

I was born on a ranch some three miles South of Salinas, Monterey County, California, On November 10th, 1875. When about 8 years old, my father donated an acre of land for school purposes, and the Llano School district was formed, and a One room school was built and occupied. When was 2 or three years older, we moved to Salinas, so that my brother and myself could attend a grade school. Finished grammar school and through high school in 1895; then entered Stanford. Between 1895 and 1902 got in about 2½ years, in Civil Engineering courses. In the periods was not able to attend the University, worked on ranches, and about 1898 worked for about a year with a grading crew for the Spreckels people, preparing their lands for irrigation and the sugar beet industry.

In 1902, June if remember correctly, went to work for the Southern Pacific as a rodman on the Coast Division. During that summer and fall, general maintenance work, laying out industrial spurs, staking out culvert and bridge extensions, and cross-sectioning for Second Trach, San Francisco to San Jose. Next was engineer in charge, General time and material clerk, on a bridge across the Salinas River, at Neponset, on the Monterey Branch, Concrete piers and abutments on a pile foundation, with steel through span, four or five in number. After this retraced the line from Santa Margarita to San Luis Obispo, set center stakes and top of rail stakes for replacing gravel ballast with crushed rock. At that time was getting \$80 per month, with expenses when away from San Francisco. Between then and the fire in 1906, was in charge of building extensive additions and rearrangments in the Mission Bay yard, and a new Mission Bay Roundhouse, turntable and tracks to serve. In the winter of 1905-1906, was transferred to the San Joaquin Division, Bakersfield to Los Angeles, but did not stay long. Did not suit the then Resident Engineer, and was fired. Went to San Francisco, just after the 1906 Quake, and went to work for the Location department, first under William Hood. Was Transitman on preliminary and location surveys from 1906 to 1914; first on a line from Pleasanton to San Ramon; Retrace line from Boca east toward Reno; Preliminary and location of the line from Niles to Redwood City, across the lower end of San Francisco Bay at Dumbarton; then to the Salton country where located the one hundred feet below sea level line, a nice summer line, with temperature of 90° to 136°, as remember. We had 3 crews; one coming, one working, and one going. At that time weighed about 170, but the heat brought my weight down to 125 when we finished the job. From then on was on a number of location jobs, all north of the Bay. About 1910 went to WXXXXXXXXXX the Northwestern Pacific, Ran a line from Healdsburg to Wendling, and preliminary Willits to the Eel River along the Outlet; then along th Eel to Fort Seward, and located same. On this job had to assemble data for all colverts, XX bridges, channel changes in tributatory streams, and Tunnels. As this was a Summer Job, on aset of high water in winter, one winter located new line Northwood to Monte Rio, and tapered curves, for broadgaging monte rio to Duneans. One winter worked on construction Rocklin to Colfax, and another winter made maps for Revaluation, with necessary surveys, and assembling data for the revaluation for the I.C.O.

In the spring of 1914 had a run in with the Asst. Chief Engineer, and was fired. Went to San Francisco, but nothing doing in my line, so enlisted in the 3rd Engineers, for service in the Philippine Islands. Landed in Jan. 1915 and was immediately put in charge of a party making a 5' interval contour map of the Island of Corregidor, followed by surveys around Fort McKinley, followed by observations for azimuth, base line work, and determination

of mean high tide for basis of contouring, for the northern part of the island of Luzon, along the Cayagan River Basin, and connection across to Bagio. We worked here during the Dry Season, then to Manila, and office calculations and assembling the field sheets for tracing by Filipino draftsmen. We were doing the same type of work as that of the secondary surveys of the Geological Survey in the States, with a probable error of one tenth of a second for azimuth, and a corresponding probable error in base line work, and distances between triangulation stations. On this work, and other surveys of the same class, I sure learned a lot about accurate work. Observations on Polaris for Azimuth, Base line work, determination of different tide levels, and all kinds of contouring and map work.

