

Meanderings of a Montana Rockhound

By ©Paul Fry 1972



Rockhounds

There are hounds, you know, that hunt the fox.
Now, we are the hounds that hunt the rock.
We have rocks in the car; rocks in the shed;
Some even say we have rocks in the head!

But we love to hunt them on river and hill
And to cut one in two is always a thrill.
Although you may travel far from your home
You'll find nothing as grand as a good agate stone.
God hid them in his mysterious way
That they may be found in our time and day
So we might dig and hunt and hike.
Each one is different, no two are alike.

To be out there in your walking shoes
Is always the cure for the worst of the blues
So come with us, have a good look around.
And you may become an avid rock hound.

Paul Graupner, Broadus, Montana

Acknowledgement

I wish to thank those who gave me encouragement and assistance in writing this little book. Especially my wife, Anna, who said she thought I was windy enough to write a book!

The encouragement and advice of Mr. and Mrs. Klapmeier, Mrs. Marvin (Alice) Dodd, Mr. Ralph Harris, Bill May, Ken Arnold and Henry (Hank) Stuver is greatly appreciated, and to Henry's brother Julian (Jul), the author's long time friend and Alaska prospecting companion, for his help and advice in interpreting our observations of the geology of the area, I say, "Thanks, Jul!", also to Jul's wife Mae.

To the typists who deciphered and typed my hieroglyphic scribbling into readable script, I extend my deepest appreciation and sympathy!

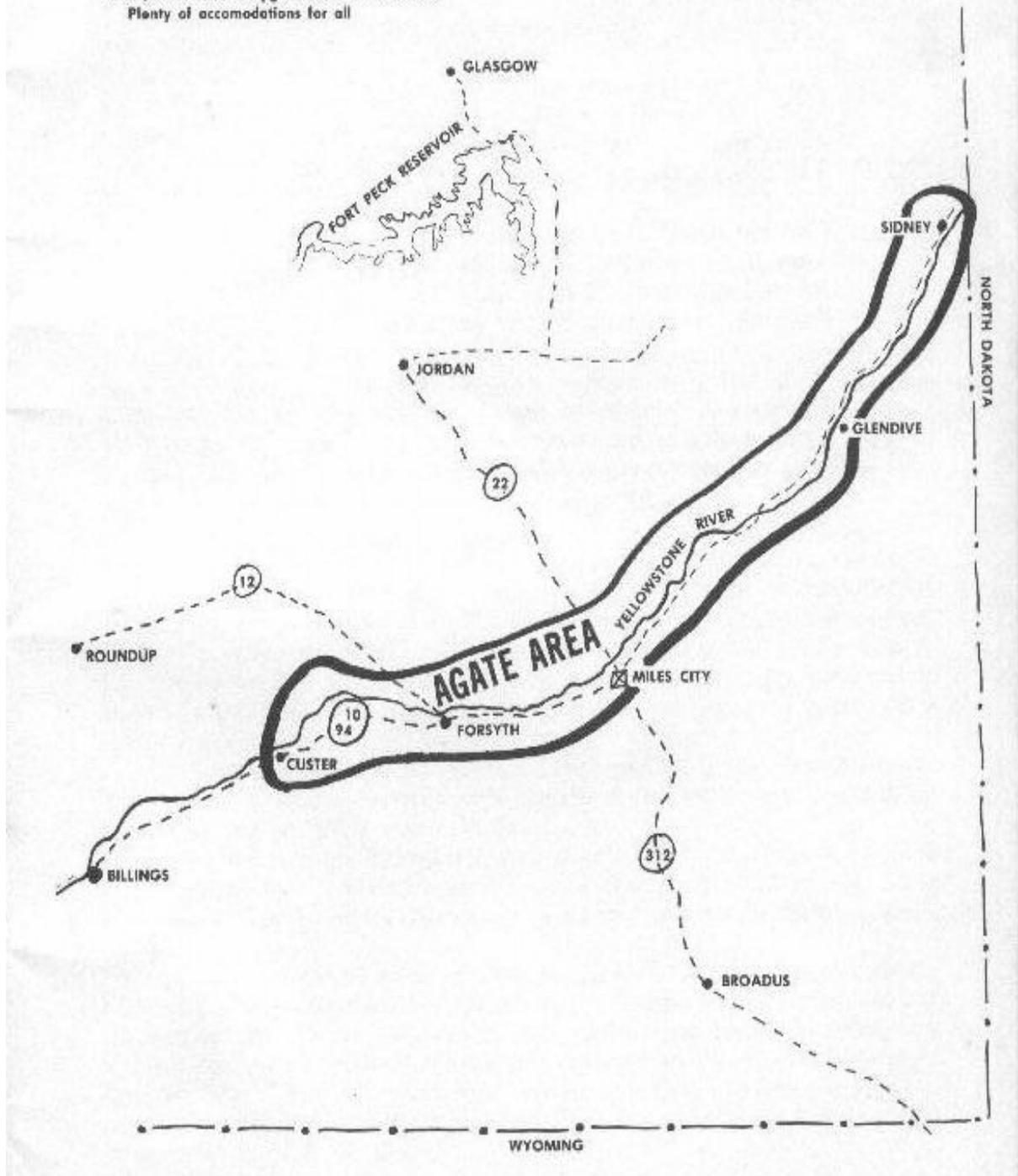
To Paul Graupner of Broadus, Montana, I would like to say a special thanks for the poem that appears on the first page of this book.

Billings to Miles City 148 Miles
 Miles City to Glendive 76 Miles
 Glendive to Sidney 56 Miles

Montana Agate Area inside heavy lines

Main Highways marked with a circle (22)

Hotel, motel and campgrounds at all the cities
 Plenty of accommodations for all



Introduction

Southeastern Montana has been my home almost all my life. My wife and I lived on the West Coast for a number of years and in 1945 we were living in Seattle, Washington, when one day we chanced to walk past a store window that displayed gem-cutting equipment. We went inside and talked to the management, and soon we were gem-cutting enthusiasts. The next year we moved to Montana and purchased a home at Miles City.

There were a number of rockhounds in Miles City as well as three agate shops. While neither of us had looked for agates or cut gemstones of any kind, I had done quite a bit of prospecting for minerals and had learned some geology, so I was not entirely unacquainted with the mineral kingdom.

We were soon roaming the hills, creeks and river looking for agates. As soon as we had accumulated a few agates we purchased a saw, and it wasn't long until we were cutting agates and we have continued to enjoy the hobby till this day.

We have enjoyed many collecting trips and have made many friends during the twenty-five years we have been here, and we hope to enjoy more field trips and to make more friends.

We are continually meeting new people who have been a joy and inspiration to us. We made the garage into a small shop, which is only a few feet from our home, and we always greet visitors whether it is morning, noon or night.

There is a retired collector from North Dakota, who always camped with his pickup camper in our yard. Many times upon arising we looked out the window and there he was camped just off the lawn. He would arrive late at night after we had retired and just pull his truck to a level spot and camp. We would say, "Well, there is Reed!" We haven't seen him for several years now, and we miss him. I hope some day we'll look out the window and be able to say, "Well, there is Reed!"

We often receive letters of inquiry from rock hounds from all over the United States and Canada asking about the agate hunting possibilities in Southeastern Montana. Once there were two lads from Ireland with their cousin from New York who called up and asked if we would show them where and how to hunt agates. I took them to a good spot on a gravel bar along the river. As I had to return home soon, I got them started and left them happily walking over the gravel bar looking for agates.

Often people come to this area to look for agates without first making inquiries only to find to their disappointment that they have arrived at a time when it is difficult, if not impossible, to find agates. When one plans his vacation to take in some agate hunting, and after he arrives to find out he has come at the wrong time of the year, is disappointing, to say the least!

It is with this in mind that I write of my knowledge of the area and how to cut this popular agate. I hope it will help some of my fellow collectors when they arrive in this area.

