

The Mineral Industry of South Dakota

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the South Dakota Geological Survey for collecting information on all nonfuel minerals.

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Nonfuel mineral production in South Dakota during 1983 was valued at \$222.3 million, a 64% increase over that of 1982 but \$5.6 million below the high set in 1980. The 1983 increase was attributed principally to the propitious advance in gold production and price.

Nine of the fourteen mineral commodities produced during the year had increased

outputs, and the same number registered value increases over those of 1982. Nearly three-fifths of the State's total mineral value was derived from gold. Among the non-metallic minerals, cement led in output value, followed by stone and construction sand and gravel, collectively comprising about 35% of the total value.

Table 1.—Nonfuel mineral production in South Dakota¹

Mineral	1982		1983	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:				
Masonry..... thousand short tons..	4	\$383	4	\$359
Portland..... do.....	520	27,978	603	37,435
Clays ² do.....	128	346	123	353
Feldspar..... short tons.....	W	W	7,109	107
Gem stones..... NA.....	NA	70	NA	70
Gold (recoverable content of ores, etc.)..... troy ounces.....	185,038	69,558	309,784	131,348
Sand and gravel (construction)..... thousand short tons.....	3,816	8,604	^e 5,100	^e 11,500
Silver (recoverable content of ores, etc.)..... thousand troy ounces.....	26	209	62	713
Stone:				
Crushed..... thousand short tons.....	^e 2,600	^e 7,400	3,906	12,982
Dimension..... do.....	^e 48	^e 16,270	43	15,952
Combined value of beryllium, clays (bentonite), gypsum, lime, mica (scrap), and value indicated by symbol W.....	XX	4,855	XX	11,432
Total.....	XX	135,673	XX	222,251

^eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Excludes bentonite; value included with "Combined value" figure.

Table 2.—Value of nonfuel mineral production in South Dakota, by county¹

(Thousands)

County	1981	1982	Minerals produced in 1982 in order of value
Beadle	(2)	\$23	Sand and gravel (construction).
Bon Homme	—	35	Do.
Brookings	(2)	W	Do.
Brown	(2)	182	Do.
Brule	(2)	—	—
Butte	W	W	Clays, sand and gravel (construction).
Campbell	(2)	W	Sand and gravel (construction).
Charles Mix	(2)	156	Do.
Clark	(2)	75	Do.
Clay	(2)	30	Do.
Codington	(2)	W	Do.
Corson	(2)	10	Do.
Custer	\$647	298	Feldspar, beryllium, mica.
Davison	(2)	W	Sand and gravel (construction).
Day	(2)	89	Do.
Deuel	(2)	204	Do.
Dewey	—	49	Do.
Douglas	(2)	W	Do.
Fall River	470	181	Do.
Faulk	(2)	33	Do.
Grant	17,543	W	Do.
Gregory	(2)	142	Do.
Haakon	—	16	Do.
Hamlin	(2)	40	Do.
Hand	(2)	W	Do.
Hanson	W	3	Do.
Harding	—	40	Do.
Hughes	(2)	9	Do.
Hutchinson	(2)	W	Do.
Hyde	(2)	100	Do.
Jerauld	(2)	31	Do.
Jones	(2)	90	Do.
Kingsbury	(2)	—	—
Lake	(2)	317	Sand and gravel (construction).
Lawrence	W	W	Gold, silver, sand and gravel (construction).
Lyman	(2)	—	—
McPherson	(2)	W	Sand and gravel (construction).
Marshall	(2)	W	Do.
Meade	15	1,165	Do.
Miner	(2)	W	Do.
Minnehaha	2,995	516	Do.
Moody	(2)	W	Do.
Pennington	32,807	33,404	Cement, lime, sand and gravel (construction), clays, gypsum.
Perkins	(2)	W	Sand and gravel (construction).
Potter	(2)	—	—
Roberts	(2)	292	Sand and gravel (construction).
Sanborn	(2)	W	Do.
Spink	(2)	W	Do.
Sully	(2)	509	Do.
Tripp	(2)	—	—
Turner	(2)	W	Sand and gravel (construction).
Union	(2)	76	Do.
Walworth	(2)	55	Do.
Yankton	W	203	Do.
Undistributed ³	130,998	73,626	—
Sand and gravel (construction)	⁹ 9,224	XX	—
Stone:			
Crushed	XX	⁶ 7,400	—
Dimension	XX	⁶ 16,270	—
Total ⁴	194,698	135,673	—

⁶Estimated. W Withheld to avoid disclosing company proprietary data; included with "Undistributed." XX Not applicable.

