FACTORS IN THE EXCHANGE VALUE OF METEORITES.[1]

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Historical.—For many years an acceptable standard of meteorite values has been sought by students and investigators in this branch of geology, as well as by those museums or individuals who aim to complete the great collections. While the supply of one locality or fall is often known to the fraction of a gram, its institutional owner's reluctance to exchange may not be measured by any known formula. It is then most natural that negotiations frequently pro-

[1] Since values are not settled by individual, but by collective opinion, an outline of this article was submitted to several active exchangers. The curator of one of the two greatest meteorite collections warmly commends the effort to determine exchange values from new viewpoints. He expresses the belief that museums in general will utilize the work, and will welcome the elaboration of any detailed system which affords a standard of value for meteorite exchanges.

Professor E. A. Wülfing writes:

"Your article on the factors which determine the exchange value of meteorites interested me very much. . . . In my consideration of the matter in 1897, I did not think primarily of market prices, but of exchanges between the large museum stocks, which I thought was not wholly impossible. The purchase price was only considered by me in so far as it influenced the choice between the formulæ W_1, W_2 and W_3. Your second factor, 'weight of specimen offered,' could not influence me, since there seemed to be much too little of what was offered in 1897, in comparison with the large museum-masses to be dislodged. . . . But these were all factors which it was impossible to consider in 1897; likewise the 'area of slice' had to be set aside, otherwise the problem of clearing away the endless confusion in the price question would have grown still more insoluble.

"I would say therefore, that in quite properly criticizing the formula, . . . the conditions which produced it, and which only could have produced it, should be considered. . . . I believe that you have undertaken this [extension of the formula] in the right way and I wish to express the hope that you may succeed in further distributing meteorite masses and thereby advance their study."

long into failure during the years which are required for exchangers to get together. Apart from the few who devote much time to meteorites, are the many to whom they have but an incidental and minor interest, and who have little idea of values other than those given by the owner. Hence the occasional as well as the regular collector may find worth while a brief examination of the subject. We may first exclude local values, since they are usually determined by agreement between finder and buyer.

The first to attempt any systematic enlightenment in this field was Dr. Otto Buchner. In 1863 appeared his volume on meteorites in collections,[2] wherein he noted 230 different localities.

Thirty-four years after Buchner's publication, Professor E. A. Wülfing, an eminent authority, wrote: "The present interest in meteorites on the part of many, could be increased by a wider distribution of material. Believing that this is attainable through active exchanging, and further because I see an aid to this end in a determination of the relative value of meteorites, even if only approximately, I shall endeavor to establish their exchange values." Accordingly, in 1893 he wrote to all owners or curators of meteorite collections, asking them to report the weight of each meteoritic fall or locality in their possession. Then followed a long and voluminous correspondence which, with the arduous tabulation of the data secured and the development of his formula, delayed for nearly four years the publication of his exhaustive treatise[3] of some 500 pages. The major part of this work consists of a list of all known meteorites, giving, for each, the full locality, symbol, date of fall or find, bibliography, original weight, present known weight, and finally, a list of owners with the weight in grams of their holdings. In the two concluding chapters is elaborated a theory of values. He finds but three important factors which enter into the value of each meteorite:

1. The Present Known Weight.—This, Wülfing states, is incomplete in many cases, because of his failure to reach some owners and to secure full data from others. Where the original weight is un-

[2] "Die Meteoriten in Sammlungen, ihre Gewichte, mineralogische und chemische Beschaffenheit."

[3] "Die Meteoriten in Sammlungen und ihre Literatur," Tübingen, 1897.

accountably reduced, some of the shortage is considered in the exchange value given to such falls.

2. The Group Weight.—A modification of the admittedly imperfect Rose-Tschermak-Brezina group classification, is used, showing each group weight.

3. The Number of Owners.—Wülfing acknowledges the unreliability of this factor, in that some owners have not enough to part with any and should therefore not be included. However he includes all owners as of equal importance in his formula for finding the value of a fall, arguing that when divided among many holders, it is less desirable in other eyes.

The following variable factors, which he excludes, are then referred to as not being computable or as of insufficient weight to be utilized in working out the formula: (4) Material which may be found in the future and thus raise certain group-weights, especially of the rarer groups, when new individuals of such are found, (5) the original cost of collecting specimens, (6) state of preservation, (7) historical interest, (8) if seen to fall, the meteorite is valued higher, especially in the case of nine irons so distinguished. The wisdom of doubling his valuation of these nine falls, or making even a greater increase, is left by Wülfing as an open question. Concerning the stones, he states that there is generally no difference in value between the few not seen to fall and those seen to fall.

The author here begins a mathematical inquiry into the relative value of the three factors chosen; Group Weight (G), Present Known Weight (N), and the Number of Owners (B). Following a long analysis with numerous allowances and exceptions, he establishes the exchange value (W) in the formula,

$$W = \frac{1}{\sqrt[3]{GNB}}$$

Four tables follow for estimating the value of new meteorites: the first is for meteorites having from 1 to 3 owners; the second 4 to 8 owners; the third 9 to 20; the fourth table being for those of 21 or more owners. The group weight is given vertically and the locality weight horizontally. At the intersection of these lines is a numeral indicating the exchange value per gram, taking the value of Canyon

Diablo as unity. It is thus not a money value, but an exchange value index.

In the next chapter is a group classification of all meteorites known in 1897, giving figures under U (original weight), N, B and W for each fall. In the determination of U and N and in their discrepancies, many uncertainties arise, and on this account two values are given for some falls and other values are omitted altogether. In some of his value-pairs Wülfing indicates the less probable of the two within parentheses. Again where both values are doubtful, they are enclosed in brackets.

In 1899, the late Professor E. Cohen, author of many important scientific studies of meteorites, published a table[4] collating the Wülfing exchange values with the trade prices of eight dealers. For each fall, he showed in one column the lowest dealer's price in pfennigs, then the highest, and in a third column the medium or average of all prices. The Wülfing exchange values ($\times$ 13) he gave in a fourth column. This table afforded a basis for comparing the theoretical exchange value with the actual market price of each fall.

Professor Cohen called attention to the fact that previously no account had been taken of the area of a slice, maintaining that this feature should receive full consideration in estimating the value. Examining the tabulation, he pointed out that about one third of the falls compared, showed large variations between the medium trade price and the Wülfing exchange value. Most of the relatively low figures of Wülfing he ascribed to the fact that although the masses are very large, they are securely held against partition by sale or exhange. On the other hand, many of Wülfing's relatively high figures are due to the fact that they belong to the rarer groups, which, according to Wülfing's critic, come on the market only by chance, and with no fixed value. Finally Cohen stated that it is not the number of owners which affects the value of a particular fall, but the number of owners who are able to part with some of their holding, a collector of pieces under 15 to 30 grams being

[4] "Über den Wülfing'schen Tauschwerth der Meteoriten im Vergleich mit den Handelspreisen," *Mitth. aus dem naturwiss. Ver. für Neu-Vorpommern u. Rügen,* 1899, XXXI., pp. 50–62, Greifswald.

negligible in an estimate of available exchange material. He concluded his review with a conditional acceptance of the exchange basis established by Wülfing, and welcomed his guidance among those final personal factors which in the past have rendered meteorite exchanging so difficult a process.

In 1904 the late Professor Henry A. Ward, the greatest traveling collector of meteorites, made a new collation[5] of seven dealers' prices, contrasting his results with those of Cohen. Professor Ward included the prices paid at a large meteorite auction, as well as two records of many sales, but excluded all abnormal figures. He was the first to fully emphasize the fact that a large specimen is worth far less per gram than a small one of the same fall. However, he greatly overestimated this variation in saying, in effect, that an increase of sixteen-fold in weight deserved a decrease to one eighth the gram price. This would make a 16-pound piece worth only twice as much as a 1-pound piece of the same fall.