More young people are becoming interested in mineral and rock collecting and this book

is written for young and old alike and is easily read by the young "pebble pup" as well as adult cutters and collectors.

Due to changing conditions, the regulations concerning the collecting of minerals and other gemstones change occasionally, so it would be wise for the collector who contemplates a field trip to first consult proper authorities relative to the area in which he wishes to collect, be it in Montana or elsewhere.

There may be a few readers who will not be interested in parts of this book, but I couldn't resist the urge to include some history. If the reader will bear with me, as the Indian said when someone complained about the weather, "Huh, if you don't like the weather, stick around a while and it will change!"

While the incidents recorded in this book are mainly true, some of the names are fictitious.

The account of "Uncle Bill" and the Ford, while I had to draw on my imagination a bit to fill in details is essentially true. The character "Uncle Bill" is not the real name of the relative, but I felt it prudent to use a fictitious name. The stories of my experiences and of other's accounts are true as I remember them.

Prior to World War One there were literally thousands of tons of agates to be picked up on the surface in the hills and creeks adjoining the Yellowstone River, as well as along the river itself. Agates were plentiful and their value was practically nil. Many people, especially sheepherders and cowpunchers would break nice large agates just to see what was inside them. Even today, chips can be found where someone had broken an agate and left it lie.

During the First World War the European gem cutters suspended cutting operations until after the war. When operations resumed there was a large demand for gem material and good cutting material found a ready market.

A firm in San Francisco became interested in the Montana agates as a source of supply. In addition to being good gemstone material these agates were also used in the manufacture of precision bearings. The San Francisco firm arranged with a man in Billings, Montana, to supply them with material who in turn hired a man in Miles City to obtain local men to pick agates, and in 1919 and 1920 he shipped agates out by the carload.

This firm bought agates until 1920 when they suddenly went out of business, leaving the contractor in Billings with a large supply of agates on hand. The contractor refused to accept the supply of agates that were in Miles City, and he made arrangements with the man in Miles City to keep them. There were about fifty tons of agates, and they were stored in the basement of a saloon for a number of years. The owner of this establishment also bought agates from local people, and after he died, the administrator of the estate sold some of the stones locally and some people in Huntley, Montana bought the rest.

For many years there were only two agate cutters in Southeastern Montana. These two were Ralph Harris of Miles City and a man in Glendive. In the late 20's and in the 30's several others started cutting agates but it wasn't until immediately after World War Two that the lapidary arts became a hobby. As lapidary knowledge became more available more hobbyists took to rock cutting until today one can find one or more rock shops in almost every city in the United States that has a population of a thousand or more, and many smaller communities can boast of one or more shops that supply the ever-growing hobby.

Also as awareness of gemstones and other minerals grows and the number of hobbyists as well as professional cutters increase, equipment and techniques have improved to the point where almost anyone can cut stones and make them into beautiful ornamental and jewelry

items. Hunting agates and other gemstones and minerals is an interesting and healthful pastime and an increasing number of vacationists and retired people are taking to the rock trail. As the Montana agate lends itself exceptionally well to lapidary treatment and techniques, this material keeps increasing in popularity until today the demand for top quality gem grade Montana agate is so great that good agate is becoming increasingly difficult to obtain.

While the Montana agates are not as easily found as in years gone by, it is possible to find Montana agates if a little knowledge of their occurrence, when to hunt them, etc., is obtained before starting on 'an agate hunting trip.

Lest the reader gain the impression that these agate beds are being depleted, I would like to say it is my belief that these agate bearing strata will never be depleted, at least not in the foreseeable future, if at all. When one considers that the agate beds are from ten to thirty miles in width and about two hundred and eighty miles long with varying thickness of ten to forty feet in depth, it is difficult to imagine these agate bearing gravel beds ever being depleted, especially when there is no mining, and all the agate hunting being confined to picking up material on the surface that is uncovered by erosion.



As the map indicates, these agates are found in an area in Southeastern Montana from Custer to Sidney, a distance of about 280 miles, and roughly two to fifteen miles wide on each side of the Yellowstone River Valley.

There is some controversy as to where these agates originally came from and how they were brought here. The most accepted explanation is that they were formed in a rhyolitic or similar formation in the mountains to the westward and over eons of time were eroded out of the original strata and brought to their present location by water action, probably washed down by a huge prehistoric river. The author has a few Montana agates that still have some of the original matrix of a brownish rhyolite type of rock encased in cavities in the agate nodules. To me, this would further indicate that these agates were brought here from another location for the area where these agates are found is in the Fox Hills Formation of the Tertiary period, and there has been little, if any, volcanic activity in this area.

A theory that some hold is that the agate bearing gravels were brought here by glacial action, but, while I do not wish to enter into controversy here, I have studied the rocks for signs of glacial markings. The agates as well as the gravels show percussion marks as you would expect to see in stream transportation. There was no striation in the rocks, erratic, or other evidence of glacial action observed. This, with other observations would lead me to believe the material was brought here by water action. While there were local glaciers, these comparatively small glaciers should not be confused with the huge continental glacial ice drift that extended as far south as the central part of Montana. These huge glaciers did not extend as far south as Miles City, neither did they cover much, if any, of the northern agate bearing area.



There apparently were two or more geological periods that brought these agates here as the agates found from Terry westward to Custer are generally of a different color pattern than the agates from Terry northward to Sidney. The stones to the westward are ribbon and colored patterns of browns, reds, dendritic and sometimes a mixture of all the colors while the stones further east and north are more predominantly reds with some dendritic. The reds are not a bright red as a piece of cloth would be, but a brownish red.

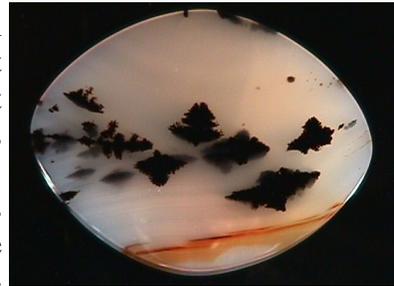
However, for all practical purposes they are called red.

Also, the "skins" or outside of the stones have a different look to experienced cutters; the ones to the north and east being slightly darker, generally, than the ones to the westward.

Most of the largest agates found on the Yellowstone were in the area between Terry and Forsyth. The stones in this up-river part of the area, that is, to the westward, average larger in size than the stones to the northward. This does not necessarily mean the agates from one area are of better quality than agates from another area. It depends on what one is looking for.

Some of the dark brown ribbon with orange border in clear agate make a beautiful gemstone and are much sought after. Of course the dendritic or "spot" agate is the most prized of all. Many people call the dendritic agate "moss agate" due to the tree like or bush like inclusions of dendrites.

However, this "spot agate" is not truly the "moss agate." Occasionally green moss agate is found but they are rare. The moss agate has inclusions that resemble long tendrils of moss scattered indiscriminately throughout the clear stone. Many of these green moss agates from this area are not good cutting material as they undercut due to the green oxides leaving tiny pits or sometimes there are tiny spots of quartz. However, occasionally one is found that is solid and cuts beautiful cabs.



To the west of Custer between Custer and Billings, the agate bearing strata disappears under layers of sandstone and shale; therefore, it is useless to look for this type of agate west of Custer, although occasionally some agates are found near Billings. But generally speaking, the gravels west of Custer are almost barren of agates.

There are undoubtedly some geologists and others who will disagree with this theory. However, this is not a thesis on the geology of the area but merely a background of the occurrence of these agates and where and how to find them.

There are also agates in the Hardin area. How these agates happen to occur so far from the Yellowstone River area is not known. Perhaps they were carried there by a local glacier, or a better theory is that these agate beds are the remnants of an upper terrace of the Yellowstone valley. There are several deposits of agates to the southward of Billings in the foothills of the Pryor Mountains in the vicinity of Dryhead Creek. These agates are commonly called Dryhead agates. They occur in a reddish brown shale immediately over a hard whitish grey limestone bedrock. These Dryhead agates are nearly round and



many are geodes with beautiful bands of red, orange, white and yellow circling the hollow centers. Some are solids with the bands and swirls of color and, of course, some are duds as will be found with almost all agates. These agates are of an entirely different characteristic than the Yellowstone agates and have no connection with the Yellowstone River deposits.