¹The following counties are not listed because no nonfuel mineral production was reported: Aurora, Bennett, Buffalo, Edmunds, Jackson, Lincoln, McCook, Mellette, Shannon, Stanley, Todd, and Ziebach. County distribution for construction sand and gravel (1981) and crushed and dimension stone (1982) is not available; total State values shown separately under "Sand and gravel (construction)" or "Stone."

²Construction sand and gravel was produced; data not available by county.

³Includes gem stones and some construction sand and gravel (1982) that cannot be assigned to specific counties and values indicated by symbol W.

⁴Data do not add to totals shown because of independent rounding.

Table 3.—Indicators of South Dakota business activity

	1982	1983 ^P	Change, percent
Employment and labor force, annual average:			
Total civilian labor force	314.4	313.7	-0.2
Unemployment	22.7	17.4	-23.4
Employment (nonagricultural):			
Mining ¹	2.4	2.5	+4.2
Manufacturing	23.8	26.5	+11.3
Contract construction	5.8	6.8	+17.2
Transportation and public utilities	12.2	12.4	+1.6
Wholesale and retail trade	58.8	60.2	+2.4
Finance, insurance, real estate	12.0	12.7	+5.8
Services	51.3	52.1	+1.6
Government	57.0	56.7	-0.5
Total nonagricultural employment ^{1 2}	223.4	229.7	+2.8
Personal income:			
Total	\$6,676	\$6,792	+1.7
Per capita	\$9,582	\$9,704	+1.3
Construction activity:			
Number of private and public residential units authorized	1,220	2,750	+125.4
Value of nonresidential construction	\$77.8	\$106.6	+37.0
Value of State road contract awards	\$78.0	\$85.4	+9.5
Shipments of portland and masonry cement to and within the State thousand short tons	197	278	+41.1
Nonfuel mineral production value:			
Total crude mineral value	\$135.7	\$222.3	+63.8
Value per capita, resident population	\$196	\$318	+62.2
Value per square mile	\$1,761	\$2,882	+63.7

^PPreliminary.

¹Includes oil and gas extraction.

²Data do not add to totals shown because of independent rounding.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

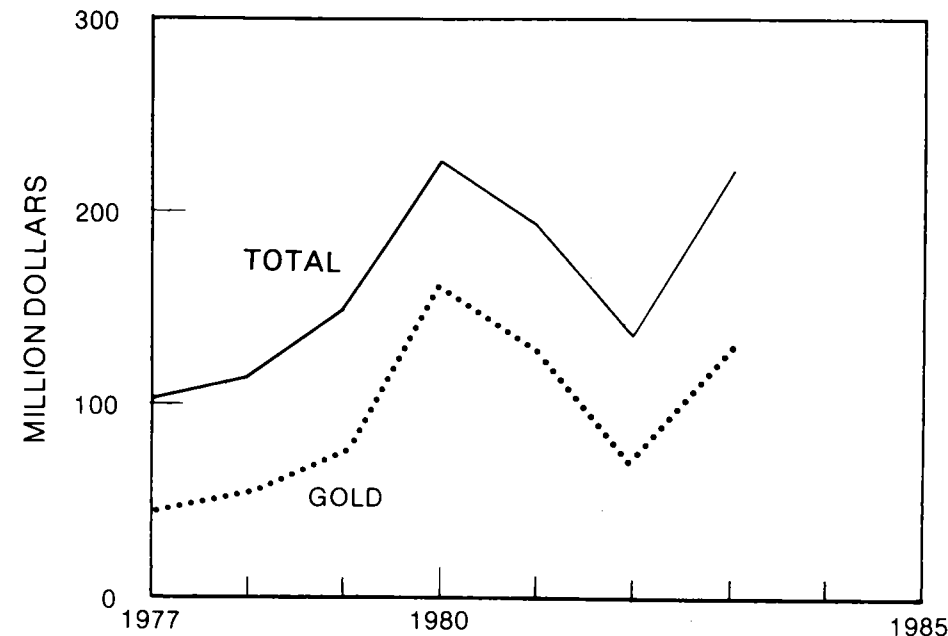


Figure 1.—Value of mine production of gold and total value of nonfuel mineral production in South Dakota.