Present Factors.—In using the Ward Collation, the writer, in common with most exchangers, found it of great value, but as often lacking because of the numerous meteorites commercially quoted during the intervening eight years. In making a 1912 collation for personal use, it seemed worth while to check it carefully throughout and publish with certain observations.

The following arrangement of the main elements of meteorite values, attempts only to roughly indicate the order of their importance. The first factor may make a difference of several hundred-fold in the gram price, the second usually five to ten-fold, and rarely much more. The remaining factors generally involve lesser variations.

Essential Factors.

1. Present known weight.
2. Weight of specimen offered.
3. Number of owners.
4. Group weight.
5. Observation of fall.

[5] "Values of Meteorites: Relative and Individual," *The Mineral Collector*, Vol. XI., No. 7, pp. 97–115, New York.

Occasional Factors.

6. Area of slice offered.
7. Phenomenal variation between individual specimens.
8. Distinctness of structure.
9. Missing portions.
10. Historical interest.

1. *Present Known Weight.*—Wülfing distinguishes between the original weight and the present known weight among recorded owners. After the original weight is announced, usually the only important loss is by sawing, etc.; hence the portions held by unknown owners should not be ignored. In general the present weight may be approximated by subtracting from the original weight, a loss of 10 per cent. to 30 per cent., according to the extent and manner of division.

Evidently we have here supply versus demand in its simplest aspect. Thus, Canyon Diablo and Toluca are at one end of the list, with many tons distributed, and respectively offered at 3 cents and 4 cents per gram, or only double the price of silver. Omitting Adalia and one or two others of which only a few grams are known, we may take as typical of the most costly meteorites, Angra dos Reis, Barea and Epinal, with an average known weight of 1,000 grams. These bring over $7.00 per gram, or ten times their weight in gold.

2. *Weight of Specimen Offered.*—This variation is based on the high costs of sawing irons, as well as on the consequent loss of one tenth to three tenths of their mass; and finally on the expensive distribution of all kinds of meteorites to the most limited, yet widely scattered, of markets. While this principle is generally recognized in practice, the fact that it is second only in importance to the weight of the fall, is frequently overlooked. Although excluded by Wülfing, if allowance is not made for this element, his system often becomes misleading in individual transactions. Its relative importance is shown by many sales. Thus, Canyon Diablo, of which fifteen to twenty tons have been distributed, brings in 100 gram pieces 3 cents per gram, and in 100 kilogram pieces three tenths cent per gram, or $3.00 per kilogram. That is, a thousand fold

increase in weight means a reduction to one tenth of the per gram price. At rare intervals greater extremes of this price variation are shown by wholly abnormal and unstable quotations.

In the case of iron localities affording a few hundred to a few thousand kilos, a ratio of price variation of about 8 : 1 will be typical where the weight variation is 1 : 1,000. This is roughly illustrated in the table below by the recently found Amalia, a fall identical with the original Mukerop.

Ordinary Prices.		Exceptional Prices.	
Highest.	33 Per Cent. Decrease.	50 Per Cent. Further Decrease.	60 Per Cent. Final Decrease.
Very thin slices of about 30 grams (0.03 kilo)	Thin slices of about 300 grams (0.3 kilo)	Thick slices of about 3000 grams (3 kilos)	Very thick slices or end-pieces of about 30,000 grams (30 kilos)
6 cents per gram ($60.00 per kilo). Price, $1.80	4 cents per gram ($40.00 per kilo). Price, $12.00	2 cents per gram ($20.00 per kilo). Price, $60.00	0.8 cent per gram ($8.00 per kilo). Price, $240.00

One universal tendency is for the price variation to lessen directly with the decrease in total weight, so that in meteorites totaling less than 1,000 grams, the price variation may not exceed 3 : 2 in a weight variation of 1 : 10. There are two elements in price variations between 30 and 30,000 grams. The first element is difference in weight and the second is difference in thickness. If we eliminate the latter, there is less price variation. Thus an iron slice of 3,000 grams, measuring $20 \times 20 \times 1$ cm. thick, is worth nearly as much per gram as a 30-gram piece measuring $2 \times 2 \times 1$ cm. This is partly because the relative cost of sawing a large slice is more than for a small one. Stony meteorites have a smaller ratio of price variation, generally ranging below 4 : 1, in a weight variation of 1 : 1,000, because the costs of sawing are less than for irons. Further, single stones of over 20 kilos are somewhat rare and are in demand as complete individuals. It may be further noted that collectors differ as to whether aerolites are better sawed or broken. The latter method of division avoids waste of material and labor costs, and affords a broader fractured surface; at the same time it does not prevent polishing a small face if desired. In falls dis-

tinguished by an abundance of small complete individuals, their gram price is somewhat lower than that for slices, because of the sawing cost. Examples are Canyon Diablo, Toluca, Estherville, Mocs, Pultusk, Holbrook, etc.

3. *Number of Owners.*—As pointed out by Cohen, this, to a buyer, is secondary to the number of those who might part with some of their holdings. Omitting irons seen to fall and localities of which the original weight was much greater than the present recorded weight, the market values of the following are more than three times those of Wülfing: Barea, Bendego, Daniel's Kuil, Djati Pengilon, Elbogen, Emmitsburg, Epinal, Juncal, Krähenberg, La Caille, Molina, Nulles, Petropavlovsk, Red River, Tieschitz and Wold Cottage. For the preceding list, the average number of recorded owners is 21, but only one or rarely two owners of each fall have an excess over their own requirements. Wülfing's low price, based partly on the number of owners, is here in great measure explained. Nevertheless the disposer of a meteorite, in evaluating it, will consider the likely exchangers, lowering his price according to the number of those who already possess nearly as much as their probable requirement.

On the other hand some of the cheapest meteorites in the market are held at first by some one dealer whose policy is to sell at a figure which will dispose of his stock within a few years. In nearly all cases where a locality is so controlled, the price is lower than the Wülfing value, and far lower than if held by a large institution which has parted with little or none. The high exchange offers which the institution receives, even though uninvited, tend to elevate the trade price until their exchange policy loosens. Many of the highest ruling prices are largely due to such influences. Further on this is clearly shown in a comparative analysis of the Wülfing values and the trade prices collated by Cohen.

This factor of available weight, so dependent on personal inclination, is the most uncertain of the essential elements, the fall being almost unobtainable where it is preserved entire as municipal or church property. Between the extremes cited lie those meteorites held in public meteorite collections, where the policy is nearly

always against the preservation of a fall in its entirety. For the purpose of study, a broad slice or polished end piece is quite as valuable as a large mass of iron.

4. *Group Weight.*—Stony meteorites are classified in groups according to their petrographic structure and composition; irons according to their crystallization. Wülfing gives this second position among the factors of value. He calculates the total weight of each group, giving to individual falls a value influenced by the group weight.

5. *Observation of Fall.*—This factor is placed eighth and last by Wülfing. His final exclusion of such a factor constitutes another limitation of his formula, as may be seen by a comparison of actual selling prices with his theoretical values. Of about 300 known irons, only nine have been seen to fall. Comparing only these siderites seen to fall and listed by Wülfing, which have been retailed: Agram, Charlotte, Braunau, Rowton, Mazapil, we find that Wülfing's theoretical value averages for these five falls 55 cents per gram, whereas the last quoted selling prices averaged $4.71 per gram, showing that sellers have rated irons seen to fall at more than eight times the figures that Wülfing accords them.

Four siderolites seen to fall, Estherville, Lodran, Mincy and Veramin, which are collated by Cohen at an average of $3.06, are estimated by Wülfing at an average of $4.42. This comparison is quite inconclusive because of the uncertainty as to the location of a large portion of the original weight of Lodran. As Wülfing estimates it by the present recorded weight, its value is enormously inflated ($15.71), thus nullifying the results. Eliminating Lodran, the remaining three are averaged by Wülfing at $1.99 and by Cohen at $6.61, showing that siderolites seen to fall are estimated by Wülfing at less than one third their market value.