I have made inquiry as to how the Dryhead Creek got its name. The old timers say the first settlers in the area found an Indian buffalo jump where the Indians used to run buffalo off a cliff or steep bank, many of them being killed or maimed in the fall. Then the Indians would finish off the crippled ones with arrows and spears. There were many dried buffalo skulls scattered along in t/he creek bed and thence the name "Dryhead."

Also there are agates found in Beaverhead County in southwestern Montana and a deposit of blue agate south of Livingston in south-central Montana. None of these agates have any connection with the Yellowstone agates as they are altogether a different type of agate.

The original beds of the Yellowstone agates must have been a huge deposit as the agate bearing gravels are in a continuous deposit for a distance of 280 miles in and adjacent to the Yellowstone River. As stated in other paragraphs the agate bearing gravels are 30 to 40 feet thick. In other places, the gravel beds are only 2 or 3 feet thick. Also, in some places there are 2 layers of agate with a strata of shale between. Occasionally strata will be seen with a layer of coal between. I have never found a thorough report on the geology of this area so we will just have to use our imagination and common sense as to how these layers of agate were laid down here.

In recent years when the through highways were being built, the engineers first drilled the area to determine the strata that would be encountered also to find spots where there was plenty of gravel for road building. In one place where a crusher was installed, the gravel beds were in excess of 30 feet in thickness with agates throughout the entire depth.

These gravel layers can plainly be seen along the steep banks of the river. Some are 30 feet or more in thickness and others only a few feet thick. In other places, on the same level, there is no gravel at all. This would further seem to indicate the agate bearing gravels were brought here by water action--the great prehistoric rivers depositing millions of tons of gravel at some spots and little or none at other places. Also, in the river channel, there are bars along the shore and on the small islands that occur in the river throughout the area. There are spots that seem to be barren of agates while other places only a short distance away are found to be more productive. However, as a whole, the agates occur almost continuously along the river as described in preceding paragraphs.

Many who are not acquainted with the occurrence of these agates have the impression that the agates are dug or mined from claims or private land. However, the agates are so thinly scattered among the alluvial gravels as to making mining operations unprofitable. Several attempts have been made to mine them by various methods but with little success. One man, who has since passed away to a happier agate hunting ground, tried to mine agates with a "cat" and 'dozer, and at the end of the day he didn't have enough agates to pay expenses.

One man tried using a small portable pump to wash the mud and silt off the rocks with little success. When you consider that sometimes one walks for dozens of feet right after the gravel has been stirred up from high water before finding an agate, it is understandable why mining is not practical for these agates. Agate hunters in this area depend entirely on natural erosion; that is, seasons of high water in the river, rains in the creeks and hills, etc., to wash

out new material.

The best places to look for these agates is in the creeks and along the river on the gravel bars and islands that occur continuously along the full length of the river in the area shown on the map. The agate formation occurs for several miles on each side of the river valley in the low rolling hills and gullies, and even though erosion is continually exposing new material, hunting in these areas is unlikely to meet with much success, for the hills have been hunted extensively, unless, as sometimes happens, there occurs a gully washer rain, especially



in the months of June and the first part of September. Also, if there is a heavy winter snowfall and the snow melts rapidly in the spring, there is new material washed out in the creeks and gullies. In this case, the heavy run-off of water washes out new material by gouging out gravel bars, banks caving and so forth.

Once the author and his wife, after a heavy rain, picked up a number of very nice agates in a distance of less than half a mile in one of the numerous creeks in one afternoon and half a mile down the creek two other local rockhounds found about the same amount. Another time I, myself, found a number of exceptionally nice agates in one of the dry creek beds after a cloudburst. However, to do this one must watch the creeks carefully after a heavy rain and



as soon as the water recedes try to beat the other collectors to the most likely spots.

Along the river are many bars and islands that contain the agate bearing gravels and even though agate hunters have been there before you, they can't find them all and with diligent hunting it isn't likely one will go home empty handed. Of course, the same conditions hold true with hunting on the river as in the hills and coulees; the one who gets there first gets the best agates. So it is very important to arrive in the area at the right time.

The winters in Montana are usually very cold, the thermometer sometimes dropping to twenty five or thirty degrees below zero, freezing a thick layer of ice on the river. In the spring, usually around the first of March, the snow melt raises the river, breaking up the ice into huge cakes. These cakes of ice gouge out new material, and the extremely high water caves off banks, sometimes cutting new channels and in the process exposing new agates. The Yellowstone River starts in Yellowstone National Park in Wyoming and runs northeast and empties into the Missouri River in North Dakota. Therefore, warmer weather occurs upstream first and breaks up the ice before the ice moves out in the lower regions to the north. This upstream ice moves downstream until it meets the still solid ice to the northward, causing huge ice jams sometimes half a mile or more long and spanning across the entire width of the river. These ice jams make a dam for the melting snow and rushing water, causing the water to flood over the river banks and often flooding the lowlands in the valley.

After several days there is such a tremendous pressure built up behind these ice jams that

finally the ice below breaks up and the jam moves on downstream. Often the same ice jam stops again, repeating the process. When one of these ice jams breaks loose there is so much pressure of rushing water upstream that the huge ice cakes rear up on end for 10 or 12 feet out of the water and go tumbling and grinding over each other, sometimes washing out whole islands and making new ones. This, of course, exposes new material.

It is usually several weeks after the water level has receded before agate hunting is possible as the high water and ice jams leave huge cakes of ice lying thickly on the banks and the islands, almost covering the gravel bars. It is then necessary to wait until the ice has melted before agate hunting is possible on the river. The ice is usually melted by the first of April, sometimes in March, depending on the seasonal weather changes. All the month of April is usually mild, sunny weather, and agate hunting is good as the water table is low unless a Montana spring snow storm dumps about a foot of snow on the ground. Then, of course, there is no agate hunting until the snow melts.

After the ice breakup the water level is low until about the middle of May when the snow pack starts to melt in the mountains. These mountain ranges are the Big Horn Mountains in southern Montana and northern Wyoming, the Beartooth Mountains in the Yellowstone Park areas of north-western Wyoming and south central Montana and several other lesser mountain ranges to the westward. These high mountains have a very deep snow pack, and the snow does not leave until May or June when the weather becomes warmer. By the first of June all the gravel bars along the river are completely covered with water and again new material is washed out and exposed for the rock hobbyist. During this period, it is useless to look for agates along the river for the only gravel deposits in the valley itself is in the river bed. There is no agate bearing strata on the valley floor. This valley is alluvial, sandy loam and shale and is farmed extensively. The only agates to be found at this time of year would be in the surrounding hills and streams that empty into the river.

The "June rise," as this high water is locally called, lasts until about the middle of July or the latter part of July depending on conditions, and by the first of August the water table is again low and all the bars and islands exposed. It is at this time of year that the rock hounds from all over the U.S. come to collect a few agates to add to their collection, for this is the only area that produces this type of agates in any appreciable amount.

The water table stays low all the rest of the summer and until freeze-up, which can be anytime after the middle of October. Occasionally there are heavy rains in September that raises the river somewhat, but as a rule the gravels are exposed until snow comes to stop all agate or other mineral collecting until spring. Often one can find material late in the fall after most collectors have quit if one can stand the cold, windy days at this time of year. One fall in November the author and a friend looked for agates on the river with a boat and even though it was late in the fall with a cold wind blowing we found a few nice agates, until we became chilled from the icy wind and had to leave. However, one shouldn't plan too heavily on looking for a collection that late in the fall for there could be snow anytime after the middle of October.

Most of the islands in the Yellowstone are impossible to get to without a boat, and many local and a few out-of-state collectors use a boat. By using a boat it is not only possible to look on the islands but some of the bars along the shore are easier to reach.