Nationally, the State ranked 32d in value of nonfuel mineral production, accounting for 1% of the U.S. total. Among the minerals produced during 1983, gold output in South Dakota ranked 2d among 12 States; beryllium, 2d of 3; mica, 2d of 7; feldspar, 6th of 6; silver, 10th of 16; dimension stone, 11th of 39; crude gypsum, 19th of 22; lime, 26th of 39; portland cement, 28th of 40; clays, 29th of 44; masonry cement, 32d of 38; construction sand and gravel, 37th of 50; and crushed stone, 38th of 48.

Employment.—According to the South Dakota Department of Labor, Research and Statistics Division, the average annual employment in the State's mining industry during 1983 was 2,653 workers, about a 15% increase compared with that of 1982. Mining industry workers represented about 1.2% of the State's total nonagricultural work force during the year. During 1983, wages in mining averaged \$462 weekly, a 5% increase over those of 1982.

Trends and Developments.—Nonfuel mineral exploration for minerals other than aggregates increased moderately over that of 1982. Twenty exploration permits were issued, mostly for precious metals in Lawrence and Pennington Counties. The State additionally issued 14 mining permits for extracting nonfuel minerals, excluding aggregates. Three of the mining permits were for granite in Grant County; one for gypsum in Meade County; eight for precious metals in Custer, Lawrence, and Pennington Counties; and two for pegmatite minerals in Custer County.

In recognition of its environmental achievements, Homestake Mining Co. received a national award cosponsored by the President's Council on Environmental Quality and the Environmental Industry Council. The award was for Homestake's continuing program to dispose of tailings safely and to remove solid wastes from process water used at its gold mine operations in Lead.

At a site 3-1/2 miles southwest of Lead, Wharf Resources (USA) Inc. advanced from the pilot stage into full production of gold at its Annie Creek Mine project. A former underground mine, the property was converted to an open pit operation. A heap-leaching process recovered the gold from the ore. Ore production was targeted for 500,000 short tons annually, from which 14,000 troy ounces of gold was to be recovered.

At yearend, Homestake was proceeding with development work on reopening its old

"Open Cut" gold mine near the surface facilities of its current underground mine on the outskirts of Lead. The project, a 2-year pilot test, will be used to determine the long-range feasibility of continuing the venture. About 4 million tons of waste rock and 500,000 tons of ore were to be removed during the pilot program. The Open Cut reportedly could yield 15 to 20 years of surface mining, producing 7.5 million tons of ore.

Legislation and Government Programs.—The 1983 South Dakota Legislature enacted the following that affected the State's mining industry:

1. HB 1067—Mining Without a Permit. Any person mining without a required permit would be guilty of a Class 2 misdemeanor.

2. HB 1132—Study on State Severance Taxes. The measure required that a legislative committee be appointed to study the State's existing severance taxes on precious metals and to report its findings to the next legislative session for possible action. The pros and cons of a severance tax versus a net profits tax on precious metals was the principal issue to be investigated.

In other action, the legislature granted the State Board of Minerals and Environment authority to approve mining permits for the "life of mine" rather than requiring the operator to renew its permits each year. Life-of-mine permits do not apply to sand and gravel or other aggregate-related material operations.

South Dakota received \$1.1 million during fiscal year 1983 from the U.S. Department of the Interior as its share of receipts the Federal Government collected on mineral leasing rents, royalties, and bonuses from Federal lands in the State.

The Mining and Mineral Resources and Research Institute of the South Dakota School of Mines and Technology at Rapid City received a \$150,000 grant from the U.S. Bureau of Mines under the provisions of title III of Public Law 95-87. The grant was designed to encourage the training of mining engineers and scientists involved in mineral-related studies. The funds, to be matched with non-Federal funds, can be used by the schools for research projects, demonstrations, fellowships, or other programs.