But when we examine the aerolites, we find that out of nearly 400 known stones, only about one twelfth have not been seen to fall. The following ten aerolites not seen to fall, are the only ones quoted by dealers and estimated by Wülfing: Goalpara, Tomhannock Creek, Waconda, Prairie Dog Creek, Long Island, Salt Lake City, McKinney, Bluff, Pipe Creek and Minas Geraes. The average of the

last quoted medium trade prices, is 75 cents, and their average Wülfing price is $2.20. Thus on stones not seen to fall, Wülfing estimates about three times the market value.

6. *Area of Slice.*—According to Cohen, a section of relatively large exhibition area is of more value per gram than a thicker piece of the same weight. Of two pieces of the same weight, the one having the larger exhibition surface will be chosen, as better illustrating the variation in structure, crystallization and included minerals, besides making a more impressive display. However, most 1912 catalogues show no apparent difference in the price per gram because of differences in thickness. While there is little advantage in a slice of iron 20 to 30 cm. broad being more than 1 cm. thick, some siderolites and aerolites require a greater thickness because of their friability. Quite apart from the relative desirability of two pieces of the same weight but of differing exhibition area, is the large item of cost, since a thin slice costs proportionately more per gram for sawing and wastage than a thick slice.

7. *Phenomenal Variation between Individual Specimens.*—Interesting differences between individual slices or masses of the same fall are often seen. In aerolites, one fragment or slice may (1) have much more crust than another; (2) it may show a slickensided surface; (3) primary and secondary crust formed before and after exploding; (4) radial lines of fusion flow on the front, with thicker overflow on back; (5) brecciation, etc. In irons, one slice may (1) rarely show hieroglyphic characters and often nodules of included iron compounds; (2) twinning; (3) a flowage of the usually straight Widmanstätten figures; (4) on the exterior deep pitting, or fluidal lines; (5) more commonly, marked octahedral cleavage. Such features increase the value of one piece over that of another of the same weight and fall which is less interestingly marked. An extreme case is Canyon Diablo, valued at 3 cents per gram. When showing diamonds (of no commercial value), the price has exceeded 30 cents per gram.

8. *Distinctness of Structure.*—Other things being equal, beautifully crystallized irons and stones of striking chondritic structure, are prized higher than those in which the crystallization is clouded or the structure quite indistinct.

9. *Missing Portions.*—This factor concerns very few meteorites, but where formerly unobtainable pieces are secured, they naturally cause a depreciation in the price. Such a drop is sometimes discounted where the ultimate availability of the missing portion is assured.

10. *Historical Interest.*—Comparatively few falls are affected in value by this element. Where a meteorite has fallen near a town and has been preserved as an object of civic pride for many years, as in the case of Krähenberg, Elbogen and Ensisheim, its value is greatly enhanced, since it is practically unobtainable. Again, when it has been worshiped or venerated by primitive or even civilized peoples, as in the case of Wichita, Durala, Kesen and many others, its value is slightly increased. Finally, the one or two prehistoric meteorites (Casas Grandes, Anderson, etc.) have a somewhat higher value because of their ethnological interest.

The 1912 Collation.—Leaving the general discussion of values, we may examine actual prices as shown in the following table. The totals of 241 falls collated by Cohen and 366 by Ward, are here increased to 465. To facilitate comparisons with former periods, the collating rules of Ward are observed:

Only specimens under 400 grams weight are included.

Original sales by the finder are excluded.

The catalogue price *per gram* of a fall is determined by dividing the total price of the catalogued specimens by the total weight.

The following prices are, in the opinion of the writer, abnormally high and often erroneous. They were excluded from the collation because based on comparatively insignificant material, generally fragmentary. They are more than 50 per cent. higher than the next lower price collated for the same fall: Benares, $3.00; Bischtübe, 44 cents; Bjurböle, 59 cents; Bluff, 15 cents; Brenham, 30 cents and 40 cents; Canyon Diablo, 19 cents; Charcas, 37 cents; Cosby's Creek, 25 cents; Crab Orchard, 25 cents; Doña Inez, 27 cents; Estacado, 12 cents; Estherville, 44 cents; Hessle, 76 cents; Homestead, 36 cents; Kernouvé, $1.00; Kesen, 73 cents; Kuleschovka, $6.00; Medwedewa, 60 cents; Mincy, 31 cents; Nelson County, 63 cents; Ness County, 16 cents; Nocoleche, 75 cents;

Saline, 79 cents; Trenton, 23 cents and 42 cents; Wichita, 35 cents; Zaborsika, $8.00; Zacatecas, 78 cents.

No prices are omitted from the collation because of being too low. The following however are some of those which are more than 50 per cent. lower than the next higher price or Wülfing's value, where no other price is given. In the writer's opinion these figures are too low. Nearly all are for fragments of a few grams. Bath, 20 cents; Black Mt., 33 cents; Bustee, $1.00; Copiapo, 33 cents; Dalton, 6 cents; El Capitan, 11 cents; Harrison Co., $1.00; Ibbenbühren, $1.50; Le Pressoir, $1.25; Mantos Blancos, 38 cents; Motta di Conti, 38 cents; Nammianthal, 75 cents; Orvinio, $1.20; Pipe Creek, 17 cents; Pirgunje, $1.50; Reed City, 13 cents; Richmond, $1.20; St. Denis Westrem, $1.00; Salt River, 91 cents; Uden, $2.00; Yatoor, 33 cents. The lowest Toluca price is based on several slices. One small complete mass listed in the same catalogue at 1 cent per gram is excluded. The iron-shales resulting from the oxidation of the Canyon Diablo and Augustinovka irons are omitted. The Wülfing (1897) exchange values of the following falls are not quoted, as their subsequent re-classification probably gave them new group weights: Barratta, Carlton, Eagle Station, Crab Orchard, Dakota, Imilac, Kendall County, Mejillones, Salt River, Shingle Springs, Summit and Zaborzika. Wülfing's value for Fisher is omitted, being erroneous because based on incomplete data.

Only seven dealers issue catalogues. Two American and one European publication have names and prices printed and are not annual, being dated 1912, 1907 and 1908 respectively; two European have names printed but prices written in, while two small European lists were merely typewritten.

ROSE-TSCHERMAK-BREZINA SYMBOLS.[6]

A	Angrite	Cco	Ornansite
a	veined	Cek	Crystalline Enstatite-Anorthite Chondrite
Am	Amphoterite	Cg	Gray Chondrite
b	breccia-like	Cha	Chassignite
Bu	Bustite	Chl	Chladnite
C	Chondrite	Co	Orvinite
c	spherulitic	Db	Ataxite, Babb's Mills group
Ccn	Ngawite		

[6] Dr. Aristides Brezina, PROC. AM. PHIL. SOC., Vol. 53, No. 176, pp. 211 to 247.

PROC. AMER. PHIL. SOC., LII. 211 P, PRINTED OCT. 3, 1913.

Dc	Ataxite, Cape group	m	medium
Dm	Ataxite, Muchachos group	Mg	Grahamite
Dn	Ataxite, Nedagolla group	n	Netschaevo group
Dp	Ataxite, Primitiva group	O	Octahedrite
Ds	Ataxite, Siratic group	Obc	Brecciated Octahedrite, Copiapo group
Dsh	Ataxite, Shingle Springs group		
Eu	Eukrite	Og	Broad Octahedrite
f	fine	Pa	Pallasite, Albach group
ff	finest	Pi	Pallasite, Imilac group
gg	broadest	Pk	Pallasite, Krasnojarsk group
H	Normal Hexahedrite, not granular	Pr	Pallasite, Rokicky group
Ha	Granular Hexahedrite	Ro	Rodite
Ho	Howardite	s	black
ho	Howarditic	Si	Siderophyre
i	intermediate	U	Ureilite
K	Carbonaceous Chondrite	w	white
k	crystalline	z	Zacatecas group
Lo	Lodranite	zg	N'Goureyma group
M	Mesosiderite		

The critical scrutiny to which theoretical prices are usually subjected should not be discarded in considering the following trade figures. They are not reproduced here as being true value indices in all cases, and should therefore be analyzed before accepting them as a guide in any important transfer.

