	.54728 grms.	.27574 grms.
.5cm.	.505cm.	.33460 grms.	.16858 grms.
	.495cm.	.31511 grms.	.15877 grms.
.4cm.	.405cm.	.17260 grms.	.086957 grms.
	.395cm.	.16014 grms.	.080673 grms.
.3cm.	.305cm.	.07271 grms.	.037153 grms.
	.295cm.	.06670 grms.	.033605 grms.
.2cm.	.205cm.	.02239 grms.	.011277 grms.
	.195cm.	.01926 grms.	.009706 grms.
.1cm.	.105cm.	.0030076 grms.	.0013124 grms.
	.095cm.	.0025981 grms.	.0011223 grms.

The settling velocity was determined by dropping at least fifty particles of each diameter through 170cm. of distilled water. This was done in a vertical tube, 105.4 cm. high and 19.4 cm. in diameter.

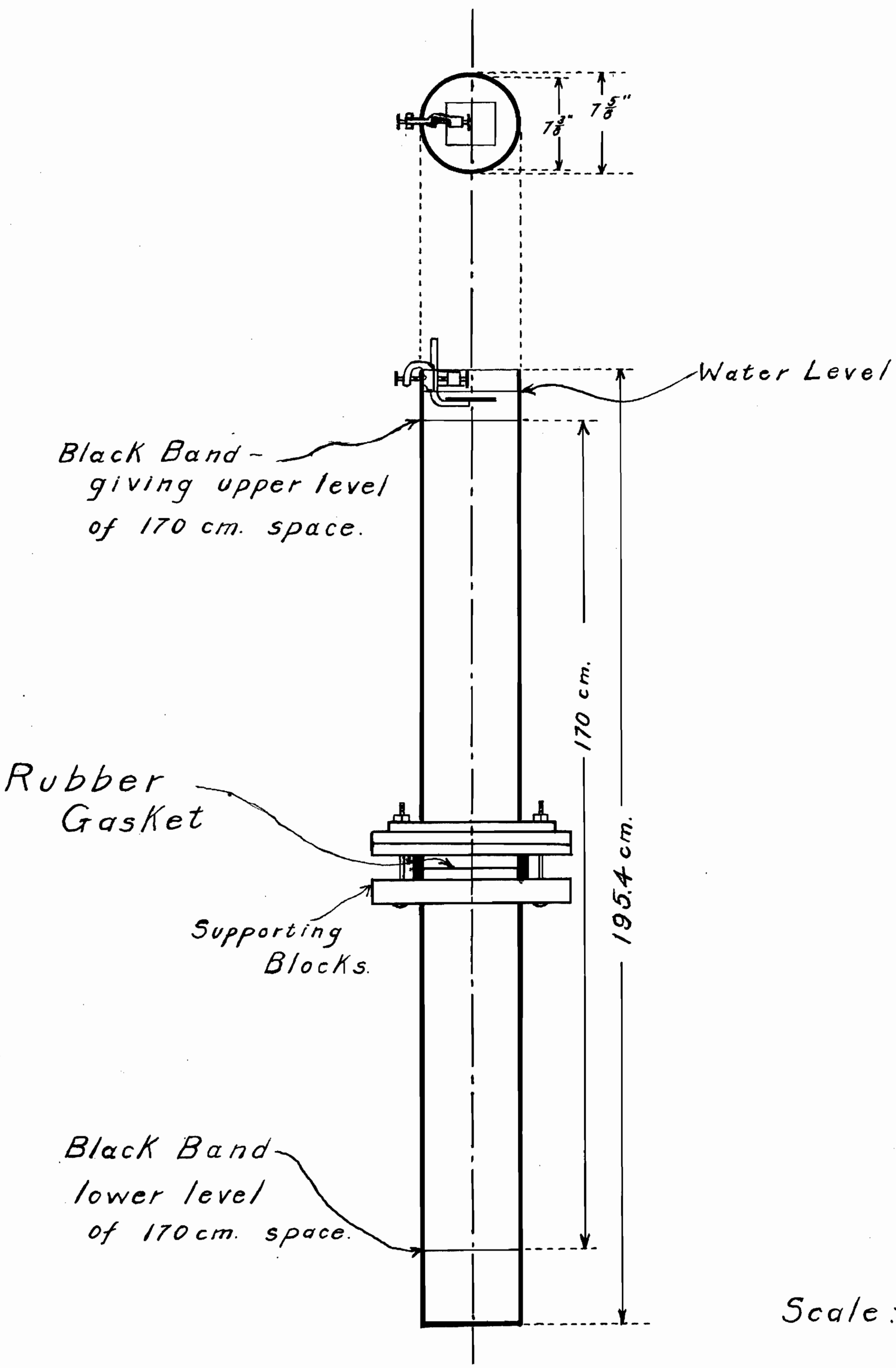
This tube (see figure, page 13) was in two sections; the upper one a flanged glass tube 102.1 cm. high; the lower one a flanged glass jar 93.3 cm. high.