During 1983, the South Dakota Geological Survey (SDGS) continued its involvement in a variety of activities that provide a better understanding of the State's underlying geology and associated mineral and water

resources. Water resource programs received a major thrust during 1983.

SDGS conducted a total geologic and hydrologic investigation of the entire Big Sioux Basin. This project was to bring together all aspects of research within the basin; the result was to be a computerized ground water model allowing maximum development of water resources through proper management.

SDGS undertook a special water supply study of the entire State for the U.S. Army Corps of Engineers and conducted water-quality studies of selected aquifers in cooperation with the U.S. Environmental Protection Agency. All basic data from these

programs were being entered into a computerized data-management system for easy retrieval and for use by interested parties. Near yearend, 5,348 drilling records, 2,336 water-quality records, and over 18,000 water level measurements were in computerized storage.

The following were among the SDGS publications released during 1983:

"Groundwater Studies for the Cities of Fairview and Iroquois"; "Major Aquifers in Miner, Davison, Hanson, and Yankton Counties"; "Sand and Gravel Resources in Davison and Hanson Counties"; and "Geology and Water Resources in McPherson, Edmunds, and Faulk Counties."

REVIEW BY NONFUEL MINERAL COMMODITIES

METALS

Beryllium.—Bland Mining and Pacer Corp. produced hand-cobbed beryl in Custer County. Total State output for 1983 remained small, falling below the level of 1982.

Gold.—The State ranked second nationally, behind Nevada, in gold production for the year. The bulk of the output came from the underground mine at Lead operated

by Homestake, and the remainder came from the open pit mine of Wharf Resources in Lawrence County. Total output rose 67% in quantity and 89% in value over that of 1982. The 1983 production level, the highest since 1976, exceeded the 10-year average by 9%. Gold prices during the year averaged \$424 per troy ounce, an advance of \$48 per troy ounce over the 1982 price.

Table 4.—South Dakota: Mine production of gold and silver in terms of recoverable metal

Year	Mines producing		Material sold or treated ¹ (thousand metric tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Troy ounces	Value (thousands)	Thousand troy ounces	Value (thousands)
1979	1	--	1,297	245,912	\$75,618	58	\$648
1980	1	1	1,621	267,642	163,947	51	1,058
1981	1	1	1,677	278,162	127,854	56	587
1982	1	--	1,059	185,038	69,558	26	209
1983	2	--	1,771	309,784	131,348	62	713
1876-1983	NA	NA	NA	38,303,555	1,878,017	13,593	15,523

NA Not available.

¹Excludes placer gravel.

The average recovery grade of the nearly 2 million tons of gold ore mined and processed in the State during 1983 was approximately 0.16 troy ounce per ton of material treated. No placer ore production was reported in 1983.

According to the Homestake Mining Co. 1983 Annual Report, gold ore reserves at the Homestake Mine at Lead were 19,990,000 tons at an average grade of 0.221

ounce per ton. During 1983, the average grade of ore mined increased 7%, tons mined per worker shift increased an average of 1.01 tons or 13%, and the gold recovery rate improved by 2%. The company reported that the average production cost was \$301 per ounce and that it paid South Dakota severance taxes amounting to 17% of the Homestake Mine's operating earnings, or \$25.46 per ounce of gold sold.

Mining and exploration work continued in the deep level of the Homestake Mine below the 6,800-foot level. The new 7,250-foot level was begun, and exploration to determine ore continuity proceeded on the 8,000-foot level. At the company's tailings disposal site, a 50-foot lift was completed on its Grizzly Gulch dam, and construction began on a waste water treatment plant that will incorporate new technology using bacteria instead of chemicals in its treatment process. The plant startup was scheduled for mid-1984.

Silver.—The State's entire silver production in 1983 was as a coproduct with the gold produced at the Homestake Mine in Lead. Output increased both in quantity and value by 138% and 241%, respectively, over that of 1982. A sharp rebound in silver prices during 1983 resulted in an average advance of \$3.49 per troy ounce over that of 1982 for an average price of \$11.44 per troy ounce.