The total Wülfing exchange values of 248 falls having both Wülfing and 1912 values, afford the factor 3.1904+, when divided into the total of the corresponding medium 1912 values in the present collation. Hence the first column of figures is Wülfing's theoretical exchange index multiplied by the approximate factor 3.2.[7] Wherever Wülfing gives two figures as of equal probability, the mean is employed. If he prefers one of two given, the preferred only is used. Where he places both values within brackets as doubtful, both are omitted.

The second column of figures gives the 1899 medium market prices.

The third column gives the 1904 medium market prices.

The fourth column gives the lowest 1912 market prices.

The fifth and last column gives the medium 1912 market prices.

The highest 1912 price of any fall may be roughly calculated by comparing its lowest with its average price for 1912.

Prices are per gram in dollars, counting M4/=4/—=$1.00.

[7] The approximate factor used by Cohen was 3.1 cents (13 pfgs.).

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Abert Iron; locality?	Om	1.63	—	—	2.69	2.69
Adargas	Om	—	—	.18	—	—
Admire	Pr	—	—	.39	.09	.20
Agen	Cia	.74	.89	1.39	.54	.77
Agram	Om	.26	—	10.00	—	—
Ahumada	Pr	—	—	—	.24	.24
Aigle, see L'Aigle.						
Alais	K	4.48	3.62	4.00	7.00	7.00
Alastoewa, see Djati Pengilon.						
Albacher Mühle, see Bitburg.						
Albareto	Cc	1.60	—	1.75	2.50	2.50
Aldsworth	Cga	2.75	—	1.17	—	—
Aleppo	Cwb	3.55	.37	.52	—	—
Alessandria	Cga	2.02	—	.75	—	—
Alexejevka, see Bachmut.						
Alfianello	Ci	.32	.16	.14	.07	.11
Algoma	Om	—	—	1.00	—	—
Allegan	Cco	—	—	.17	.18	.20
Amalia, see Mukerop.						
Amana, see Homestead.						
Ambapur	Cck	—	1.06	.66	—	—
Anderson	Pk	—	—	6.50	—	—
Andover	Cc	—	—	1.61	—	—
Angers	Cwa	3.46	—	2.62	—	—
Angra dos Reis	A	15.72	6.00	8.00	—	—
Antifona, see Collescipoli						
Apoala	Of	—	—	.23	—	—
Apt	Cga	1.60	—	1.08	1.25	1.25
Arispe	Ogg	—	—	.10	.10	.12
Arlington	Om	—	.95	.46	.24	.28
Arva, see Magura.						
Asheville, see Black Mountain and Bairds Farm.						
Assisi	Cc	1.60	1.00	.93	.68	1.06
Aubres	Bu	16.93	—	2.50	—	—
Auburn	H	.80	—	.88	1.56	1.56
Augustinovka	Of	—	.44	.47	.25	.26
Aumières	Cwa	1.60	—	2.09	1.48	2.24
Ausson	Cc	.64	1.15	.57	.56	.68
Avilez	Cc	3.55	4.55	—	—	—
Babb's Mill	Db	.13	.70	.46	.34	.34
Bachmut	Cw	1.60	1.00	1.02	1.00	1.00
Bacubirito	Off	—	—	.22	.25	.25
Bahia, see Bendego.						
Bairds Farm	Om	.74	—	.55	.33	.33
Bald Eagle	Om	—	—	1.02	—	—
Bali Kamerun	Cs	—	—	—	6.00	6.00
Ballinoo	Off	—	.15	.22	.12	.18
Bandong	Ro	1.28	—	.75	—	—
Barbotan	Cga	.74	1.13	.71	.56	.93
Barea	M	1.28	—	7.50	—	—

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Barranca Blanca	Obz	—	—	.30	1.00	1.00
Barratta	Cgb	—	—	.22	.15	.15
Batesville, see Joe Wright.						
Bath	Ccb	.74	.35	.18	.20	.34
Bath Furnace	Cia	—	—	.29	.31	.31
Beaconsfield, see Cranbourne.						
Bear Creek	Of	.22	—	.78	.84	.84
Beaver Creek	Cck	1.60	.50	.28	1.00	1.00
Bella Roca	Of	.35	.24	.22	.14	.18
Benares	Cc	.96	3.00	2.07	1.89	1.89
Bendego	Og	.03	.22	.16	.08	.11
Berlanguillas	Cia	1.60	—	2.27	—	—
Bethlehem	Cck	—	—	6.50	10.00	10.00
Beuste	Cgb	1.60	—	2.00	—	—
Bialystock	Ho	6.53	—	.65	—	—
Bielokrynitschie	Cib	2.69	—	.73	.66	.78
Billings	Og	—	—	—	.20	.20
Bischtübe	Og	.26	—	.34	.10	.10
Bishopville	Chla	3.46	2.35	1.75	4.88	4.88
Bishunpur	Cs	3.97	—	3.00	—	—
Bitburg (unmelted)	Pa	—	2.40	—	—	—
Bitburg (melted)	Pa	—	—	.14	.12	.12
Bjurböle	Cca	—	—	.08	.08	.12
Black Mountain	Og	1.22	1.06	1.53	.33	.33
Blansko	Cga	2.62	—	4.75	—	—
Bluff	Ckb	.32	.15	.07	.05	.05
Bocas	Cw	—	—	5.00	—	—
Bohumilitz	Og	.19	.25	.34	.21	.31
Bois de Fontaine, see Charsonville.						
Bonanza, see Coahuila.						
Borgo San Donino	Cho	1.70	—	.75	.50	.50
Bori	Cia	1.02	1.09	.64	—	—
Borkut	Cc	1.22	1.25	.99	.80	.80
Borodino	Cgb	3.55	—	—	7.14	7.14
Botschetschki	Cg	2.75	—	2.00	—	—
Brahin	Pr	—	1.42	.80	—	—
Braunau	H	.26	.87	.78	.73	1.12
Breitenbach	Si	—	—	.35	.38	.38
Bremervörde	Ccb	.74	.95	1.10	1.28	1.28
Brenham	Pk	.10	.20	.12	.06	.11
Bridgewater	Of	.90	.39	.25	1.20	1.20
Bückeberg, see Obernkirchen.						
Burlington	Om	.45	.42	.36	.52	.53
Buschhof	Cwa	.96	2.50	.68	1.00	1.00
Bustee	Bu	9.89	—	—	1.00	1.00
Butcher Iron, see Coahuila.						
Butler	Off	—	.37	.24	.25	.25
Butsura	Ci	.45	—	.58	—	—
Cabarrus County, see Monroe.						