The joint between the two consisted of the two flanges and a rubber gasket, held tight together by wooden blocks resting against the flanges and, in turn, held together by four bolts.

On this tube 170 cm., was the longest distance that could be conveniently laid off for a timed course. This was marked by a black line around the cylinder, four inches from the top, the upper edge of which marked the starting point. The four inches at the top was left to allow the particles to attain full velocity; 170 cm. below this black line was another black line, the upper edge of which marked the finish or lower sight.

At the top of the cylinder was placed an adjustable bracket with a glass platform. This platform could be lowered to a sufficient depth beneath the surface of the water so that particles could be placed upon it without exposing them to the air. After the

SETTLING TUBE.



Scale: 1" = 1'-0"

particles were in position, it could be raised to a position four inches above the starting line.

The fifty particles taken for each size in the experiments were selected with great care; the particles of .6cm., .5cm., and .4cm. diameter were selected from a sample equal to one-eighth of the material on the respective screens. All the particles from these samples were weighed, saving those between our limiting weights, as determined from the formula. (Page 6) This operation was repeated until a sufficient number had been obtained. The particles of .3cm. diameter were selected from a one-thirty-second sample and weighed as above. The particles .2cm., and .1cm. diameter were selected from a sample equal to one-sixty-fourth of the material on the screen. This sample was then spread out in a long row about two particles wide, and pieces were selected from one end until a sufficient number of particles were obtained. All the samples were cut down with a Jones Sampler.

The timing, also, was done with great care by two observers, one at the upper sight, the other at the lower. The upper observer dropped a particle from the glass platform, started his stop-watch when the particle passed the upper sight, and then handed the stop-watch to the lower observer who stopped the watch when the particle passed the lower sight. The figures recorded in Tables IV. and XV. show the time elapsed.

Tables IV. and IX. show the number of marcasite particles dropped through the 170cm. of water, with their settling velocities. Tables X. to XV. show the same for chert. The average velocity at the foot of each table is that of the whole fifty particles.

Because of the adhesion of air bubbles to the marcasite, the particles were first immersed in hot alcohol to break the greasy film, and then were boiled in water for ten minutes; this water was cooled to room temperature, and from it the particles were placed on the lowered glass platform without being exposed to the air. This was done to obviate all danger of having air bubbles clinging to the particles. With the chert, the particles were boiled in water only, and placed on the glass platform without coming in contact with the air.

TABLE IV.

Seconds of Time for Marcasite Particles to Drop Through 170 cm. Diam. of Particles .6cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
3.7	45.8	3.4	50.1	3.0	56.7
3.2	53.2	2.8	60.8	3.8	44.8
4.4	38.6	3.8	44.8	4.4	38.6
3.5	48.6	3.8	44.8	5.4	31.5
3.2	53.2	5.0	34.0	2.6	65.1
3.4	50.1	4.7	36.2	2.8	60.8
4.9	34.7	3.5	48.6	3.4	50.1
3.8	44.8	4.3	39.6	3.3	51.6
3.7	45.9	3.8	44.8	3.6	47.4
3.8	44.8	5.1	33.4	3.6	47.4
3.5	48.6	3.4	50.1	3.2	53.2
5.1	33.4	4.2	41.0	3.8	44.8
3.8	44.8	3.1	54.8	3.1	54.8
3.3	51.6	5.4	31.5	3.2	53.2
5.4	31.5	5.5	30.9	3.2	53.2
3.7	45.9	5.5	30.9	Avge.	45.55
4.9	34.7	3.2	53.2		
5.7	29.9	2.6	65.1		
4.6	36.9	3.2	53.2		
3.7	45.9	3.0	56.7		
4.1	41.5	5.1	33.4		

TABLE V.

Seconds of Time for Marcasite Particles to Drop Through 170 cm. Diam. of Particles .5cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
4.4	38.6	4.3	39.5	3.7	45.9
3.7	45.9	5.0	34.0	4.4	38.6
3.4	50.0	4.5	37.7	4.3	39.5
3.3	51.6	6.7	29.8	3.2	53.1
3.7	45.9	3.6	47.2	4.3	39.5
5.4	31.5	6.5	26.1	4.5	37.7
3.5	48.6	6.7	25.7	4.6	36.9
4.4	38.6	4.3	39.5	3.0	56.7
3.6	47.2	4.8	35.4	4.2	40.4
3.8	44.7	3.8	44.7	3.4	50.0
4.9	34.7	5.1	33.3	5.5	30.9
4.6	36.9	3.6	47.2	4.8	35.4
3.4	50.0	4.1	41.5		
3.3	51.5	4.6	36.9	Avge.	39.82
6.3	26.9	4.0	42.5		
4.2	40.4	3.9	43.6		
5.0	34.0	4.8	35.4		
3.5	48.6	3.2	53.1		
4.2	40.4	4.0	42.5		
4.0	42.4	3.0	56.7		

TABLE VI.