All the land adjacent to the river is privately owned, and many farmers and ranchers will not allow trespassing on their property. Therefore, some stretches of the river are difficult to

reach without a boat. Always remember that all this land is privately owned, and a trespasser can be prosecuted and fined. There are places where one can get to the river but a stranger would be wise to seek local information.

The kind of boat in general use is a 12 to 14 foot open boat such as a hunting or fishing boat. It is best to use an outboard motor for it is impossible to row a boat against the current very far in this river. Some collectors leave one vehicle a short distance downstream, then float down to it. This is alright if there are two people, each with a car.

If a motor is used a 9 1/2 to 15 horse power is used, although some use larger motors of the 25 to 35 horse power type. These latter motors are really too heavy and fast and unless one is accustomed to boating on this river the larger motors can cause a lot of trouble. The river from Terry westward is not a speedboat river and caution must be used or disaster could occur.



Down river from Terry the river flattens out somewhat and is wider and deeper. This part of the river can take a larger motor as there are not so many rapids, shallows, etc., and the further down river one goes the deeper is the water. However, a boater must use caution and common safety procedures when boating on any part of the Yellowstone as the water is swift and treacherous to anyone not accustomed to boating on fast shallow water. Often shallows will be encountered, especially where the water separates to go past an island and one should be careful at these places, particularly if an outboard motor is used.

Sometimes a rubber boat or raft is used. These are alright under good conditions, but they have the disadvantage of not being able to travel upstream. Also, if a wind is blowing, the boater is practically helpless, for the wind blows the boat around like a cork and usually the boat ends up against the shore. They do have the advantage of being light and easy to transport.

If a rubber raft or boat is used always tie it securely to something such as a large rock, tree root or other solid object, otherwise there is danger of the wind blowing the light boat into the river. Two collectors from Miles City almost lost a rubber boat while looking for agates on one of the islands in the river. They pulled the boat up on dry ground but neglected to tie it securely. A small twisting whirlwind picked up the boat, even though it contained equipment and some rocks, spilling everything out, then depositing it in the river where the wind forced the boat to the opposite shore. Luckily, the water was shallow to the mainland and they waded across, obtained another boat and recovered it.

A word of caution and advice about boating on this river. This river starts its journey in Yellowstone Park in Northwestern Wyoming and runs northward into Montana. The upper reaches are so fast and rocky it is impossible to use a boat in this area. The Yellowstone Falls, famous for its beauty, is in the upper part of the river. The river tumbles its way down through forest covered mountains and colorful canyons, almost directly north to more level plains area in Montana where it turns abruptly northeasterly and flows through a great area of rolling prairie, spotty pine and juniper covered hills, tipped with red and scarlet scoria and pastel colored bad lands to its junction with the Missouri some 400 miles distant. This is

part of the Big Sky Country, famous for its legends of trappers, explorers, fur traders, cowboys and Indians of a day gone by. This is the land Lewis and Clark explored on their historic expedition. Kit Carson and other famous explorers and hunters trod this broad land as did General Custer and other famous army men.

Where the river reaches the lower plain area in Montana after its rapid tumbling journey down the north slopes of the mountains, it levels out somewhat but is still rapid with many shallows until it reaches Custer, Montana, where it flattens out and from Custer the river is negotiable with a small boat. However, it is still swift; the average flow being about 9 miles an hour with stretches much faster. Below Custer, the river looks so placid and smooth that a stranger standing on the shore does not realize the dangers involved when boating on this river. The river is much swifter than first appearances would lead one to believe. A little carelessness in boating on these waters can, and often does, lead to disaster.

In addition to being fairly fast water, in places there are reefs sometimes reaching across the full width of the river, and if one is not acquainted with the river, the current could very easily sweep a boat down onto the rocks with very unpleasant results.

Between Miles City and Terry are a series of rapids and rock dikes that can be negotiated safely by anyone who is familiar with them and uses care and caution. Two stretches of these rapids are exceptionally dangerous, and these are shunned by most boaters. One series of rapids is about one-quarter mile down stream from the mouth of Sunday Creek. These rapids are the Buffalo Rapids, and they extend from a short distance below the mouth of Sunday Creek to just below the Burlington Northern Railroad bridge some 2 miles down stream. The other one, which is worse, is about one mile down stream from the old post office at Zero, about half-way between Zero and the mouth of Powder River. These rapids are the most dangerous rapids in all this area. There is a rock dike that extends across the entire width of the river and most of it sticks out of the water and forms a dam. The water, when it reaches to within 100 feet of the dike quickens, and by the time it gets to the dam, the water plunges over the dam like an express train with a fall of 2 to 5 feet. Any boat that hits these rocks is almost sure to be wrecked. About 200 feet below is another bad one, though not quite as bad as there are places where, if one uses extreme care, can be negotiated without trouble.

One time my wife and I were going down this rapid when the prop hit a rock and broke the prop pin leaving us helpless to keep control of the boat. By that time, we were past the most dangerous place, and the boat floated on down to calmer waters when it was necessary to row to shore and replace the pin.

The first dike mentioned of these two is the worst, though. A story is told of two rock hounds who were unfamiliar with this stretch of the river boating down the river, stopping occasionally to look for agates, and eventually came upon these rapids.

In the early days when this area was first being settled, there was an army fort, Fort Keogh, located a short distance west of the present city of Miles City. Steamboats brought supplies up the Missouri and on up the Yellowstone to the army fort and for trappers and explorers as well as for the trading posts. It was impossible to bring the boats over this reef, except perhaps when the river was extremely high, so the army men blasted out a section of the dike to make an opening wide enough for the steamships to go through.

These two agate hunters made it down okay, collecting agates, petrified wood, jasper and other rocks. When they started back, they thought if they could plane the boat they could

make it up over the rapids without any trouble. However, the boat wouldn't plane, but they tried it anyway, and with the motor throttle wide open they hit a rock, the force of the impact ripping a large hole in the bottom of the boat. They lost the boat, motor, rocks and supplies and were lucky to escape with their lives.

As a rule, when boaters approach this dike, they go to shore a safe distance above and "line" the boat down; that is, they walk along the bank and lead the boat down with a rope fastened to the bow, and in this way they can let the boat float down close to the bank without any danger.

Once an agate hunting companion whom we will call Jack, and I didn't want to take the time to do this so we kept going over the dike. As neither of us had ridden a boat over this rapid, we were not certain where the opening was.

So Jack stood up in the bow of the boat (I wouldn't recommend this to anyone!) and looked ahead for an opening in the dike. As we were using my boat, I was steering and Jack had to motion me back several times before he finally saw an opening between the jagged rocks.

With the roar of the rapids plus the noise of the outboard motor, it was impossible to hear each other so Jack made signals to guide me, for I was sitting on the rear seat and couldn't see far enough ahead to tell where to steer. Finally, after two or three attempts, he nodded and pointed his arm, guiding me directly to the opening.

As we approached the dike, we could feel the current pulling the boat faster and faster toward the opening. When we got to within about thirty feet of the dike, I said, "Well, here we go!" It was too late to turn back then even if we had wanted to.

As we went over, I saw we were headed for a large trough that was formed by the water falling over the dam. This water trough was probably eight feet wide by twelve feet long and about four feet deep. As our boat was a small fourteen foot fishing boat I was afraid it wouldn't ride up out of the trough but would nose-dive into the deep, fast water. Here was a time to do some mighty fast thinking and not get excited. I gritted my teeth, expecting the worst. Then I saw a ridge of water to the right of the trough and gunning the motor slightly to get more steering control, I steered the boat up onto this water ridge, and we shot safely past the trough and on down to calmer waters. All this time my companion sat calmly, seemingly as unperturbed as if we were on a placid pond!

This is the only time I have ever gone over this reef although I understand many have done so. It is not advisable for anyone not thoroughly familiar with this kind of boating to go over this or any of the rapids in this area as it is very precarious even for local boaters who know the river.