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1859.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Cabezzo de Mayo	Cw	1.25	2.55	.75	4.00	4.00
Cambria	Of	.45	.40	.36	.74	.74
Campo del Cielo	Ds	.06	.97	.91	.47	.47
Canellas	Ci	1.02	—	1.75	—	—
Cangas de Onis	Cgb	.93	1.02	.73	1.00	1.00
Canyon City	Og	—	—	—	.20	.37
Canyon Diablo	Og	.03	.10	.07	.03	.03
Canton	Ogg	—	—	.15	—	—
Cape Girardeau	Cc	1.63	—	.95	2.00	2.00
Cape of Good Hope	Dc	.58	.62	.45	.41	.41
Carlton	Off	—	.24	.16	.10	.17
Carthage	Om	.13	.22	.29	.19	.28
Casas Grandes	Om	—	—	—	.13	.13
Casey County	Og	.93	—	.65	1.37	1.37
Castalia	Cgb	.74	—	.82	.75	.87
Castine	Cwa	—	—	4.16	2.00	2.00
Central Missouri	Ogg	—	—	.16	—	—
Cereseto	Ccb	1.22	1.16	1.25	—	—
Chandakapur	Cib	.99	—	.62	—	—
Chantonnay	Cgb	.67	.56	.38	.47	.54
Charcas	Om	.10	—	.17	.19	.21
Charlotte	Of	.93	—	1.60	3.52	3.52
Charsonville	Cga	.74	1.14	.65	.49	.66
Chassigny	Cha	7.87	—	2.93	7.00	7.00
Château Renard	Cia	.58	.61	.48	.42	.58
Chesterville	Ds	1.60	.35	.19	—	—
Chulafinnee	Om	.35	.55	.34	—	—
Chupaderos	Of	—	.41	.22	.05	.10
Claiborne, see Lime Creek.						
Clarac, see Ausson.						
Clégnérec, see Kernouvé						
Cleveland (Lea Iron)	Om	.16	—	.30	.30	.30
Coahuila (exact loc.?)	H	.06	—	—	.03	.03
Coahuila (Sancha Estate, Saltillo or Couch Iron)	H	.06	.20	.15	.14	.15
Coahuila (Fort Duncan)	H	.06	.20	.09	.07	.09
Coahuila (Butcher Irons from Bonanza and Desert of Mapimi)	H	.06	.12	.11	.08	.08
Cooke County, see Cosby's Creek.						
Cold Bokkeveldt	K	1.86	2.25	1.38	1.33	1.44
Colfax	Om	—	.52	.40	.98	.98
Collescipoli	Cc	1.12	.75	.88	.63	.63
Concepcion, see Adargas.						
Coon Butte	Cib	—	—	—	.59	.59
Coopertown	Om	.26	—	.42	1.00	1.00
Copiapo	Obc	1.22	.50	1.20	.33	.33
Cosby's Creek	Og	.16	.30	.15	.10	.11
Costilla Peak	Om	.38	—	.14	.11	.14
Cowra	Off	—	2.10	2.00	—	—
Crab Orchard	Mg	—	.12	.12	.11	.12

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Cranbourne (Beaconsfield)	Og	—	.17	.10	.11	.11
Cranbourne (Melbourne)	Og	.03	.22	.23	.05	.06
Cross Timbers, see Red River.						
Cuernavaca	Of	—	—	.12	.11	.21
Cynthiana	Cg	1.22	—	.80	1.00	1.00
Dakota	Ogg	—	—	.40	.60	.60
Dalton	Om	.19	.57	.27	.06	.23
Dandapur	Cia	.93	—	—	1.00	1.00
Daniel's Kuil	Ck	1.57	—	3.00	5.00	5.00
Danville	Cga	2.34	—	3.00	6.00	6.00
Deep Springs	Db	—	—	.26	.30	.30
Denton County	Om	.54	—	.80	1.17	1.17
Descubridora	Om	.13	—	.15	.11	.12
Dhulia	Cwa	—	—	5.50	—	—
Dhurmsala	Ci	.45	.25	.16	.10	.20
Djati Pengilon	Ck	.22	2.00	1.00	.97	.97
Dolgovoli	Cw	2.69	—	1.13	1.00	1.00
Dona Inez	M	.58	.19	.18	.12	.15
Dores dos Campos Formosus	Cwa	—	—	—	.40	.40
Doroninsk	Cgb	1.82	2.50	1.50	—	—
Drake Creek	Cwa	.74	—	.65	.75	.75
Durala	Cia	.74	—	—	1.25	1.25
Duruma	Cia	2.02	1.07	2.00	4.00	4.00
Eagle Station	Pr	—	.49	.39	.48	.50
Ekaterinoslav, see Mordvinovka.						
Elbogen	Om	.13	.75	.85	1.00	1.15
El Capitan	Om	.51	.24	.13	.11	.11
Elgueras, see Cangas de Onis.						
Elm Creek	Cco	—	—	—	.22	.22
Emmitsburg	Om	1.60	—	1.24	5.00	5.00
Ensisheim	Ckb	.35	.62	.74	.92	.96
Epinal	Cc	2.62	10.62	—	—	—
Ergheo	Ckb	—	—	.26	.15	.19
Erxleben	Ck	.99	—	.84	1.00	1.00
Estacado	Cka	—	—	—	.05	.05
Estherville	M	.16	.19	.14	.13	.16
Farmington	Csa	.35	.19	.09	.08	.13
Favars	Ci	2.02	—	3.25	—	—
Fayette County, see Bluff.						
Fisher	Cia	—	—	.30	.35	.35
Forest	Ccb	.26	.23	.12	.08	.15
Forsyth	Cwa	.74	—	.87	2.00	2.00
Forsyth County	Dn	—	—	.19	.21	.21
Fort Duncan, see Coahuila.						
Fort St. Pierre	Om	.42	.44	.52	.59	.76
Franceville	Om	—	—	—	.10	.10
Frankfort	Ho	7.30	—	4.00	4.13	5.56

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Futtehpur	Cwa	.96	—	1.00	—	—
Ghambat	Cia	—	1.04	—	—	—
Gilgoin	Ck	—	—	.18	.11	.11
Girgenti	Cwa	.96	1.00	1.23	2.07	2.07
Glorieta Mountain	Om	.13	.25	.20	.12	.12
Gnadenfrei	Cc	1.60	5.00	—	1.00	1.00
Gnarrenburg, see Bremervörde.						
Goalpara	U	5.63	—	3.00	—	—
Goamus, see Mukerop..						
Grand Rapids	Of	.35	.16	.13	.13	.19
Great Fish River	Of	1.70	—	—	2.50	2.50
Grosnaja	Cs	.96	3.25	2.07	1.00	1.00
Gross-Liebenthal	Cwa	.93	1.75	.89	.50	.88
Grüneberg	Cga	2.02	—	1.00	—	—
Guareña	Ck	.58	—	1.50	—	—
Hainholz	M	.45	—	.35	.38	.38
Harrison County	Cho	2.43	—	—	1.00	1.00
Hartford (Linn County) see Marion.						
Heredia	Ccb	2.02	—	—	3.50	3.50
Hessle	Cc	.45	.89	.44	.38	.42
Hex River	H	.35	.14	.17	.50	.50
Holbrook	Cck	—	—	—	.09	.09
Holland's Store	Ha	.93	—	.37	—	—
Homestead	Cgb	.22	.15	.15	.10	.15
Honolulu	Cwa	.96	1.31	1.18	2.00	2.00
Hopper	O	—	—	1.20	—	—
Hraschina, see Agram.						
Huejuquilla, see Chupaderos.						
Hungen	Cga	4.70	—	4.00	—	—
Hvittis	Cck	—	—	—	.98	.98
Ibbenbühren	Chl	4.35	—	1.50	1.50	1.50
Ilimaë	Om	.38	—	—	.25	.25
Imilac	Pi	—	.34	.13	.17	.19
Inca, see Llano del Inca.						
Indarch	Kca	1.60	2.32	2.17	.89	.89
Independence, see Kenton County.						
Indian Valley	Ha	—	—	—	.74	.74
Indio Rico	Ck	—	—	—	2.50	2.50
Iquique	Dc	2.43	—	.90	—	—
Iredell	H	—	—	—	1.49	1.49
Ivanpah	Om	.26	—	.65	.14	.14
Jackson County	Om	1.63	—	—	3.03	3.03
Jamestown	Of	1.28	.36	.28	.43	.62
Jamyscheva, see Pavlodar.						
Jelica	Am	.96	.37	.38	1.50	1.50
Jenny's Creek	Og	.64	.66	.53	.30	.39
Jerôme	Cck	—	—	.60	.20	.20
Jewell Hill	Of	.45	1.57	.77	.75	.75
Joel's Iron	Om	.74	1.70	—	1.67	1.67
Joe Wright Mountain..	Om	.19	.37	.24	.29	.29