Seconds of Time for Marcasite Particles to Drop Through 170 cm. Diam. of Particles .4cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
3.5	48.6	4.0	42.5	4.9	34.7
5.0	34.0	4.6	36.9	4.2	40.4
5.8	29.3	4.4	38.5	4.4	38.6
4.5	37.7	4.8	35.4	4.3	39.5
3.8	44.7	4.6	36.9	5.0	34.0
5.1	33.3	4.8	35.4	4.7	36.2
3.9	43.6	5.2	32.7	4.8	35.4
4.3	39.5	4.6	36.9	4.2	40.4
3.9	43.6	3.6	47.2	4.2	40.4
4.0	42.5	4.6	36.9		
4.9	34.7	3.8	44.7	Avge.	37.81
5.8	29.3	4.6	36.9		
5.0	34.0	4.6	36.9		
4.4	38.6	4.2	40.4		
4.0	42.5	4.7	36.2		
6.7	25.9	3.5	48.6		
3.8	44.7	4.4	38.6		
3.4	50.0	4.6	36.9		
5.1	33.3	4.2	40.4		
4.2	40.4	4.0	42.5		
5.4	31.5	4.3	39.5		

TABLE VII.

Seconds of Time for Marcasite Particles to Drop Through 170 cm. Diam. of Particles .3cm.

Time.	Velocity.	Time.	Velocity.	Time	Velocity.
6.0	28.3	4.8	35.4	6.9	24.6
10.0	17.0	4.0	42.5	4.0	42.5
6.0	28.3	6.7	25.4	6.8	24.9
6.2	27.4	6.7	25.4	5.2	32.7
6.6	25.7	9.3	18.3	4.4	38.6
5.4	31.5	5.8	29.3	7.0	24.3
4.8	35.4	6.2	27.4	5.6	30.3
5.1	33.3	6.2	27.4	5.4	31.5
/	/	6.3	26.9	5.2	32.7
6.9	24.6	5.0	34.0	4.9	34.7
6.8	24.9	5.3	32.1	5.2	32.7
4.5	57.8	4.6	36.9	4.8	35.4
5.5	30.7	4.8	35.4	7.3	23.3
6.6	25.6	5.6	30.3		
7.8	21.8	4.5	37.8	Avge.	30.12
4.8	35.4	8.5	20.1		
4.8	35.4	6.0	28.3		
5.2	32.7	6.4	26.6		
		4.2	40.5		
5.0	34.0	6.0	28.3		

TABLE VIII.

Seconds of Time for Marcasite Particles to Drop Through 170 cm. Diam. of Particles .2cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
7.5	22.7	7.2	23.6	10.3	16.5
8.2	20.7	6.8	20.5	5.9	28.8
10.2	16.65	✓	✓	5.1	33.3
6.6	25.7	7.3	23.3	7.7	22.1
8.9	19.1	9.4	18.1	7.2	23.6
6.6	25.7	7.0	24.3	5.5	30.9
7.4	23.0	6.2	27.4	6.2	27.4
8.0	21.3	6.6	25.7	6.2	27.4
8.3	20.5	6.5	26.1	6.6	25.7
7.0	24.3	7.0	24.3	8.0	21.3
6.1	27.9	✓	✓	7.0	24.3
✓	✓	7.0	24.3	5.5	30.9
8.7	19.5	8.9	19.1		
5.6	30.4	11.0	15.45	Avge.	24.33
5.7	29.8	6.4	26.6		
9.1	18.7	7.1	23.9		
8.8	19.3	6.6	25.7		
6.2	27.4	7.1	23.9		
5.9	28.8	5.4	31.4		
6.0	28.3	6.2	27.4		

TABLE IX.

Seconds of Time for Marcasite Particles to Drop Through 170 cm. Diam. of Particles .1cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
11.9	14.3	14.9	11.4	10.4	16.3
11.2	15.2	11.0	15.5	8.6	19.7
14.0	12.1	10.3	16.4	9.3	18.3
16.0	10.6	11.2	15.2	9.5	17.9
14.7	11.6	10.2	16.15	12.2	13.9
12.3	13.8	9.2	18.5	11.5	14.8
13.0	13.1	12.2	13.9	9.8	17.4
12.0	14.15	11.1	15.3	10.1	16.8
8.5	2.0	9.4	18.1	9.1	18.7
9.9	17.13	8.3	20.15	9.1	18.7
11.0	15.5	11.3	15.0	13.7	12.4
9.8	17.4	9.8	17.4	9.4	18.1
12.3	13.8	12.2	13.9	Avge.	15.59
13.0	13.1				
10.3	16.4	10.4	16.3		
12.3	13.8	8.7	19.5		
11.0	15.5	9.3	18.3		
10.7	15.9	10.7	15.9		
9.0	18.8	8.4	20.2		

TABLE X .

Seconds of Time for Chert Particles to Drop Through 170 cm. Diam. of Particles .6cm.