When the early steamboats came up this river the crew would line the boat up the rapids and also down. Going up, they took two long ropes or cables that reached each bank of the river where they pulled with horses or men and with the aid of this power, the steamboats didn't have too much trouble. Usually they made these trips when the river was at a high water level, although some of the historical writings give an account of one captain who brought his steamboat up the river in August when the water table was very low. I don't believe he could do it today for, due to erosion control and flood control projects as well as irrigation, the river does not carry as much water as it did in those days.

One of these early day steamboats was making an up river trip, and they had maneuvered most of the Buffalo Rapids when the ship struck the rocks and was sunk. This was in 1879.

The boat was damaged to the extent that it was never attempted to put her back into service but was abandoned to the river. Later, some of the timbers were salvaged and were used in a business building that was being built on Main Street in Miles City. For many years this building was called the Steamboat Building. Later, some more timbers were salvaged and used in another building. There is a rumor the cargo was lost, including eighty thousand dollars in gold coins that was destined for Fort Keogh as the payroll for the soldiers there.

At this point I can see some treasure hunters prick up their ears. But before you lads pack up your duds and start for Miles City, let me explain that I have searched records of writers of history of the era and I have found nothing that would indicate that this is true. Quite the contrary, a book in the Miles City public library in the Montana History room, that I believe to be authentic, records an item about the sinking of the steamboat "Yellowstone" in 1879. This item says that everything of value was taken from the boat. There is no mention of gold or money even being on the boat, although it is possible the payroll could have been on the Yellowstone when she wrecked, for most freight and other supplies for the area along the rivers was brought by boat, but if so it apparently reached its destination.

Besides the rocks and reefs in this river, there are other dangers that must be avoided. Near the town of Forsyth there is a dam across the river, and any boat that goes over this dam is irrecoverably lost. There have been several drownings at this dam even though the boaters wore life jackets. There is such a suction at the base of the dam that anything that goes over is sucked under. Also, if one gets too near the dam from below, the suction and whirlpools sucks the boat toward the dam and forces it under. Stay away from this dam!

Also down river from Glendive, there is a large dam across the river. This dam also should be avoided with a boat. Just below this dam is where the large paddle fish are caught, some weighing 60 pounds or more.

Often times the swift water caves off banks and huge trees fall into the water with their roots still attached to the bank and the tops extending out into the water. This is called a "sweeper," and any boater who lets his boat be swept down against this "sweeper" is in for trouble. The force of the swift water tips the boat over in seconds and sucks the boat under, and invariably the boat, motor and equipment are never recovered. Unless one is wearing a life jacket, he is in danger of drowning for it is very difficult to swim due to undertow at these places. Also, especially in the early spring months and late autumn, the water is extremely cold, and anyone unlucky enough to fall into the deep water would not last long. I am told that when the body temperature reaches 40 degrees F, you've had it! Occasionally a log will be seen with one end sticking in the mud and the other end sticking out of the water. These should be avoided also. Always watch ahead and be prepared for emergencies.

Two local rockhounds one time were boating on the river when the motor stopped, leaving them helpless to steer. Before one could man the oars, the boat was swept against a tree that was partly submerged with the result that the boat was instantly sucked under. As the boat went down, they both managed to grab hold of a large limb where they hung on for dear life. Some fishermen down river saw their lunch buckets, life jackets and other equipment floating down, and, realizing something was amiss, motored up to rescue them. One of the men has never gone out on the river since!

My friend Jack, the agate hunter who was with me when we went over the rapids described in preceding paragraphs, owned a small racer type boat with a 35 horsepower outboard. He would open the throttle and plane the boat and would come skimming along the

water like a seaplane making a run for take off. We could hear the motor roaring before he hove in sight, and we would say, "here comes Jack." One day he lost the shaft gears, shaft and propeller when planing. This can be expensive!

Another time he was alone in the boat and with the throttle wide open was taking movie pictures. He said the bank looked farther away through the lens than it really was, and the boat ran full speed on the shore and shot about 20 feet on dry land before coming to a stop! It was a lucky thing the bank was sloping at this spot. Ordinarily most of the bank is a perpendicular wall, and if he had hit bow first into a steep bank the sudden stop would have catapulted him head first into the river!

It may seem as if I am trying to discourage boating on the Yellowstone. Not so! I am merely trying to cite the dangers involved when one is careless or poorly prepared. Boating on this river can be a pleasant and interesting sport and recreation if proper care is used. There are thousands of boaters on this river every year, and, while there are usually a few accidents and sometimes drownings in the Yellowstone, I think it is usually due to carelessness. Always have life jackets on when on the water. If you sit on it for a cushion, or if it is in the bottom of the boat, you just as well leave it at home for if a boat tips over the swift current sweeps the jacket out of reach with no chance of reaching it. Also have a pair of oars handy in case of motor failure. A small fire extinguisher should always be kept handy. A pair of pliers, screwdriver and small crescent wrench is necessary in case a shear pin has to be replaced or a spark plug cleaned, etc. It's a long way to walk to town! Have a supply of shear pins along for often the prop will hit bottom at the shallow spots and sometimes a pin is sheared. If you will use care, I see no reason why anyone familiar with a small boat should not enjoy boating on this river.

There is an abundance of wildlife along the Yellowstone. When my daughter was a young girl she occasionally went with me in the boat and often my wife, daughter and I would all go together for an agate hunting trip on the river. Our daughter went along on the hot summer days mostly to see the wildlife and to get down on the river where the cool moisture laden' breezes feels cool and fragrant with the flowers and other vegetation on the shores. Many water fowl live on the river, and flocks of wild ducks and Canadian geese are on almost every island. The ducks and geese nest on the islands where they are safer from predators and in the spring time sometimes one comes suddenly upon a nest of eggs, and the duck or goose flies up with a great squawking and flutter of wings and tries to lure the intruder away. One should always back away and stay away from the nest for if the nest or surrounding area is disturbed the mother bird leaves the area, and the eggs will never hatch. Often times one will come upon a Blue Heron standing motionless, knee deep at the edge of the water patiently waiting for an unwary minnow to come close enough to spear with his long beak. If we come too close, he awkwardly flies up with his long neck stretched out and his long, skinny legs trailing along behind. He looks so awkward one wonders how he can stay in the air.

In the late afternoons deer will sometimes be seen tiptoeing daintily down to the water's edge for a drink of cool water. Along the shore killdeers cry their anxious, plaintive call of "killdee, kildee." Sometimes a beaver will be seen swimming along close the shore looking for his favorite spot to dig for roots. At the slightest movement he dives and slaps his broad tail on the water, making a loud slap-aplash," warning his fellows that there is danger near. Other wildlife also take heed of this warning.

Anyone who likes the great outdoors and wildlife surely would enjoy a trip down this river, if only to be with peaceful nature for awhile. I believe nothing makes family ties closer than a trip with nature, if only for a few hours.

When looking for agates in the hills and coulees away from the river, often antelope or deer can be seen, as well as other wildlife. A question often asked is "Are there rattlesnakes?" While there are a few rattlesnakes, they are not plentiful, and one need not worry too much about coming upon one. If you hear a buzzing sound, back away if the sound is in front of you. I have seen only three or four rattlesnakes in the past several years, and while they always put a chill down my spine, I have never come close to being bitten by one. However, one should be careful around tall sagebrush or other vegetation. Around old buildings is a good place for them to hang out to get in the shade for a rattlesnake cannot stand the direct sunlight for long, and they like to coil around a clump of grass or perhaps get in the shade of a log or under an old building. Their living quarters is usually underground, in a sink hole or a gopher hole, so watch out around these holes in the ground.

Often an old homestead shack will be seen where a homesteader lived long enough to "prove up" on his claim, then sold the land and moved away. Most of these old homestead houses and shacks are tumbling down and weather-beaten. Often the remains of an old Model T Ford will be sitting forlornly nearby. I never see these old Fords that I don't think of my boyhood days.