NONMETALS

Cement.—Cement manufactured in South Dakota came exclusively from the State-owned plant at Rapid City. The output—consisting of four types of portland cement, an oil-well cement, and a prepared masonry cement—collectively increased 16% in quantity and 33% in value compared with that of 1982. The average unit value of both the portland and masonry cement sold in 1983 reached record highs of \$62.03 per short ton and \$83.20 per ton, respectively. According to South Dakota Cement Commission officials, cement plant profits during 1983 totaled about \$11 million, and about 43% of the 607,000 tons sold during 1983 went to South Dakota customers.

Ready-mixed concrete companies were the largest users of portland cement, consuming 48% of the 1983 shipments, followed by highway contractors, consuming 20%. Approximately 91% of the portland cement shipments were handled by truck and the remainder by rail. Of the total shipments, 96% were made in bulk form. Consumed in manufacturing the 1983 cement output was 910,000 tons of mostly State-produced non-fuel mineral raw materials.

Clays.—American Colloid Co. operated the sole bentonite processing plant in the

State during 1983. The crude material processed at the plant came from within the State and from out of State. Output of processed bentonite in 1983 increased nearly sevenfold over that of 1982 to its highest level since 1976. Among the more than a score of uses for which the bentonite was marketed, its use in animal feeds, drilling muds, foundry sand application, and as an iron ore pellet binder were among the leaders.

Common clay from pits operated by the South Dakota Cement Commission for use in manufacturing cement accounted for the total State output during 1983. Although the quantity produced increased slightly over that of 1982, it remained 26% below the 10-year average.

Feldspar.—Pacer ground crude feldspar, purchased from area miners, at its Custer plant. The quantity and value of the crude feldspar processed during 1983 were below the 1982 levels.

The ground feldspar was marketed throughout the United States and abroad for use principally in enamels and pottery.

Gem Stones.—No commercial gem stone mining operations were reported in South Dakota during 1983. No precise value is known for gem material that rockhounds, mineral collectors, and other hobbyists collected. The value for gem stones indicated in table 1 is an estimated amount.

Lime.—The State's entire lime production in 1983 was from the Pete Lien & Sons Inc. plant in Rapid City. Output increased both in quantity and value over that of 1982. Lime consumption in South Dakota, obtained from all domestic sources, was approximately 77,000 short tons in 1983.

Mica.—Mica production during 1983 increased substantially over the 1982 level. During 1983, Pacer accounted for the entire State output, which was processed at the company's grinding mill in Custer.

Sand and Gravel.—Construction sand and gravel production is surveyed by the U.S. Bureau of Mines for even-numbered years only; therefore, this chapter contains only estimates for 1983. Data for odd-numbered years are based on annual company estimates made before yearend. Estimated production in 1983 rose significantly above the level recorded for 1982.

Table 5.—South Dakota: Construction sand and gravel sold or used by producers

	1982			1983 ^a		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
Sand	690	\$2,245	\$3.26	NA	NA	NA
Gravel	2,844	5,980	2.10	NA	NA	NA
Sand and gravel (unprocessed)	283	378	1.34	NA	NA	NA
Total ¹ or average	3,816	8,604	2.25	5,100	\$11,500	\$2.25

^aEstimated. NA Not available.

¹Data may not add to totals shown because of independent rounding.

Stone.—Stone production is surveyed by the U.S. Bureau of Mines for odd-numbered years only; the 1982 chapter gave estimates. Data for even-numbered years are based on annual company estimates made before yearend.

Granite, limestone, and sandstone-quartzite were all produced in the State during 1983. Stone production increased nearly 50% over the quantity estimated to have been produced in 1982. In 1983, 14 firms quarried stone at 20 locations in 8 counties.

Crushed.—Crushed limestone, exceeding that of any other rock type produced, came from nine quarries in six counties. Among the specified uses of the limestone mined, the largest amount went into cement manufacturing. Pennington County led in crushed stone output.

Three companies produced crushed sand-

stone or quartzite at three quarries in Hanson and Minnehaha Counties. The largest use for the quartzite produced was as a concrete aggregate.