During this period, from arrival in the Islands to the date of our entry into the First World War, went from buck private to SFC, to lance corporal, corporal sergeant, and passed the examination for master sergeant, senior grade, in the Engineers, but never got the warrant, as was given a Temporary Commission as Second Lieutenant in the Infantry, and assigned to the construction Quartermasters department, and sent to Corregidor in charge of construction and repairs of all installations, housing sewerage and water supply, with the necessary shops and equipment to carry on. Continued at Corregidor until the 27th and 31st Infantry, brought up to full war strength, were sent to Siberia, with the object of keeping the Trans Siberian Railroad open for traffic. We landed in Vladivostok, and started west to pick out posts along the Trans Siberian; Was left at a point about 100 miles out, and while inspecting abandoned Russian barracks for quarters that could be used for our battalion as winter, was recalled to Vladivostok, and handed a letter authorizing me to spend any money necessary to provide winter quarters for those troops stationed in or near Vladivostok, and also provide all facilities and buildings necessary for hospitalization required for troops in Siberia. It also was necessary to provide a ~~distilling~~ distilling plant for drinking water, and in connection with this plant, we utilized the waste water used in distilling for a bank of showers for all troops. As soon as this work was well under way, all plans made, and checked, and got a chance to relax, the Quartermaster stuck me with the motor transport, and had to provide winter quarters for them and their equipment, with an expected temperature of -40° , with winds of up to 50 miles per hour. Also had to remodel three railroad erecting shops, built by the Baldwin people, as warehouses for supplies for 10,000 troops, and keep the temperature in the one handling canned goods, at a temperature around $+40^{\circ}$, while the outside temperature was -50° .

In the spring following the armistice, three engineer officers were sent over from the States to relieve me, and was returned for duty with 31st Inf. As in the time had been in the Islands and Siberia, had never served with troops, and hardly knew the difference between squads right and right face, my request for discharge was approved, and caught the next transport back to the States, and was discharged, as a First lieutenant on May 27th, 1919, at San Francisco.

After getting into civilian clothes, visited with my father and mother at Pacific Grove, and got acquainted with my sister-in-law and her people in Berkeley, and then had sworn, when left Siberia, that would never go to a cold place again, when offered a job as resident engineer on construction with the Alaskan Railroad Commission, was foolish enough to accept. Went up by boat to Skagway, then by narrow gauge railway to White Horse on the Yukon, and then by river boat down the Yukon to the Tanana, and then up this river to Fairbanks headquarters for the next year.

This was a new one for men as it was only two to four feet from the surface to perpetual frozen ground. Worked straight thru that winter, except when it was over 40° below zero, when had to lay off outside work. This condition prevailed the following winter on Broad Pass, though the field parties did not work when it was over 30° below, as impossible to keep legible notes. Even at that, everybody, both engineers and contractors, by working whenever possible.

Averaged over 24 days per month. Dont know which was the worst, the cold, and wind during the winter, or the mos quitos and gnats during the summer and fall.

During the late spring of 1921, just before the ice went out in the small streams, had an explosion of a $\frac{1}{2}$ ton of black powder and $\frac{1}{2}$ ton of T N T, just unloaded by a couple of dog teams, close to the camp of a small contractor, and also close to a shallow cut where men were working. My handling and promises to the contractor led to a row with the Engineer in charge of the northern division, and to my resignation.

Back in San Francisco, landed a job with the S P Co, Western Division, Worked part of the time in the field on realignment and resurfacing from Niles to Tracy, and a multitude of small jobs ; then a couple of years as Office Engineer. As usual, got in a row with the Asst, to the Division Engineer, and arranged a transfer to the Coast Division, where stayed until the spring of 1930, when got sick of the way things were going, and as these were layoffs coming, and I was the only single engineer, walked off the job.

In the winter of 1930-1931, went to work for the Meeker's at Camp Meeker, renovating the water system, Stayed with them until 1939, when quit on acct pay and policy in matter of extensions.

From that time until the present worked as a private land surveyor, and did the engineering work on some 10 or 12 subdivisions, as well as staking lots, retracing old surveys, and partitioning various ranches and properties.

Some four or five years ago was appointed to the County Planning Commission and took an active part in all matters affecting subdivisions, road acquisitions and abandonments, and those matters requiring an engineering background, until this year, my health was not too good, and had to slack up.

Was ill for a month, and then on August 19 went to the General Hospital at Santa Rosa for treatment; and was discharged Nov. 9, and unless complications occur, should be, as regain strength, in good shape for office and light field work by the end of this year.