In the days of the horse drawn vehicle, horse and buggy days, there were many men who never learned to drive an automobile for the auto was not in general use as it is today. My Uncle Bill never learned to drive although the automobile had come into it's own when he was of middle age.

Uncle Bill acted in the capacity of Justice of the Peace for many years. In his law enforcement duties he occasionally found it necessary to make a trip to the county seat, eighty miles distant. On one of these trips he went with the deputy sheriff in the sheriff's Ford. Eighty miles was a good day's drive, and if they were lucky and didn't have too many fiat tires and the dirt roads were dry, they could drive it in a day. They were gone several days. What they were doing all that time I don't know to this day. (Business, I suppose!)

I remember of Uncle Bill telling this account of the trip, and of his first driving lesson.

On the return trip, it was a nice day, the going was good, and they both were in a jolly mood. The sheriff asked Uncle Bill if he would like to drive.

"Sure," said Bill.

So after instructing Bill in the fine art of driving, the sheriff turned the wheel over to him.

The Model T Ford had a lever that extended out at right angles from the steering column and just under the steering wheel. This lever was the accelerator and was operated by hand. On the opposite side of the column was another lever that was used to retard or advance the spark. For more gas the driver pulled down on the gas lever and to advance the spark he pulled down on the spark lever. These levers were jokingly called "ears."

Well, as I said, it was a beautiful day, they were both feeling fine, so Bill pulled both ears down as far as they would go and down the road they went, the Model T swaying and bucking over the rutted road. They had not gone far when the sheriff yelled, "Slow down!"

"How do I slow down?" asked Bill.

"Push up on the right lever!" the sheriff yelled back.

So Bill pushed up on the lever and the Ford came to a shuddering stop.

"What's wrong? Why did you stop?"

"Well," said Bill, "You told me to push up on the right lever!"

So the sheriff got out to crank 'er up, for Bill was now the driver.

Now, these Model T Ford engines were tricky brutes. If the spark lever was too far advanced when it was cranked the engine would backfire and the crank would kick backwards. There was many a man that sustained a badly bruised wrist or hand, and there were cases when the crank had such force as to break a wrist or finger. Bill didn't know this and the sheriff neglected to tell him so when he started to crank the spark lever was still down with the result the sheriff got a smart rap across the knuckles with the backlash of the crank. He let out a howl, looked at Bill a moment, then walked back and adjusted the levers, himself.

He tried it again and this time the Ford let out a snort and a rumble and the sheriff got back in the seat. They both pulled down their hats and they went merrily on the way, the wind blowing through their whiskers (Uncle Bill always wore a handle-bar mustache). In those days very few Model T's sported a top and this one was no exception, so the windshield was the only windbreak they had. Some Model T's didn't even have a windshield.

They were speeding along about twenty miles an hour when, for some reason, Uncle Bill took his eyes off the road for a few minutes. The Ford hit a bump in the road and "Old Betsy" made a sharp right turn and headed for the barpit where they made a two point landing with the front bumper hung up on the opposite bank. After much digging, prying and pushing, Bill doing the pushing, they finally got "Old Betsy" back on the road. The sheriff remarked he guessed he had better drive if they wanted to get home that. night! As far as I know, that was the first, last and only time Uncle Bill tried to drive a "stink wagon" as he derisively called them.

They have both passed out of this world long ago, and I hope they can be together "over there" where they can talk and laugh about old times.

After you have obtained some agates, if you have a saw, you undoubtedly will want to go to work on them soon. You should first determine how each stone should be cut. Most Montana agate cutters examine each stone by candling them. To do this a 100 watt or brighter light bulb of the incandescent type should be used. The fluorescent type of lamps do not emit enough light in a concentrated spot to be effective. Wash off all the mud or soil that might be adhered to the stones. While the stones are wet hold one toward the light with one hand held above the stone to shield the eyes from the direct rays. Otherwise, the bright light shining in your eyes will interfere. The stone should be held approximately 12 to 14 inches from the light. Be careful and do not let any water get on the hot bulb for it will shatter. The color and pattern can usually be seen in the translucent stone.

Some agates are very dark and difficult to candle, and then it's mostly a matter of guess work. Unless one can clearly see the pattern, it is mostly a guess whether or not it is a good stone. The banded agates and most of the dendritic are cut across the stone as one would cut a piece of bologna. However, some of them should be cut differently, perhaps lengthwise or at an angle. Many of the scenes or pictures so highly prized are found by closely examining the stone, then cutting it to obtain the best pattern.

Many cutters who are not familiar with the Montana agate have the impression that nearly all are of the scenic or picture type. This is far from being correct. Rare is the stone that has a scenic pattern all the way through. A very small percentage of these agates have a

definite picture or scene. As a rule, only one or two slices of a stone show a scene, the rest of the stone being just color, ribbon, dendritic or whatever type one is cutting at the time. Occasionally one is found to have a scenic pattern all the way through, but this is a rare exception.

One type of Montana agate that sometimes cuts a beautiful scene or trees is the layer agate. These agates are formed in definite layers and should be cut parallel to the layers. The patterns are usually in the dividing line between the layers. The designs in these layer agates are very thin so be careful that you don't cut the design away when sawing the slabs. Sometimes lovely snowflake or sunburst patterns are found in this type of stone.

The dendritic or "Spot" agates, as they are locally called, are the ones that produce the trees, bushes, forests, etc. The dendritic, trees with a lake in the foreground and perhaps a red or brown sunset in the background, is the most lovely and also the rarest of the Montana agates. I think it is not exaggerating to say that only one out of several thousand agates have this design, and when one is found the owner has a prize and very few cutters will part with it. Many collectors from almost every state in the U.S. come here looking for something unusual in scenic or picture agates. Often the ribbon or other patterns cut beautiful scenes, such as landscapes, hills and valleys, etc. Often these scenic patterns are not visible until the stone is cut. Some of the most prized specimens are cut



from agates that are classed as second or third grade agates or even throw aways. The designs are the secret, and one never knows what he might find in some of these lesser grade stones. I once cut an agate about the size of a man's hand, that, from all appearances, looked like a tumbling grade stone. I held it to a three hundred watt light and thought I saw a couple of snowflake designs lying parallel to the fiat surface of the stone. I gripped the stone in the vise so the saw blade would cut the stone parallel to the flat surface, and it turned out to be one of the finest specimens I have ever cut. I have it in my display case.

Pictures In Montana Agate

Occasionally a Montana agate is cut that shows a definite picture such as a horse, deer, man or the likeness of other figures. Jack, a rockhound in Miles City, but who formerly lived in Sidney, tells of a man in that area that found an agate that when cut, in the cutter's words, "showed a picture of a train, complete with cars, caboose and even the conductor standing on the caboose platform!" He said it looked so real you could hear the Conductor holler "all aboard!"

When marking out a slab for a cabochon, often one will see a scene or a picture that would be ruined if is cut out in regulation size and shape. These should be cut "free hand," that is, cut them any shape or size that will make the best picture. These cabs can then be mounted in a hand made mounting or simply placed in a case for display. I have seen Montana agates ruined by inexperienced cutters trying to cut orthodox cabochons from a scenic slab. These scenic cabochons should be thinner than normal cabochons. If they are made with a high crown, the scene is distorted and a great part of its beauty is lost. If you have already cut a thick slab before the scene is located, the cabochon should be ground thinner by grinding off some of the back. Do not grind on the face of a scenic cab any more than is

necessary to prepare for sanding for part of the scene or picture might be ground away. Some of the prize cabochons are made in this way.

Ed Klapmeier of Miles City is a genius at cutting and mounting agate cabochons. He has one of the finest, if not the finest, collections in the world of Montana agate. He seldom pays any attention to orthodox methods of marking out cabs but makes them in all sizes and shapes which ever suits the stone he is working on. He then makes his own hand-made mountings of silver and different colors of gold with his own designs. He then engraves the mounting, and they are out of this world for beauty and craftsmanship.