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Jonzac	Eu	1.89	—	2.25	—	—
Juncal	Om	.16	.96	.52	—	—
Juvinas	Eu	.58	1.11	1.80	.49	.53
Kaande, see Oesel.						
Kaba	K	2.08	—	2.74	—	—
Kakangarai	Stone	—	—	1.86	—	—
Kansada, see Ness County.						
Karakol	Cw	2.75	—	2.00	—	—
Karand, see Veramin.						
Kendall County	Hb	—	.26	.22	.18	.25
Kenton County	Om	.16	.16	.09	.06	.07
Kermichel	Ck	—	—	—	1.48	1.48
Kernouvé	Cka	.35	.67	.51	.42	.46
Kesen	Ccb	.93	.52	.26	.13	.18
Khairpur	Ck	.58	—	1.71	1.67	1.67
Kilbourn	Cga	—	—	—	4.67	4.67
Kingston	Om	—	—	—	.40	.40
Klein Menow	Cck	1.60	1.30	—	1.23	1.23
Klein Wenden	Ck	.93	—	.74	—	—
Knyahinya	Cg	.19	.17	.13	.08	.13
Kodaikanal	Obk	—	—	—	.60	.60
Kokomo	Dc	2.02	—	—	4.31	4.31
Kokstad	Om	.51	.50	—	—	—
Krähenberg	Cho	.99	—	3.00	—	—
Krasnojarsk, see Medwedewa.						
Krawin, see Tabor.						
Kuleschovka	Cwa	.74	—	—	1.00	1.00
La Baffe, see Epinal.						
La Bécasse	Cw	2.75	—	1.04	—	—
Laborel	Cib	—	1.25	1.00	—	—
La Caille	Om	.06	.64	.78	.79	.79
La Grange	Of	.35	—	.37	.60	.60
L'Aigle	Cib	.74	.39	.29	.18	.20
Lancé	Kc	.54	—	1.30	.90	.95
Lançon	Cia	—	1.06	.82	.82	.91
La Primitiva	Dp	1.09	1.06	—	—	—
Lasdany, see Lixna.						
Laurens County	Of	—	—	.90	—	—
Lea Iron, see Cleveland.						
Leighton	Cgb	—	—	—	2.86	2.86
Lenarto	Om	.16	.50	.23	.25	.29
Le Pressoir	Cc	2.02	4.25	2.52	1.25	2.12
Les Ormes	Cw	7.87	—	4.00	—	—
Lesves	Cw	—	1.32	1.13	—	—
Le Teilleul	Ho	9.89	—	3.00	—	—
Lexington County	Og	.54	—	.25	.27	.27
Lick Creek	H	.99	1.25	—	—	—
Lime Creek	H	.22	.75	.24	.21	.21
Limerick	Cgb	.51	—	1.19	.83	.83
Linn Co., see Marion.						
Linnville	Db	7.65	—	1.50	6.00	6.00
Lion River	Of	.26	.64	.38	.38	.38

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Lissa	Cwb	.58	1.22	.97	—	—
Little Piney	Cc	—	—	—	5.00	5.00
Lixna	Cga	.74	1.56	.81	1.00	1.00
Llano del Inca	M	.74	.14	.13	.04	.07
Lockport, see Cambria.						
Locust Grove	Ds	—	.27	.15	.38	.38
Lodran	Lo	15.71	5.65	3.65	—	—
Long Island	Cia	.32	.11	.09	.08	.10
Losse, see Barbotan.						
Losttown	Om	.54	.34	.26	—	—
Lucky Hill	Om	.77	—	—	1.00	1.00
Luis Lopez	Om	—	—	.28	.25	.27
Macao	Cia	1.22	—	1.75	2.86	2.86
Macquaire River	M	—	—	—	.91	.91
Madoc	Of	.22	1.25	—	—	—
Maêmê	Cia	—	.59	.63	1.50	1.50
Magura	Og	.13	.15	.09	.10	.10
Mainz	Cia	—	1.27	1.10	—	—
Manbhoom	Am	2.62	2.52	2.10	2.14	2.55
Mantos Blancos	Of	.99	—	—	.38	.95
Marion	Cwa	.67	.55	.30	.30	.37
Marjahlatti	Pi	—	—	—	.44	.44
Mart	Off	—	—	.57	—	—
Mauerkirchen	Cw	.99	1.84	.79	—	—
Mazapil	Om	.77	—	3.40	5.59	5.59
McKinney	Cs	.86	.17	.16	.08	.12
Medwedewa	Pk	.10	.47	.22	.24	.25
Mejillones	Mg	—	—	.20	1.00	1.00
Menow, see Klein Menow.						
Merceditas	Om	.19	.31	.35	.25	.29
Mern	C	—	—	—	.71	.71
Mezö-Madaras	Cgb	.45	1.75	.72	.31	.31
Mhow	Ci	3.55	—	.85	—	—
Midt Vaage, see Tysnes.						
Mighei	K	1.60	3.00	1.79	1.24	1.25
Mikenskoi, see Grosnaja						
Milena	Cw	1.60	1.45	.97	1.00	1.00
Minas Geraes	Cwa	2.18	—	—	1.82	1.82
Mincy	M	.26	.17	.17	.14	.17
Misshof	Cc	1.22	.95	.64	.64	.67
Misteca	Om	.22	.35	.14	.11	.18
Mocs	Cwa	.26	.11	.08	.08	.10
Modoc	Cwa	—	—	—	.40	.41
Molina	Cgb	.35	—	2.85	2.50	2.50
Monroe	Cga	.86	.67	.69	.90	.95
Mooranoppin	Ogg	—	.95	.62	—	—
Mooresfort	Ccb	.96	1.85	1.13	2.00	2.00
Mordvinovka	Cw	1.31	—	—	1.25	1.85
Morristown	Mg	—	.20	.14	.12	.21
Motta di Conti	Cc	1.28	—	.57	.38	.38
Mount Browne	Cc	—	—	—	1.47	1.47
Mount Joy	Ogg	.26	.05	.10	.06	.08
Mount Stirling	Og	—	.22	.17	.17	.17
Mount Vernon	Pk	—	—	—	.36	.36

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Muchachos, see Tucson.						
Mukerop (exact loc. ?)	Off	—	—	.10	.10	.12
Mukerop (Amalia Farm)	Off	—	—	—	.04	.04
Mukerop, (Goamus)	Off	—	—	—	.06	.06
Mungindi	Off	—	.25	.19	.15	.19
Muonionalusta	Of	—	—	—	.75	.75
Murfreesboro	Om	.45	1.27	.32	1.27	1.27
Murphy	H	—	—	.22	.14	.14
Nagaya	K	2.08	1.85	—	1.50	1.75
Nagy-Vazsony	Om	1.02	—	.70	—	—
Nammianthal	Cca	2.75	—	—	.75	.75
Nanjemoy	Cc	.96	.70	1.25	2.86	2.86
Nejed	Om	.19	—	.33	.11	.11
Nelson County	Ogg	.45	.25	.16	.12	.19
Nenntmansdorf	H	.45	—	.55	—	—
Nerft	Cia	.74	.85	.69	.75	.75
Ness County	Cib	—	.25	.12	.07	.07
Netschaëvo, see Tula.						
New Concord	Cia	.26	.62	.31	.22	.38
Newton County, see Mincy.						
Ngawi	Ccn	5.79	3.84	1.80	—	—
N'Goureyma	Obzg	—	—	—	.33	.33
Niagara	Og	—	—	—	.50	.50
Nobleborough	Ho	15.71	—	3.50	—	—
Nocoleche	Om	—	.60	.25	.28	.39
Novo-Urei	U	5.63	4.00	3.58	2.25	3.12
Nulles	Cgb	.93	—	3.00	—	—
Oakley	Ck	—	—	.14	—	—
Obernkirchen	Of	.35	.65	.37	.75	.75
Ochansk, see Tabory.						
Oesel	Cw	1.89	1.20	1.10	.72	.87
Okniny	Cgb	2.62	—	2.12	1.50	1.50
Old Fork, see Jenny's Creek.						
Orange River	Om	.16	.71	.82	—	—
Orgueil	K	1.28	1.47	.82	.50	.75
Ornans	Cco	3.39	2.50	1.62	4.00	4.00
Oroville	Om	—	—	.44	.22	.22
Orvinio	Co	4.48	1.32	1.69	1.20	2.15
Oscuro Mountains	Og	—	.47	.38	.25	.49
Ottawa	Cho	—	2.75	—	—	—
Pacula	Cwb	4.13	1.09	.74	1.00	2.00
Pallas, see Medwedewa.						
Parnallee	Cga	.35	.40	.51	.34	.52
Pavlodar	Pk	.74	1.15	.90	.64	.66
Pavlovka	Ho	5.79	—	1.08	—	—
Penkarring Rock, see Youndegin.						
Petersburg	Ho	6.62	—	—	10.00	10.00
Petropavlovsk	Om	.58	—	2.29	—	—
Pila, see Rancho de la Pila.						
Pillistfer	Ck	.35	.95	.95	.69	.82