Note: George died July 29, 1965 @ 90

Dick Hogan LS2798

G. S. ABBOTT
LICENSED LAND SURVEYOR

23 BOHEMIAN ROAD
CAMP MEEKER, CALIFORNIA

BOUNDARY SURVEYS AND RETRACEMENTS:

In order to retrace surveys in Sonoma County, it is vital that the Surveyor have an understanding of how the original surveys were made, and the approximate degree of accuracy involved in both the bearings and distances as recorded on maps and in deed descriptions.

Practically all deeds and grants are based on surveys by the Bureau of Lands in the period of 1855 to 1870. From the records it appears that in Sonoma county, the following procedure was followed; First, the Township lines were run, with Mt Diablo as the base for base lines and meridians; Then the different rancho lines were run, with ties where they crossed the Township lines, then the remaining lands in each Township was subdivided into Sections, and the section corners and 1/4 section corners were set. In most instances the fractional corners, where the section lines intersected the rancho lines were set, but only in rare instances were ties made from said fractional corners to a station on the Rancho line itself. These surveys were all that the Bureau made. The subdivision of the individual sections and of the Ranchos was done by private land surveyors, at the request of, generally, the purchaser of the particular tract. In the case of subdivision of sections, it was proposed that the rules laid down by the Bureau of Lands as to subdivision of sections, be followed, in staking the lines of the various U S Patents, in succeeding subdivisions in the sectionized lands, and in the Ranchos was to location, entirely up to the landowner or his successor in title. Further investigation leads to the belief that part of the ranchos were surveyed before the Township lines were run, especially in the Llano de San Rosa area and south of there, where the Rancho holdings were continuous.

In the subdivision of sections, and the retracing of section lines, we must take into consideration the methods used in the original surveys, both for azimuth and chaining. As far as can be determined from the notes of the original surveys, it appears that the instrument used to determine bearings was the magnetic compass, probably with the Jacob Staff, though some may have used a tripod. It is also probable that the compass was equipped with a ring so that the magnetic declination could be set, so that true magnetic bearings could be read direct, to the nearest 1/4 degree. With the compass in running a line, the procedure was to set up at the initial station, then line in the chainmen, and send an axeman ahead to set the first instrument point; as soon as set, the compass man went ahead and occupied that station, letting the chainmen keep on line the best they could, keeping note of crossing of streams and ridges, and giving to compassman when came up to him, for his record. When the line was produced ahead, the compassman could get a rough check on his last station, but generally relied on his needle for line; if there was a noticeable local attraction, he might take into consideration and record same. In 13 sets of field notes, have found only one who reported local magnetic variation; all the way from 2 1/2° E to 1° W. When it was also common practice, where the line fell through a tree, to set on the far side, on an estimated point where the line fell, and go ahead; It can be readily seen that, where there was any local attraction, every line was on a different base bearing, and that there was an angle, varying with the amount of local attraction, at nearly every instrument point.

As to chaining, it was common practice to use a chain with 100 links.

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Aug 15, 1958.

Northern California Section, A O S M.
 Mr William A White, Secty-Treas.

Dear Mr White; Re your Newsletter of the 12th inst;

Have been interested in land surveying since was a boy in the Salinas Valley, and while did a considerable amount of boundary work while with the Southern Pacific and the Northwestern Pacific, did not devote my entire time to that class of engineering until in the 1930's.

The greatest drawback to the present system of descriptions is that they are based, as to bearings, on readings of the Magnetic Needle. In looking over the field notes for the subdivision of T 7 N, R 10 Wm MDB&M, find that the surveyor noted local attraction of from $2\frac{1}{2}^{\circ}$ E to 1° W. On a line ran north for some 58 Stations, kept a rough check on the variation in year 1947, and in the first 20 stations, had a variation of from $17^{\circ}4'$ to $19^{\circ}45'$ E, while for the next 20 stations the variation was from $18^{\circ}45'$ to $19^{\circ}15'$ E. Today was going over an Assessor's Map, and noted they gave the bearing of the C/L of the N W P as $N 18^{\circ}03\frac{1}{2}'$ W, with the R/W line as $N 2^{\circ}$ while from a polaris observation made it $N 17^{\circ}52'$ W.