Ed grew up on a ranch on the north side of the Yellowstone, and it was while he was riding the range that he became interested in agates. At that time many agates were available, and as electricity was not available, Ed rigged up a saw machine that utilized the wind for power, and he used this saw until he later moved to Miles City where electricity was available.

I have known Ed to study an agate from every angle for several minutes before cutting. Sometimes he will lay it aside and examine it again later. I think every experienced Montana agate cutter does this.

Mr. and Mrs. Klapmeier often visit the shows with their unusual display of scenic and picture Montana agates. They have visited seventeen states with their exhibits and have won many prizes, including some firsts.

If the stone is clearly of just commercial gem cutting quality, then not too much time is used to examine the stone, but is cut slice after slice like one would cut a loaf of bread, although seldom is a Montana agate found as large as a loaf of bread!

A Montana agate that weighs twenty pounds is a rarity. A young man at Kinsey found an agate that weighed 21 1/2 pounds. This agate is egg shaped, with one end broken off enough to make a "window" and shows good red bands and dendrites. He refused to sell the agate, even though he was offered three hundred dollars for it. Occasionally agates weighing ten or twelve pounds are found but the average are from one to four pounds.

A cutter in Miles City found an agate that weighed twenty two pounds. It was an egg shaped stone but it did not have a "window" and the pattern could not be seen plainly, although it looked like a good stone. He never cut it but sold it to a collector. These large agates were found in the area between Terry and Forsyth.

Miles City has several rock shops, as has most communities throughout the U.S. Some of them offer Montana agates for sale as well as other types of gemstones. Ralph Harris was the first commercial gem cutter in Miles City that made a successful business of cutting gemstones.

Mr. Harris came to Miles City from Seattle, Washington in 1915 where he was apprentice in a lapidary and gem cutting establishment owned by a jewelry manufacturing company. When he became adept at the arts of gem cutting, he wanted a business of his own, and he had about decided to start in business in Versalia, Washington. While he was apprentice in Seattle, among the stones the firm cut was the Montana agates. Mr. Harris relates that occasionally someone would come in the shop with a few Montana agates to sell, and when asked where they got them, they always said they got them at Miles City, Montana.

Before definitely settling down in Versalia, Mr. Harris first came to Miles City to look over the country for a possible location. He got off the morning train in Miles City and before noon had bought out a gem cutting establishment.

In those days, lapidary equipment was not readily available as it is today, and most of the equipment had to be made by hand. The operators of this shop had a very limited amount of equipment, and they had cut very few stones. Therefore, I believe we can rightfully say that Mr. Harris was the first agate cutter in Miles City. The other early day cutter mentioned in a preceding chapter was a man in Glendive who was cutting gemstones before Mr. Harris started in business in Miles City.

Ralph operated the Montana Gem Shop until 1959 when he quit business and moved some of his equipment to his home, where he, as he says, "still fools around with agates." After being under the pressure of operating a successful business for many years, Mr. Harris can now relax and work with agates at his leisure or go fishing, for Ralph enjoys a fishing trip occasionally.

Besides the Montana agate, there are other gemstones to be found in this area. Often red or yellow or multicolored jaspers can be found. While many of these jaspers are badly fractured, occasionally one is found that is good gem material and makes into unusual cabochons. Also, petrified and agatized wood is found among the gravels, and occasionally a piece of black alga is found. Sometimes a rockhound will pick up a piece of green jasper, and invariably when an inexperienced rockhound finds a piece of this material he thinks he has found a piece of jade and sometimes will not believe experienced gem cutters when they tell him it is jasper.

There is no known deposit of jade in the Yellowstone Basin or any of the tributaries, except the Big Horn River that originates in the Wyoming jade fields. There have been a few pieces of jade found along the Yellowstone, but this material apparently was "float" brought here by the Big Horn River from Wyoming. These pieces of jade that were found have the characteristic rust-brown skin, and to the experienced eye, do not remotely resemble the bright green jasper found in the Yellowstone River area.

Several areas contain fossils. The fossil beds are located back in the rough hills, and to find these areas, a guide is almost a necessity. It is advisable for the collector to become familiar with the rules and regulations regarding the collecting of fossils or artifacts before going on a collecting trip for these items.

Often Montana agates are fractured; in fact, a large percentage are fractured to more or less a degree. This fracturing was caused by the movement of the material tumbling and grinding with other stones as they were being brought into this area by water action.

Fracturing of these agates is also caused by the extremely cold winter temperatures freezing the moisture content of the stones, the expansion causing fracturing. Then the next winter, moisture in the cracks freezes, again causing more fracturing. However, nearly all slabs have to be cut if cabochons are being made, and one can just mark between the fractures and still make beautiful cabs. Of course, we all like the more solid stones, but only a small percentage shows no fracturing.

Occasionally an agate slab shows iris colors when the slab is held to a light. By the way, do not hold the slabs towards a fluorescent light to see the iris colors as the light from these lamps is diffused so that it is difficult to distinguish the iris. If the slab is unpolished it should be dampened with oil and held toward an incandescent light or the sunlight, when the iris effect can plainly be seen. A polished slab need not be oiled. This iris effect is often found around a center of quartz in agate, but sometimes the iris occurs with banded brown or reddish bands and sometimes the iris occurs with dendrites. Nearly every rock cutter in this

area has a few iris slabs or cabochons. If this iris agate is to be made into a cabochon, do not make a high crown or it will destroy the iridescence effect. Also, the slab should be cut thin.

Bill May of Kinsey has some of the most striking iris agates found in this locality. Bill is an artist in his own right, and while he doesn't have as much time to work with his agates as he would like, for he owns a ranch, he has a beautiful and unusual display of scenic and iris agates. He made a coffee table using the native red cedar, and in the center of the table he left a round hole, into which he secured Montana iris slabs arranged in a circle so that they all match. He placed a light underneath, and the light shining through the thin slices of iris agate truly is a work of art. He also used iris agate in making a Ring Neck Chinese Pheasant. The pieces of slabs are so skillfully placed that the finished product not only has the shape of a pheasant but the iris is placed in such a manner that when a light is placed behind it, the iris colors is a reproduction of the natural bird with ring neck and all. These two items truly show an original and unusual beauty and craftsmanship.

Bill likes to hunt for agates and many times he and the author meet while hunting agates and sometimes we hunt the gemstones together. Bill is a good companion on rock hunting trips and he never tires of looking for the gemstones in his spare time.

There is almost no limit to the different designs these agates will show when cut properly. Also there is no limit to designing mountings as Montana agate blends well with almost any color combination.

Julian Stuver and his brother, Joe, operated a mine in Alaska a number of years and when they got through mining, they came back to Montana. Jul, as his friends call him, became fascinated with the Montana agates, as one type of gemstone for making gold nugget jewelry, and he and his wife, Mae, settled in Miles City where they operated an agate and gold nugget shop for several years. Jul brought some gold nuggets with him from Alaska, and he makes mountings of gold sheet with native Alaska gold nuggets soldered on the gold sheet in a way as to cover the entire gold sheet. With a Montana agate set in this mounting, it is an unusual and lovely work of beauty, and his customers from throughout the United States and some foreign countries buy them for gifts of the Montana agate.

The author has one on a bolo. The stone is a scenic type Montana agate showing red topped trees with reddish sunset and white snow in the foreground that makes a perfect winter scene, and the natural bright gold nuggets enhance the stone perfectly. The Stovers sold their shop in Miles City and moved to Polson, Montana, where they operate a rock shop at this writing. army camps where collectors dig for bottles. Anyone with a yen for digging bottles in this area must keep in mind that all the land immediately adjacent to the Yellowstone River is privately owned and permission must be obtained before any digging or passing over the land is attempted.