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Pipe Creek	Cka	2.69	.32	.14	.17	.17
Pirgunje	Cwa	3.97	—	—	1.50	1.50
Pittsburg	Ogg	—	—	1.14	—	—
Ploschkowitz	Ccb	—	—	—	10.00	10.00
Plymouth	Om	1.09	.24	.18	.18	.26
Politz	Cwa	.96	1.87	1.10	—	—
Powder Mill Creek, see Crab Orchard.						
Prairie Dog Creek	Cck	5.12	.60	—	—	—
Prascoles, see Zebrak.						
Primitiva, see La Primitiva.						
Pultusk	Cgb	.19	.07	.05	.05	.07
Puquios	Om	.35	.65	.57	.57	.57
Putnam County	Of	.45	.60	.56	.89	.89
Quenggouk	Cc	.74	1.07	.79	1.00	1.00
Rakovka	Ci	1.22	—	1.43	.80	.80
Ranchito, see Bacubirrito.						
Rancho de la Pila	Om	.19	.64	.17	.18	.18
Rasgata	Ds	.06	—	.32	.42	.59
Red River	Om	.06	.25	.35	.37	.37
Reed City	Om	—	—	.15	.13	.26
Renazzo	Cs	1.12	2.50	1.79	—	—
Rhine Valley	Om	—	—	.25	.50	.50
Richmond	Cck	3.10	—	2.11	1.20	1.20
Rittersgrün, see Steinbach.						
River Brazos, see Wichita.						
Rochester	Cc	3.04	—	2.58	—	—
Roda	Ro	10.14	—	6.00	—	—
Rodeo	Om	—	—	—	.15	.23
Roebourne	Om	—	.20	.14	.10	.13
Rokicky, see Brahin.						
Roquefort, see Barbotan.						
Rosario	Og	—	.92	.38	.29	.29
Rowton	Om	.54	—	3.30	—	—
Ruff's Mountain	Om	.19	.45	.34	.21	.23
Russel Gulch	Of	.58	—	.47	.96	.96
Sacramento Mountains	Om	—	—	.11	.08	.08
Saint Denis Westrem	Cca	3.39	3.12	2.81	1.00	1.00
Saint Francois County	Og	.54	.35	.28	.38	.38
Sainte Genevieve Co.	Of	—	—	.12	.11	.11
Saint Mesmin	Cib	1.57	2.12	.68	1.41	1.41
Saline	Cck	—	—	—	.20	.21
Salles	Cia	.96	—	—	1.00	1.00
Saltillo, see Coahuila.						
Salt Lake City	Cgb	2.75	—	—	1.00	1.00
Salt River	Off	—	—	—	.91	1.45
San Angelo	Om	—	.15	.12	.10	.11
Sancha Estate, see Coahuila.						
Santa Apolonia	O	—	—	—	.05	.05

Name (Locality).	Symbol	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Santa Rosa	Obz	—	—	—	.15	.15
Sao Juliao de Moreira	Ogg	.35	.15	.12	.11	.13
Sarbanovac, see Soko-Banja.						
Sarepta	Og	.35	.32	.51	.31	.31
Saurette, see Apt.						
Savtschenskoje	Cck	5.12	2.50	2.10	—	—
Schönenberg	Cwa	.93	2.36	2.62	—	—
Scottsville	H	.45	.22	.15	.25	.37
Searsmont	Cc	1.60	—	2.98	2.61	2.61
Seeläsgen	Ogg	.45	.27	.17	.13	.16
Segowlee	Ck	.74	—	—	.71	.71
Seneca Falls	Om	.54	—	.61	.73	.73
Senegal River	Ds	.74	.50	1.00	2.00	2.00
Senhadja	Cwa	.74	—	.75	.59	.79
Seres	Cg	.93	—	1.10	—	—
Sevrukovo	Cs	.45	2.20	2.01	—	—
Shalka	Chl	3.46	2.81	—	2.00	2.00
Shelburne	Cg	—	—	—	.25	.46
Shingle Springs	Dsh	—	.75	—	.50	.65
Siena	Ch	1.28	2.31	2.13	—	—
Silver Crown	Og	.45	.34	.26	.22	.24
Siratik, see Senegal.						
Sitathali	Cho	2.14	—	1.00	—	—
Slobodka	Cc	3.97	—	—	3.00	3.00
Smith's Mountain	Of	.93	—	1.08	—	—
Smithville	Og	.26	.13	.11	.09	.09
Soko-Banja	Cc	.45	.46	.41	.29	.38
Ställdalen	Cgb	.45	.79	.65	.40	.49
Stannern	Eu	.74	.51	.34	.39	.40
Staunton	Om	.16	.22	.18	.09	.15
Stavropol	Ck	1.25	—	2.58	1.00	1.00
Steinbach	Si	.58	.51	.46	.34	.36
Stutsman County, see Jamestown.						
Summit	Ha	—	—	—	5.47	5.47
Tabor	Ccb	.74	1.09	1.05	.76	.93
Tabory	Ccb	.26	.25	.27	.14	.20
Tadjera	Ct	3.39	3.00	—	5.00	5.00
Taney County, see Mincy.						
Tazewell	Off	—	.66	.36	.32	.32
Tennant's Iron	Og	—	—	—	.75	.75
Tennasilm	Cca	.93	2.02	1.05	1.00	1.00
Thunda	Om	.26	.45	.20	.15	.17
Thurlow	Of	—	.66	—	—	—
Tieschitz	Cc	.54	2.07	—	—	—
Timochin	Cc	.35	—	.73	.74	.87
Tjabe	Ck	.45	—	.85	1.00	1.00
Toluca	Om	.06	.05	.06	.02	.04
Tomatlan	Cc	—	—	—	1.50	1.50
Tombigbee R. (Jachin)	Ha	—	—	—	.21	.21
Tomhannock Creek	Cgb	1.60	1.95	1.59	.50	2.25
Tonganoxie	Om	—	.32	.16	.22	.22
Torre, see Assisi.						