It wouldn't be so bad if every individual deed used the same basis the way thru a description, but find many with two, and sometimes more, different bases. Remember one parcel, where the south line was a public road. The base used was $0^{\circ}45'$ from the Astro bearing, and the West and North lines were an average of $0^{\circ}30'$ the other way, or a spread of $1^{\circ}15'$, and the closure was some 70 feet in $1\frac{1}{2}$ miles.

Besides myself, know of only two engineers who ever base work on Solar Observations, and the only where they have to. Personally do not know what any in this area ever take a star observation. Personally, have based my work on star observations, with a Solar to check where was not a closed survey.

As to the California Coordinate System, here are my Views.
 It should be used in highly valuable and congested areas, Los Angeles and the Bay Cities; but not in the farming country, nor the mountains, where we have no control stations that are available. On the new Camp Meeker Quad, have only one triangulation station shown, and that is on a wooded knoll, where in observing they used height of instrument of over 27 meters.

My work for the last 20 years has been in the Occidental, Camp Meeker, Monte Rio, Guerneville areas, and have established an Astro base with the first work did in these locations. All work in T 7 N, R 6 & which is four miles in width, is based on an observation at Occidental, about the center of the strip. The first corner found, the SE $\frac{1}{4}$ Sec 25, was used as basis of coordinates. This made any correction to true on the limits of the strip only $0^{\circ}01\frac{1}{2}'$, and worked out O K in practice. All work Monte Rio to Sheridan on an Observation at Monte Rio, Mesa Grande

and Sheridan. Work at Guerneville-Rio Nido on original observation at Guerneville.

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LICENSED LAND SURVEYOR

23 BOHEMIAN ROAD
CAMP MEEKER, CALIFORNIA

Aug. 16, 1958.

Dear Bill.

Re your Newsletter of Aug 12th.

After a lifetime devoted to field work in Civil Engineering and Land Surveying, covering some 65 years, backed by high school education, with 2½ years, C E Major, at Stanford, have a wee glimmering of what is needed for a Qualified Land Surveyor. Held Liscence No 3748, Civil Engineer but due to a mixup in 1931, it lapsed, while was out of State, and later was issued LS-2297.

My personal opinion is that no man is qualified for land surveying, especially Boundary work, until he has had experience in field work under a qualified Land Surveyor, for at least five years, and during that time has made a study, supplementary to his university work, of Standard work on Land Surveying and related subjects,

My personal reference books ar as follows;

Trautwine;
 Land Surveying- Hodgman,
 Field Engineering- Searles and Ives.
 Field Manual for Railroad Engineers, Nagle.
 Manual of Surveying Instructions, Bureau of Land Managment. 1947.
 Clark on Surveying and Boundaries.
 Ogden's California Real Property Law.
 Boundary control for Surveyors in California, Brown
 Boundary Control and Legal principles, Brown.
 Land Survey Descriptions, Wattles
 American Civil Engineering Practice, Abbett.
 Concrete Manual, Bureau of Reclamation,
 Septic Tank Practice, Public Health Service.
 Zoning- Bassett.
 Zoning Law and Practice, Yokley.
 Manual of Second and Third Order Traverse, U S C & G S.
 Manual of Triangulation Computations And Adjustment O & G S.
 Conservation, Planning and Zoning Law; State of Calif.
 Street and Highway Code
 Government of Counties

But when you come down to the basic requirements for boundary work, honesty and good common horse sense, along with continued experience and study,

Note: George died July 29, 1965 *Abbott*

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Oct 10, 1958

Comments on the use of Solar Observations in field survey work,

As background for qualification for to make an intelligent statement, the following is a list of the work on which have been engaged since 1902. Graduated from Salinas, Monterey County, High School in 1895, and in the period 1895 to 1902, got in two and one half years at Stanford, C.E. Major. 1902 to 1906, from rodman to Asst. Engr, Maintenance of Way, S P Co; General instrument work on construction, In responsible charge of party last three years.

1906 to 1914 Transitman and Field Boss, Location and construction, S P Co. All bearings based on observations Polaris at Elongation, No Solar. Instruments without vertical Arc.