Approximately two-thirds of South Dakota's crushed stone was from three firms. The range of production from individual quarry operations during the year varied widely, with two quarries producing less than 25,000 short tons; four quarries between 25,000 and 200,000 tons; two quarries between 200,000 and 500,000 tons; and four quarries in excess of 500,000 tons. All crushed stone was shipped by truck in 1983.

Dimension.—Four companies quarried granite at eight sites in Grant County. The granite dimension stone quarried was marketed most extensively as cut stone.

¹State Liaison Officer, Bureau of Mines, Minneapolis, MN.

Table 6.—Principal producers

Commodity and company	Address	Type of activity	County
Beryllium concentrate:			
Bland Mining	Route 3, Box 18 Custer, SD 57730	Mines	Custer.
Pacer Corp	Box 912 Custer, SD 57730	do	Do.
Cement:			
South Dakota Cement Commission	Box 360 Rapid City, SD 57709	Four rotary kilns	Pennington.
Clays:			
American Colloid Co	5100 Suffield Ct. Skokie, IL 60076	Open pit mine and plant	Butte.
South Dakota Cement Commission	Box 360 Rapid City, SD 57709	Open pit mine	Pennington.
Feldspar:			
Pacer Corp	Box 912 Custer, SD 57730	Open pit mines and dry-grinding plant	Custer.
Gold:			
Homestake Mining Co	Box 875 Lead, SD 57754	Underground mine, cyanidation mill, refinery.	Lawrence.
Wharf Resources (USA) Inc	Box 897 Lead, SD 57754	Open pit mine and heap leaching.	Do.
Gypsum:			
South Dakota Cement Commission	Box 360 Rapid City, SD 57709	Open pit mine	Pennington.
Lime:			
Pete Lien & Sons Inc	Box 440 Rapid City, SD 57709	1 rotary kiln, 1 vertical kiln, continuous-hydrator plant.	Do.

Table 6.—Principal producers —Continued

Commodity and company	Address	Type of activity	County
Mica: Pacer Corp -----	Box 912 Custer, SD 57730	Mine and dry-grinding plant	Custer.
Sand and gravel (construction, 1982):			
W. E. Bartholomew & Son Construction Co.	Route 3 Huron, SD 57350	Pits and plants -----	Various.
Birdsall Sand & Gravel Co. Inc	Box 767 Rapid City, SD 57709	-----do -----	Fall River, Penn- ington, Sully.
Concrete Materials Inc -----	100 South Dakota Ave. Summit, SD 57266	-----do -----	Minnehaha and Roberts.
F. J. McLaughlin Co -----	Box 13 Watertown, SD 57201	Pit and plant -----	Codington.
Bernard Mahrer Construction Co.	Rutland, ND 58067 -----	-----do -----	Marshall.
W. & D. Morris Construction Co. Inc.	Box 337 Sturgis, SD 57785	Pits and plants -----	Meade.
Obenauer Construction Co --	Box 274 Eureka, SD 57437	Pit and plant -----	McPherson.
Reynolds Construction Co ---	Box 689 Sioux Falls, SD 57101	-----do -----	Minnehaha.
Silver:			
Homestake Mining Co -----	Box 875 Lead, SD 57754	See <i>Gold</i> -----	Lawrence.
Stone:			
Crushed:			
Limestone:			
Pete Lien & Sons Inc --	Box 440 Rapid City, SD 57709	Quarries and plants -----	Custer and Pennington.
Northwestern Engineer- ing Co. (Hills Materi- als Co.).	Box 2320 Rapid City, SD 57709	-----do -----	Fall River and Pennington.
South Dakota Cement Commission.	Box 360 Rapid City, SD 57709	Quarry and plant -----	Pennington.
Sandstone-quartzite:			
Concrete Materials Co --	Box 809 Sioux Falls, SD 57101	-----do -----	Minnehaha.
L. G. Everist Inc -----	313 South Phillips Sioux Falls, SD 57101	-----do -----	Do.
Spencer Quarries Inc ---	Box 25 Spencer, SD 57374	-----do -----	Hanson.
Dimension:			
Granite:			
Cold Spring Granite Co	202 South 3d Ave. Cold Spring, MN 56320	Quarries -----	Grant.
Dakota Granite Co ---	Box 1351 Milbank, SD 57252	-----do -----	Do.