Name (Locality).	Symbol.	Wülfing Exchange Value 1897.	Cohen Collation, Med. 1899.	Ward Collation, Med. 1904.	Foote Collation, Lowest.	Foote Collation, Med. 1912.
Toubil	Om	—	—	—	.71	.73
Toulouse	Cia	2.62	—	—	—	—
Tourinnes-la-Grosse	Cw	1.44	1.50	.87	.88	1.03
Trenton	Om	.19	.31	.17	.14	.14
Trenzano	Cca	.99	.72	.70	.64	.79
Tucson	Dm	.06	.68	.33	—	—
Tula	Obn	2.69	.95	.76	.62	.84
Tysnes	Cgb	.54	.85	.53	.38	.62
Uden	Cwb	4.35	—	2.25	2.00	2.00
Union County	Ogg	1.28	—	1.12	.67	1.06
Utah, see Salt Lake City						
Utrecht	Cca	1.25	2.25	.83	.50	.75
Vaca Muerta	Mg	.35	.59	1.03	.26	.26
Vavilovka	Ro	—	—	—	5.00	5.00
Veramin	M	1.57	6.25	2.81	1.78	2.20
Verkhne Dnieprovsk	Off	—	.87	—	.50	.50
Verkhne Udinsk	Om	.26	.49	.50	.43	.46
Victoria	Om	.22	4.20	.61	2.80	2.80
Vigarano Piave	K	—	—	—	.25	.25
Virba	Cwa	1.63	.50	—	—	—
Vouillé	Cia	.58	1.27	.77	.50	.73
Waconda	Ccb	.58	.47	.19	.12	.15
Wairarapa	C	—	—	—	1.50	1.50
Waldron Ridge	Og	.58	—	.22	—	—
Walker County	H	.22	—	—	.65	.65
Walker Township, see Grand Rapids.						
Warrenton	Cco	4.48	1.80	1.31	4.00	4.00
Welland	Om	.35	.25	.28	.34	.41
Werchne Dnieprowsk, see Verkhne Dnieprovsk.						
Werchne Udinsk, see Verkhne Udinsk.						
West Liberty, see Homestead.						
Weston	Ccb	.58	.60	.45	.50	.54
Wichita	Og	.13	.30	.17	.16	.19
Willamette	Om	—	—	—	.17	.17
Williamstown	O	—	—	—	.19	.22
Winnebago County, see Forest City.						
Wirba, see Virba.						
Wittness	Cc	1.60	2.25	—	2.50	2.50
Wold Cottage	Cwa	.45	—	1.27	2.60	2.60
Yanhuitlan, see Misteca.						
Yardea Station	Om	—	—	2.08	—	—
Yarra Yarra River, see Cranbourne.						
Yatoor	Cc	.74	1.29	—	.33	.33
Youndegin	Og	.10	.34	.17	.12	.14
Zaborzika	Cwa	—	—	—	1.00	1.00
Zacatecas	Obz	—	.40	.24	.07	.19
Zavid	Cia	—	.75	.40	.25	.30
Zebrak	Cc	1.60	2.10	—	—	—

Price Changes.—In comparing the medium prices of 190 falls collated alike by Cohen, Ward and Foote, we find that the average medium price decreased 27.4 per cent. from 1899 to 1904, and increased 18.6 per cent. between 1904 and 1912. Of all the falls collated in 1912, the following 52 have advanced in price more than one half since 1904: Alais, Auburn, Barranca Blanca, Bath, Beaver Creek, Bethlehem, Bishopville, Bridgewater, Cabezzo de Mayo, Cambria, Cape Girardeau, Casey County, Charlotte, Chassigny, Colfax, Coopertown, Cuernavaca, Daniel's Kuil, Danville, Duruma, Emmitsburg, Forsyth, Girgenti, Hex River, Honolulu, Jamestown, Jelica, La Grange, Linnville, Locust Grove, Macao, Maêmê, Mazapil, Mejillones, Mooresfort, Murfreesboro, Nanjemoy, Nocoleche, Obernkirchen, Ornans, Pacula, Putnam County, Rasgata, Reed City, Rhine Valley, Russel Gulch, Saint Mesmin, Scottsville, Senegal River, Victoria, Warrenton, Wold Cottage.

The following seventeen have decreased in price more than one half since 1904: Bischtübe, Black Mountain, Cañon Diablo, Castine, Chupaderos, Copiapo, Cranbourne (Melbourne), Grosnaja, Indarch, Ivanpah, Jerome, Juvinas, Mezö-Madaras, Nejed, Saint Denis Westrem, Stavropol, Vaca Muerta.

Rare Falls Become Less Available.—As a small meteorite is distributed among institutions which often acquire even less than they desire for their own purposes, it becomes increasingly difficult for others to secure it. Thus, of the 121 meteorites collated by Cohen in 1899 at 65 cents per gram or over, 29 per cent. are not in the 1912 market, whereas of the 120 collated at less than 65 cents, only 6 per cent. have disappeared from current catalogues.

The Cause of High Prices.—On this point an examination of Cohen's collation affords some interesting evidence. He collated 109 meteorites in 1899 which had been recorded by Wülfing in 1897, and of which the major part of each was held by one owner. Classifying them we find that:

1. Seven falls were quoted by four dealers controlling one to two falls each, at figures averaging 68 per cent. lower than Wülfing's values.

2. Sixty-one falls controlled by institutions or private indi-

viduals, were commercially quoted at figures averaging 5 per cent. lower than Wulfing. They controlled one to three falls each.

3. Forty-one falls controlled by the three oldest and largest institutional collections, were commercially quoted at figures averaging 45 per cent. higher than Wülfing. They controlled 8, 12 and 21 falls respectively.

These figures require some analysis before acceptance. It should be emphasized that they are not necessarily institutional prices, but rather prices asked by dealers for institutionally controlled falls.

We have noted that the sixty-one falls controlled by the smaller institutional and private collections afforded market prices 5 per cent. below Wülfing. That meant that their need of each fall controlled was less than the need of the "big three" institutions, whose controlled falls found market prices 45 per cent. higher than Wülfing. The smaller holders let their surplus stock go at low figures on exchange, being eager to advance the growth of their collections, or because they had merely local holdings of a nearby fall, or again because they were uninformed on values. The larger institutional owners, on the contrary, were probably well informed about relative values. Accordingly they parted with their surplus only on the most attractive offers. Moreover they required a larger proportion of each fall than did the smaller collections and had correspondingly less to part with, thus tending to advance the price. Summed up, the price of any fall depends somewhat on how willing the controlling owner is to part with his property, the demand being fully established. However, as with all commodities, such demand varies inversely with the price.

The Use of Wülfing's Tables.—In accepting the much criticized Wülfing formula as the only theoretical system of evaluation yet devised, one must do so with clearly expressed conditions.

Since some of Wülfing's critics apparently take his approximations as more exact than he intended them to be, let us in fairness read his words on p. 431. "Even though I only succeed in establishing the standard of value to such an extent that one may at least say: the value of such a meteorite is not more than double nor less

than half the given figure—even that would be an advance over the present fearful confusion prevailing on questions of value." While Wülfing's formula has a large probability of error on account of his exclusion of several highly important factors, it must be remembered that without it or some similar system, meteorites would be valued by a "rule of thumb," the elasticity of which is frequently felt in the wide limits shown by exchange and market prices.

It is certain that Wülfing's work has lessened the absurd variations in value which abound in exchanging, and that it has also aided in regulating trade prices. It is therefore to be hoped that a new edition may be published in the not distant future. Nearly two hundred meteorites are known besides the 536 which he recorded, while the number of owners has increased. Unfortunately, Professor Wülfing replies, in response to a query, that he does not contemplate a revision.

Conclusion.—In the writer's opinion, no holder of a meteorite should divide it before considering current trade prices of similar falls, a practice which is already established in the present wide use of previous collations. Likewise he should consult Wülfing's tables, which are based on present known weight, group weight and number of owners. Finally, the exchanger should estimate the importance of the following factors: Weight of specimen offered; observation of fall; area of slice offered; phenomenal variation between individual specimens; distinctness of structure; missing portions; historical interest.

It is certain that the stabilizing influence of a fuller consideration of values by meteorite exchangers will tend to dispel an already lessening hesitation among institutional owners, and result in that freer distribution which Buchner and Wülfing sought to bring about. With its achievement, the advancement of this unfamiliar but growing science will have been distinctly furthered.