1914 to 1919, U S Army, Military Survey Luzon, First order work for Azimuth Observation Polaris at any hour angle, Solar observations as check on long stadia traverse and three point work. Transitman and observer.

1919 to 1921 Asst Engr, construction Alaskan Railroad, Some star work, but only as check.

1921 to 1931. Construction and repair, S P Co. Some star work when necessary; no solar.

1931 to 1958 Land survey work, Practically all work based on Polaris Obsns. with solar observations as check on long traverses.

In the Phillipines, we found that the probable error in solar work was about $02'$, especially as we were using only as check on stadia traverse, where the probable error was 1 in 400, or better.

In Sonoma County, where most of my land work has been done since 1931, have generally followed the following pattern; Set instrument points, with azimuth points far enough away, so that would not have to change focus in pointing. Generally would have from six to ten points, grouped within a ten mile radius, and then would, on the first clear Friday night, with two assistants, start at the station farthest away, as soon as got dark enough for observation, and generally got done by one or two AM.

As to Solar work, generally tried to make the observation at a time in the AM or PM where the correction for refraction would not exceed $02'$, with a vertical angle not less than 25° if possible; Here, at latitude of $38^\circ 15'$ to $38^\circ 40'$ N. can generally get an observation some $2\frac{1}{2}$ to 3 hours before or after noon.

As to the observation itself, have in the later years followed the following procedure;
 First; Be sure that transit firmly set; that plate s are level, especially in direction of sun.

Second; check vertical vernier with telescope level that it reads ZERO. (The transit have been using has a floating vernier, so this is easy, with that machine.)

Third; Have developed a card holder, attachable to the telescope, and hinged so that can swing to one side while reading the horizontal angle. Attach this holder .

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LICENSED LAND SURVEYOR

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CAMP MEEKER, CALIFORNIA

Sept 29, 1961.

Origin of basis of Surveys in Sonoma County.

From the available records of the Surveyor General of California, Mount Diablo was made the base from which the Townships, sections and land grants surveys were made, starting in the early 1850's. These surveys were all made with magnetic compass and Gunthers chain, for bearing and length of lines, with an allowable error of one chain to the mile, to take care of errors in bearings and distances. Due to local attraction, on account of iron deposits in the rock formations, the lines as run are now found to not be straight lines, as shown on the Survey Notes official plats, nor are the distances anywhere near correct.

The property deeds in Sonoma County are all based on these original surveys, and in no case can they be depended on to be true bearings or distances. It is practically the universal practice, both by the forces of the County Surveyor and by Licensed Land Surveyors and Civil Engineers, to base their system of bearings on some line, using the bearing given for ~~that~~ line as shown on a recorded plat or in a recorded deed. This has led to there being a different basis of bearing, for nearly every survey, with consequent error in retracement. At this time it is practically impossible to replace any lost point on a property boundary in its exact former position.

To partially overcome this difficulty, the Government Code, Government of Counties, County Surveyor, Duties Generally, Section 27563, provides that "In all surveys the courses shall be according to the true meridian, and the variation of the magnetic meridian from the true meridian shall be expressed on the plat, with the date of the Survey. Webster's defines the meridian as a great circle on the surface of the earth ~~passing~~ through the earth's poles and any given point.

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LICENSED LAND SURVEYOR

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Memorandum re Boundary Surveys and retracements.

According to my concept, the object of a boundary survey is to retrace the original survey, as nearly as is physically possible, and set permanent monuments to mark on the ground the lines recovered and established; and to see that this data is made a matter of record.

I am firmly of the opinion that, before a surveyor starts on a retracement, he should have a precise knowledge of the way the original surveys were made, the allowable errors of closure, the instruments used for angular control, and the instruments and methods in chaining for distance control.

My
~~Exam~~ personal experience and observation covers the period from 1890 to 1960, over 90% of the time in actual field work, with every degree of accuracy from stadia surveys, to First Order base line, ~~and~~ triangulation and azimuth work, and for the greater part of that time in responsible charge of field work, with the last 30 years devoted primarily to land survey work. As to methods, will confine myself to the methods used in the area with which have done both the field work, and worked up the position of points found in the office.

The original work was done in this area, centering on T 7 N, R 10 W, M D B & M, in the period roughly from 1857 to 1867.