Time.	Velocity.	Time.	Velocity.	Time	Velocity.
7.7	22.1	8.4	20.2	8.0	21.3
6.4	26.5	9.5	17.9	8.2	20.7
9.4	18.1	7.4	23.0	7.0	24.3
8.8	19.3	6.5	26.2	7.7	22.1
4.0	42.5	7.5	22.7	8.4	20.2
5.8	29.3	7.1	23.9	7.1	23.9
8.6	19.8	5.6	30.4	6.7	25.4
9.8	17.35	9.9	17.1	8.6	19.8
7.0	24.3	10.7	15.9	12.1	14.1
7.4	23.0	5.5	30.9	8.2	20.7
9.4	18.1	5.6	30.3	6.8	25.0
7.4	23.0	6.8	25.0	7.9	21.5
10.2	16.65	11.8	14.8	6.0	28.3
7.8	21.6	7.0	24.3	9.1	18.7
9.0	18.9	10.2	16.65	11.5	15.1
5.3	32.1	7.9	21.5	5.0	34.0
8.4	20.2	9.9	17.4		
5.0	34.0	8.2	20.7	6.3	27.00
				Avge.	21.99

TABLE XI.

Seconds of Time for Chert Particles to Drop Through

170 cm. Diam. of Particles .5cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
8.8	19.3	11.2	15.1	✓	✓
9.0	18.9	10.2	16.6	9.2	18.5
6.5	26.2	8.7	19.6	✓	✓
14.4	11.8	11.6	14.6	9.5	17.9
8.8	19.3	8.4	20.3	8.6	19.8
10.9	15.6	9.4	14.1	10.3	16.5
10.7	15.8	✓	✓	8.5	20.0
7.6	22.4	8.1	21.0	11.9	14.3
7.6	22.4	8.5	20.0	8.3	20.5
9.2	18.5	9.0	18.9	7.5	22.7
8.2	20.7	✓	✓	8.8	19.3
8.5	20.0	6.0	28.4	7.8	21.8
12.8	13.3	10.2	16.6	8.8	19.3
12.0	14.2	5.4	31.5	6.3	27.0
11.0	15.4	10.8	15.7	10.3	16.5
7.5	22.7	10.0	17.0	10.4	16.3
9.2	18.5	10.1	16.8	9.5	17.9
8.2	20.7	9.6	17.7	8.5	20.0
7.5	22.7	6.2	27.4		
				Avge.	18.53

TABLE XII.

Seconds of Time for Chert Particles to Drop Through 170 cm. Diam. of Particles .4cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
14.2	11.9	8.6	19.8	12.2	14.05
9.8	17.4	8.0	21.3	9.8	17.4
7.7	22.1	7.6	22.4	8.5	20.0
7.5	22.7	11.8	14.4	9.5	17.9
8.6	19.8	13.0	13.1	7.4	22.9
7.1	24.0	13.6	12.5	8.2	20.7
11.2	15.2	9.0	18.9	8.4	20.2
11.7	14.5	10.6	16.05	11.0	15.4
10.3	16.5	14.5	11.7	11.5	14.75
7.8	21.8	13.1	12.9	13.0	13.1
9.1	18.7	8.0	21.3	8.2	20.7
5.4	31.5	10.0	17.0		
13.4	12.7	7.1	23.9	Avge.	16.83
11.2	15.2	6.2	27.4		
11.4	14.9	8.7	19.5		
11.8	14.4	7.7	22.1		
9.5	17.9	12.2	14.05		
11.9	14.3	12.2	14.05		
9.2	18.5	14.0	12.2		
12.2	14.05	10.8	15.7		

TABLE XIII.

Seconds of Time for Chert Particles to Drop Through 170 cm. Diam. of Particles,3cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
8.6	19.75	11.1	15.3	13.5	12.6
7.5	22.7	11.7	14.55	7.5	22.7
12.0	14.15	13.5	12.6	11.7	14.55
17.0	10.0	10.5	16.2	13.4	12.7
10.8	15.75	13.9	12.2	17.8	9.55
12.0	14.15	11.1	15.3	16.3	10.4
10.1	16.8	10.6	16.05	18.1	9.4
12.4	13.7	14.6	11.65	10.8	15.7
13.3	12.8	13.6	12.5		
11.5	14.75	12.0	14.15	Avge.	13.69
15.2	10.8	11.7	14.55		
9.5	17.9	10.0	17.0		
12.0	14.15	10.8	15.75		
11.60	14.15	10.8	15.75		
9.9	17.2	9.2	18.5		
/	/	13.5	12.6		
13.5	12.6	13.5	12.6		
12.1	14.05	14.2	11.95		
19.3	8.8	13.8	12.3		
11.2	15.2	13.7	12.4		
11.5	14.75				

TABLE IXV.

Seconds of Time for Chert Particles to Drop Through

170 cm. Diam. of Particles.2cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
15.0	11.3	14.3	11.9	13.0	13.07
15.0	11.3	13.2	12.9	14.9	11.4
14.9	11.4	19.1	8.9	14.4	11.8
16.1	10.55	15.0	11.3	10.7	15.9
15.0	11.3	18.2	9.4	15.4	11.05
13.4	12.7	19.2	8.5	11.2	15.2
16.5	10.3	15.2	11.15	11.8	14.41
14.0	12.15	16.2	10.5	13.4	12.7
19.5	8.6	12.2	13.9	12.1	14.05
9.6	17.7	9.0	18.9	17.4	9.87
14.3	11.9	13.6	12.5	15.7	10.8
12.5	13.6	13.4	12.7	16.0	10.6
13.0	13.07	14.7	11.58	15.5	10.95
13.1	12.95	15.6	10.9	Avge.	11.51
20.0	8.5	19.0	8.85		
16.4	10.35	14.6	11.65		
14.1	12.05	15.6	10.9		
12.2	13.9	19.5	8.6		
11.8	14.4	16.3	10.4		
15.9	10.7	11.8	14.4		
12.6	13.5	20.7	8.2		

TABLE XV.

Seconds of Time for Chert Particles to Drop Through

170 cm. Diam. of Particles .1cm.

Time.	Velocity.	Time.	Velocity.	Time.	Velocity.
22.9	7.41	18.8	9.0	✓	✓
✓	✓	20.0	8.5	✓	✓
16.7	10.2	17.8	9.6	16.1	10.5
19.0	8.95	22.2	7.7	✓	✓
20.0	8.5	17.2	9.9	18.7	9.0
20.0	8.5	22.4	7.5	22.8	7.5
21.9	7.75	16.8	10.0	21.9	7.8
✓	✓	17.6	9.7	17.0	10.0
25.5	6.7	24.2	7.0	21.3	8.0
25.8	6.6	18.2	9.3	18.8	9.0
25.4	7.1	28.4	6.0	20.0	8.5
19.3	8.8	17.3	9.8	17.2	9.9
16.8	10.0	16.8	10.0	23.6	7.2
20.5	8.3	23.4	7.3	24.2	7.0
20.0	8.5	20.0	8.5	Avge.	8.17
26.4	6.4	19.4	8.8		
16.3	10.4	21.8	7.8		
17.5	9.7	29.2	5.8		
20.3	8.4	19.0	8.95		
23.5	7.2	29.0	5.9		

LOG CURVE FOR MARCASITE.

DATA.

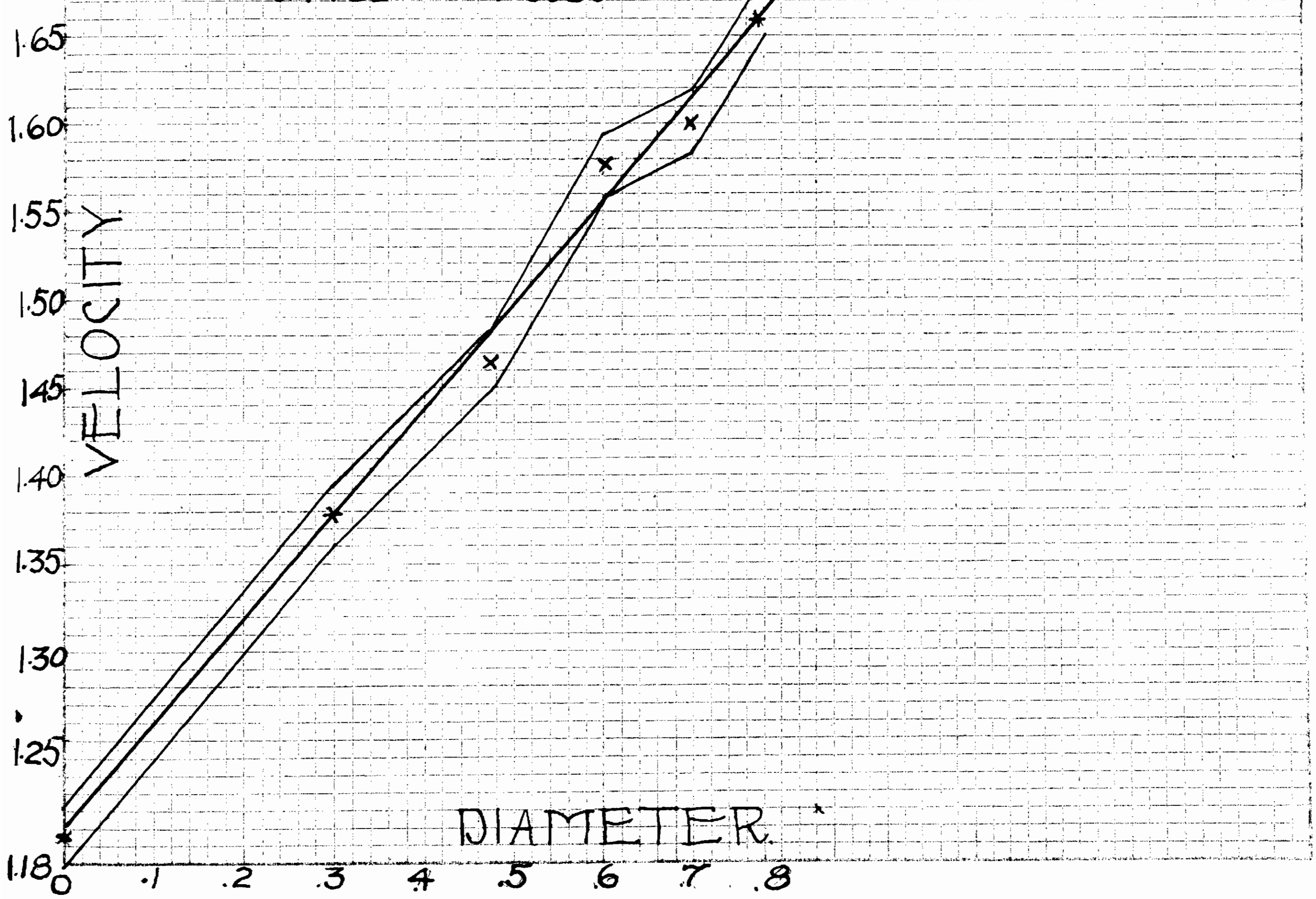
Log. diam.	Log. Velocity.
0.0000	1.1928
0.3010	1.3795
0.4771	1.4642
0.6021	1.5776
0.6989	1.6001
0.7782	1.6585