To start with, made pencil copies of the field notes from the Sonoma Co. Abstract Bureau, and later got photostats of the Township Plats and of the field notes from the Land Office.

As near as can reconstruct the procedure at that time, the Township lines were first established; then the boundaries of the Mexican Ranchos were established, and finally the Townships were subdivided into sections, and the section corners and 1/4 corners were set, with the fractional section

distance at outside of handle; Every 10 links marked with brass tag; 10 and 90, plain; 20 and 80, two prongs; 30 and 70, three prongs, and 40 and 60, four prongs, while 50 a large plain tag, You can readily see the chance of error at the 40 and 60 links, and in counting links from the nearest tag. As the weight of the chain was around Seven Pounds, it was nearly impossible to take an accurate suspended measurement of any but short distances, As I remember, on Railroad work, we used a chain of 100 feet, links of one foot, and think, but cant be sure, 3 short links and one long with the center of the 3 short as the foot mark; also remember that had a threaded turnbuckle at the rear end of chain, to take up wear at the 800 wearing surfaces, on the weekly check with the standard chain.

In actual chaining, it was standard practice to drag the chain on the ground, and on level, set the pin at the outside of the handle; On all slopes, it was common practice to pull the chain to its full length, then estimate the amount of setup and stick the pin accordingly; this meant that the chainmen, especially the head chainman, had to be able to estimate the slopes very closely, on rough ground, to get anywhere near a correct distance. There was also the chance that there would be an error in tally of pins at every 10 chains; where this was probably to occur, was where the station came on a rock or boulder, and the head chain forgot to leave a pin at the scratch at the station. You must remember that there was no stakeman to keep tally on the chainmen, and probably most of the time they had to determine their own line. A check of some 14 miles of line found that the short miles were about balanced by the miles that were long; In 549 chains the average length of chain was 99.35 links, while in 540 chains the average was 100.85, In two distances on which had a check, on the Bodega Rancho line, found as follows; The original distance from the Twp line between Tt 6 N. & T 7 N, to B-183 was north was 270.30 chains; the resurvey by Wahl was 267.92 chains while I made it 269.56; to B-183; from B 183 to B 184 , Original, 158.13 chains, Wahl 160.08 chains. I made it 158.98 chains.

corners where the section lines intersected Rancho lines.

In the field notes of the various surveyors, mention is frequently made ~~to~~ to the use of Compass and to Compassman, Whether they used a Jacob Staff or a tripod is not known, or mentioned, and in only one set of notes, by Christian Wahl, T 7 N, R 10 W, is any mention of local attraction of the needle mentioned. It seems to have been common practice, in subdividing a township, to check with and use the magnetic declination observed ~~on~~ check near the southeast corner of the Township to be subdivided, and use this variation throughout the Township. In the instance above noted, 7-10, there ^{are} numerous mentions of local attraction, all the way from $2\frac{1}{2}^{\circ}$ E, to 1° W. In the case of the $2\frac{1}{2}^{\circ}$ E, on the Bodega Rancho Line, make the bearing of this line S $89^{\circ}27\frac{1}{2}$ W, which accounts for $1\frac{1}{2}^{\circ}$ of this local; The north line of 21, where he notes a local attraction of $1\frac{1}{2}^{\circ}$ E, make the bearing S $88^{\circ}01'$ W;

In rough country like this, it was the habit of most compassmen, when set on a summit, to pick a point on the next ridge, and send an axeman ahead to set a line stake, lining in the chainmen until set, then ~~himself~~ going ahead himself, letting the chainmen keep on line the best they could, and perhaps noting topography. Another habit was to, on random lines, set over only every other station, reading bearing both ways, thus having a different basis of bearing for each pair of courses, ~~where there was an appreciable local attraction.~~ It was also common practice, when line struck thru a line tree, not to offset around it, but estimate where the line fell on the opposite side, and set up there, with the chance that local attraction would make this station an angle point.

As to chaining, the chain was of steel about $1/8''$ in diameter, of two lengths, the main links being 0.56 feet long, inside of loops at ends, and two smaller links, .05 ft long, giving an overall length of 0.66 feet, and having a wearing surface of six places for every link, or about 600 for the 66 foot chain, Brass handles at both ends, with swivel joint, took