EQUATION

$$V = K \sqrt[n]{d}$$

$n = 1.71$

$K = 15.92$



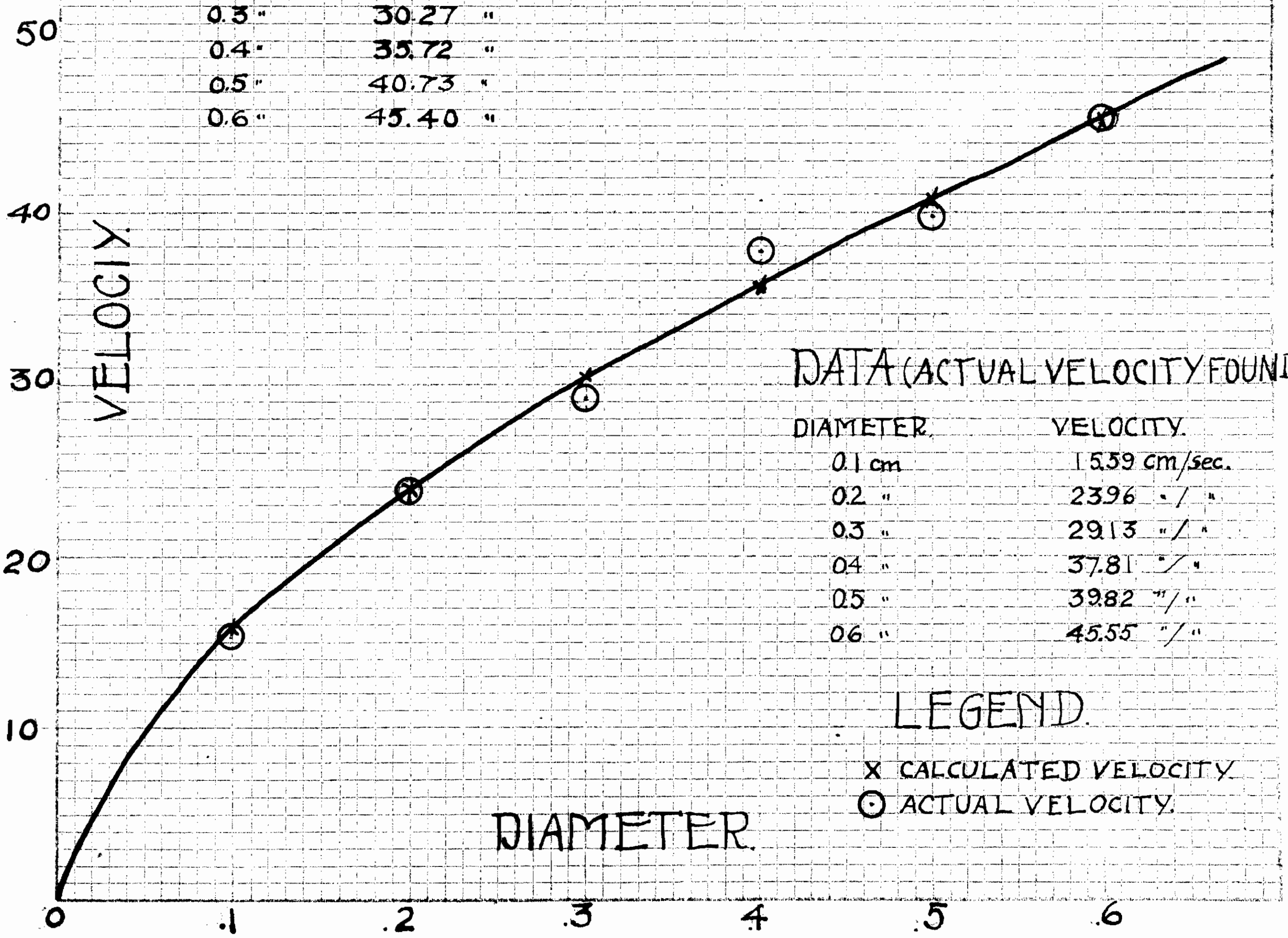
VELOCITY OF MARCASITE FALLING IN WATER.

DATA. (CALCULATED FROM FORMULA $V = 15.92\sqrt[1.71]{d}$)

DIAMETER	VELOCITY
0.1 cm.	15.92 cm/sec.
0.2 "	23.88 cm/sec.
0.3 "	30.27 "
0.4 "	35.72 "
0.5 "	40.73 "
0.6 "	45.40 "

DATA (ACTUAL VELOCITY FOUND.)

DIAMETER	VELOCITY
0.1 cm	15.59 cm/sec.
0.2 "	23.96 " / "
0.3 "	29.13 " / "
0.4 "	37.81 " / "
0.5 "	39.82 " / "
0.6 "	45.55 " / "



LOG CORVE FOR CHERT

DATA.

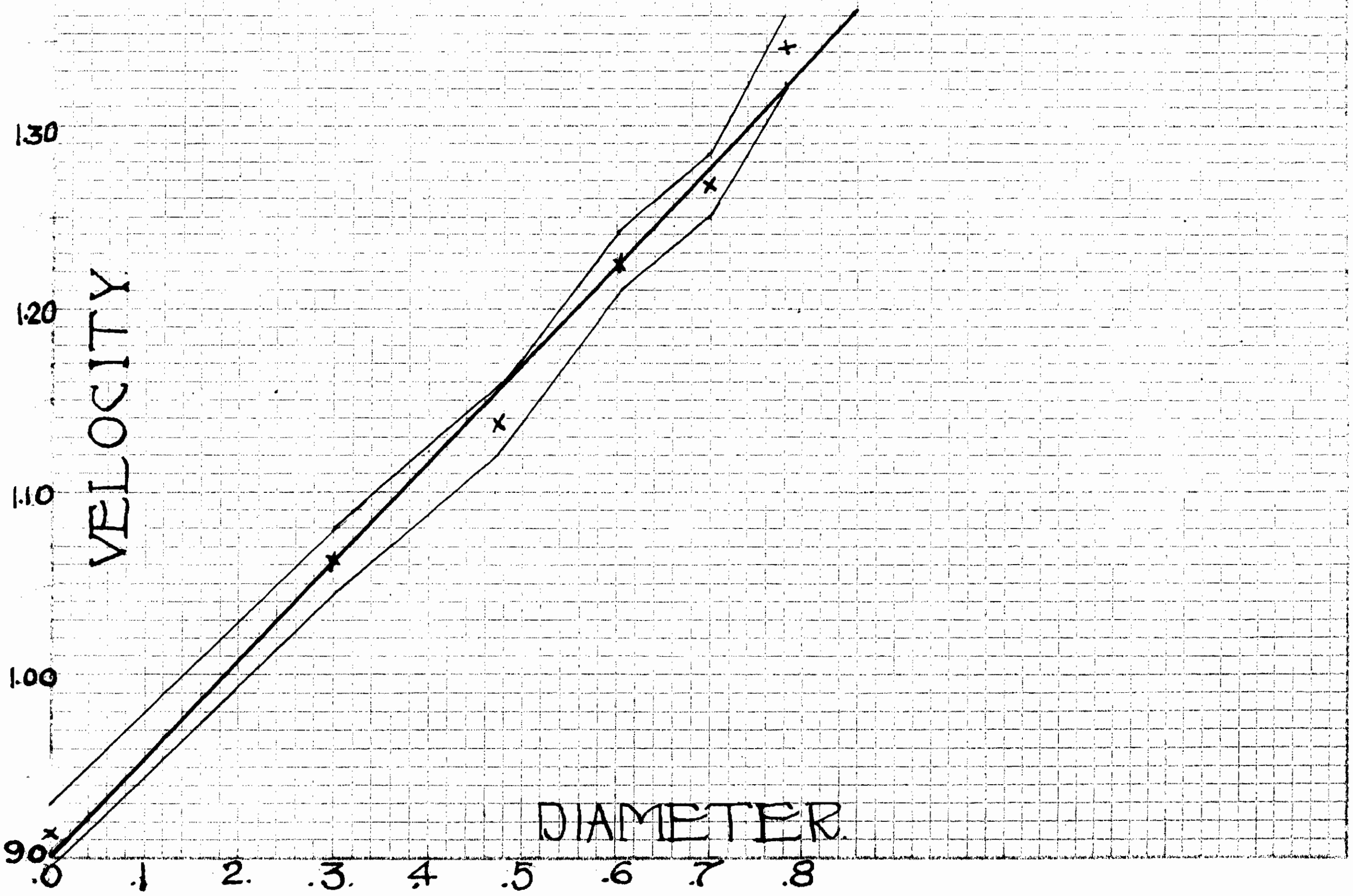
Log. diam.	Log. Velocity.
0.0000.	0.9122
0.3010.	1.0611
0.4771.	1.1364
0.6021.	1.2261
0.6990.	1.2679
0.7782.	1.3422

EQUATION.

$V = K\sqrt[n]{d}$

$n = 1.86$

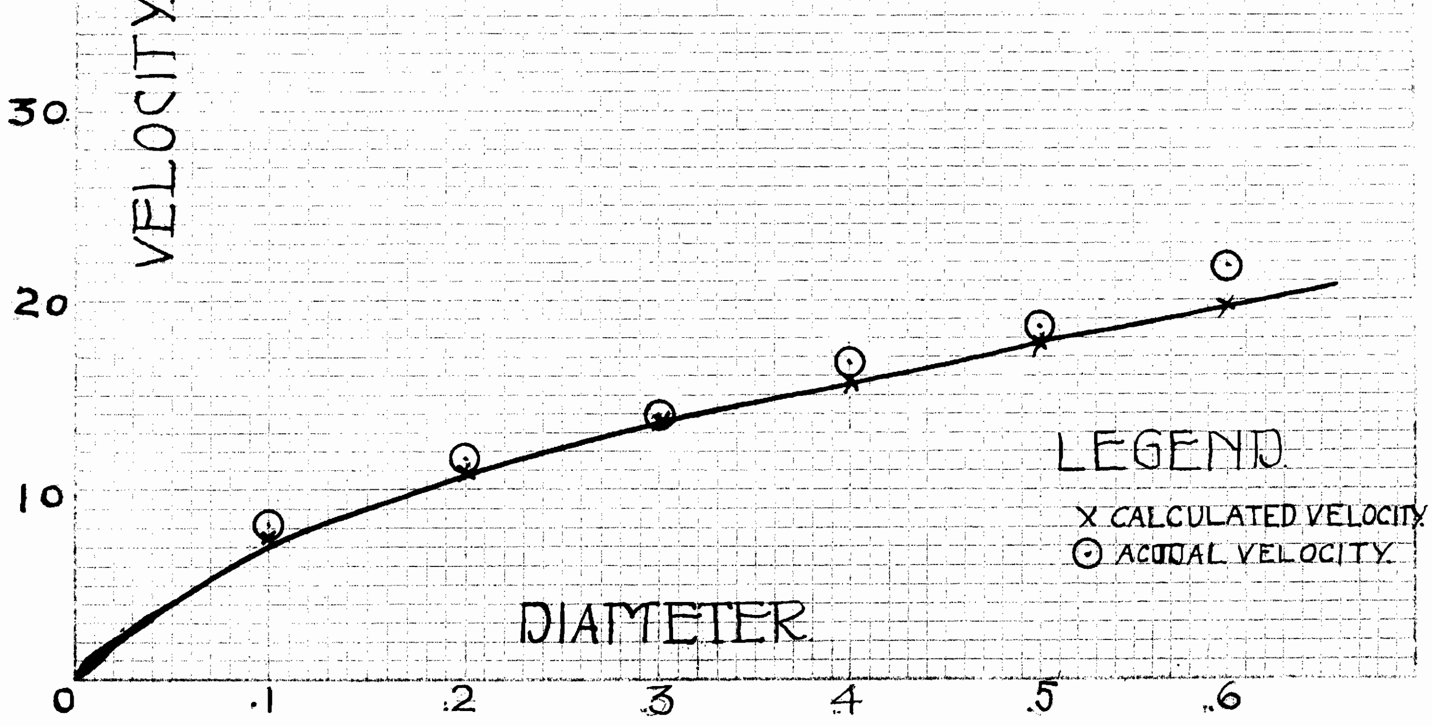
$K = 7.61$



VELOCITY OF CHERT FALLING IN WATER.

DATA. (CALCULATED FROM FORMULA $V = 7.61\sqrt[1.86]{d}$

DIAMETER.	VELOCITY.	ACTUAL VELOCITY.
0.1 cm	7.61 cm/sec.	8.17 cm/sec.
0.2 "	11.04 " / "	11.51 " / "
0.3 "	13.64 " / "	13.96 " / "
0.4 "	15.96 " / "	16.83 " / "
0.5 "	17.96 " / "	18.53 " / "
0.6 "	19.92 " / "	21.99 " / "



SUMMARY.

Our discussion deals only with the size of particles lying above the critical point, the velocities of which are expressed by Richards as

$$V = K\sqrt[2]{D(d-1)}$$

where V = the velocity in mm. per second.

D = the diameter in mm.

d = the specific gravity of the particle,

and K = a constant.

The curves on pages 29 to 32 show that the exponent is not 2.00, but 1.71 and 1.86 and that there is no direct relation between the settling velocities and the density of the mineral.

From the two minerals we are not prepared to say that the exponent that goes on the radical varies with each mineral, because a slight error in the operations would be enough to change this considerably and the difference between the results obtained and the results of Richards are not great enough to draw a conclusion.

The two results show, however, that the settling velocity of any particular mineral cannot be determined by data obtained on another mineral but that the settling velocities for different sizes of the same mineral bear a mathmatical relation to each other and knowing the velocity for a few sizes the others can be calculated.