In this great outdoors country one might travel for miles without seeing a house, but this does not mean this land is public land. Many ranches consist of thousands of acres, either owned outright or leased, and the chances are that almost anywhere a stranger would be he would be on private land. There are areas of public land, that is, land under the jurisdiction of the Bureau of Land Management but in most cases these lands are isolated tracts that would be difficult to find, unless one is acquainted with the area and has the time to search out the areas.

There are many collectors of bottles in Miles City, but bottle collecting is a story of it's own so we will skip over this hobby and go back to agates.

Often outdoor enthusiasts ask what kind of clothing to wear on an agate hunting trip. One should wear loose rough clothing and the ladies should not wear the tight fitting stretch type slacks, for there are mosquitoes in the summer months. Any kind of tight fitting clothing is uncomfortable when walking or riding in a boat. A blouse with sleeves, or better yet, a man's shirt with sleeves to keep the mosquitoes from biting the arms, and to prevent sunburn, for the days in the months of July and August are very warm with bright sunshine and a bad sunburn can be painful. A hat should be worn to protect the face and neck from the direct rays of the sun and from mosquitoes. Bring mosquito dope.

As for footwear, any type of rugged shoes is alright, but do not wear ill fitting shoes or you will soon be saying "my feet are killing me!" There is nothing that can make an outing more unpleasant than a sore foot, unless it would be two sore feet!

If a boat trip is planned, one should take along a pair of rubber hip boots or at least knee length boots. Often it is desirable to beach the boat where the water is too shallow for the boat to float well and it is necessary to wade in water ankle deep or deeper and pull the boat to shore. It is very unpleasant to walk with wet feet for soon there will be blisters.

Bring drinking water and lunch. If everyone comes prepared the trip will be much more pleasant than to start without proper preparation. A Gemscoop is a handy tool. It can be used for a walking stick as well as digging out agates. Also the scoop saves a lot of stooping to pick up stones. If you come prepared I am sure you will enjoy every minute.

If you do not find enough agates there are a number of shops throughout the area that offer rough as well as cut stones. Most of the dealers conform to accepted standards commensurate with quality and price, and one should have no difficulty in obtaining Montana agates at a reasonable price.

GOOD HUNTING!

Some Shop Tips

To distribute the flow of water evenly over my grinding wheel I soldered a nozzle from a spray can, the kind that is used for hand spraying weeds, on the end of a one quarter inch copper tube. I put a small valve about eighteen inches from the end to control the flow of water and fastened the other end to the water supply. Of course, the water must be under pressure, such as the city water line. These spray can parts may be obtained at most hardware stores.

Did you ever need to tie a plastic bag and couldn't find anything to use for a tie string? Television sets and other fine electrical instruments have many fine insulated Wires that make excellent tie strings. Most T.V. repair or electrical repair shops usually have some equipment that you can cut out the wiring.

A plastic jug or bottle of the kind Clorox, etc., comes in makes a fine container for stones and other items. To cut off the top, first mark around the jug, then heat a knife blade over an open flame and the knife will cut the plastic smoothly. Do not overheat the knife blade or the excessive heat will take the temper out of the steel. Also if heated too much the blade will turn dark in color. A knife that is not of much value should be used.

If you want to stand a slab on edge and don't have stand, cut the head off a common pin and flatten it a little on one end. Stick the flattened pin to your slab with a good cement such as Epoxy and you can stick the sharp end in any soft material and keep the slab upright.

I have used an old electric iron that still heats and made a dop wax and stone heater by simply cementing a small tin can with the bottom cut out to the fiat surface. The heat controls must be working so the heat can be regulated.

At present I am using a fiat surface electric hot plate. These are the surplus aluminum hot plates that can be obtained at most surplus stores or sporting goods stores. They are inexpensive and have a large surface for the stones to heat while the wax is heating. They can be set to any heat desired and will maintain an even temperature. A good wax pot can be made by cutting the bottom out of an empty sardine can and cementing it to the surface of the plate with Elmers Glue or other good cement. A piece of galvanized "tin" should cover the plate where the stones are warmed to prevent overheating.

If you find it difficult to grip the aluminum or bronze marking pencil, wrap some electrician's tape around the pencil and you can get a firm grip.

Make your own individual cabochon templates by marking the size and shape on a piece of clear Plastic sheet. Cut it out to shape and finish with a file and you have clear templates you can see through.

When your sanding cloth starts to wear and doesn't cut, sand a piece of obsidian and you

will get more use out of the sanding cloth.

How To Tumble Polish Stones

The methods described are my own methods of polishing cabochons and small slabs with the vibrating polisher, with a hardness of 6 1/2 to 7 1/2 on the Moh's scale.

For tumbling cabs and small slabs it is best to use the vibrating type tumblers as it is easier to get the exact grind desired before the final polish procedure, also the vibrator type is faster for small stones.

If a 10 or 12 pound barrel is used it is best to put some small slabs through the rough grind before starting on the cabochons. It is seldom the average rock hound has enough cabochons to fill a 10 pound barrel, therefore it is necessary to fill in with small slabs or small pieces of agate. If smaller barrels are used the amount of grind and polish should be reduced accordingly. Especially in polishing, if too much polish powder is used the wet powder makes too much of a cushion between the stones and this reduces the abrasive quality of the powder. Do not let the stones become dry.

First, fill the barrel two thirds full of the slabs. Add about five or six ounces of coarse, 60 to 100 grit, silicon carbide grit. Add enough water to keep the stones damp enough so the grit stays on the stones while being tumbled. Be careful, do not add too much water, just enough to keep the stones and grit wet. Run the tumbler 36 to 48 hours or until all the scratches and other marks that were made by the saw blade are removed. Now take the stones out of the tumbler and wash thoroughly to remove the coarse grit. Put the stones back in the barrel, add about two cups of water and tumble for about three minutes. Be sure barrel is clean of all grit. This three minute run in clear water will loosen any grit that might still be adhered to the stones from the first washing. Wash the stones again and they should be clean and ready for the second grind.

Now it is time to start on the preforms. When you have finished grinding the preforms on a coarse wheel, preferably a one hundred grit wheel, they will now be called cabochons. It is best to finish the grind with a 220 wheel. While the cabs are still on the dopstick sand them a little with 220 grit sanding cloth, especially the tops of the centers, or "crown". This need not be too thorough a job of sanding, just enough to take some of the coarsest scratches off that were made with the grinding wheel. The top of the crown is the most difficult to polish, so sand the tops fairly well.

If you have some large cabs such as 22 x 30 or larger it is best to tumble them with the slabs about twelve hours before adding the smaller cabs. First put the cabs in the barrel, then add the tumbled slabs until the barrel is three fourths full. Add five or six ounces of 600 grit. If you have put the stones in the barrel while they were wet from washing, this usually is enough water to start. Just enough wetness is necessary to keep the grit adhered to the stones. If this is not enough water more may be added. When adding water a spoon should be used for it is easy to add too much water and the stones will not tumble properly. Run the tumbler with the slabs and large cabs for twelve hours or less, then add the small cabs. If the vibrator tumbler is working properly it usually takes 36 to 48 hours to tumble the load with 600 grit.

Examine the cabs twice a day with magnifier so as not to grind away too much of the cabs. Just enough so you can't see any scratches that were made when you formed the Cabs with the 600 grit grinding wheel. Now wash the load thoroughly and tumble with clear wa-

ter as before. After you are sure all grit has been washed off the stones and the barrel is clean the stones are ready for the polish. If you take the stones right out of the water and put them in the barrel immediately this will be enough water. Add about two ounces of your favorite polishing powder and tumble from five to seven days. After the first three days examine daily with a magnifier until desired polish is obtained. Remember, do not let the stones run dry.

If softer stones are being tumbled the time element in the grinds should be reduced accordingly. If thickener is desired small bits of torn up newspaper may be used as this paper turns to pulp, or sawdust may be used. The plastic pellets that are offered on the market are used for this purpose and for filler.

Following is the method I use in polishing flats with the vibrator polisher. To polish flat solid stones, if the surface is cut smoothly I start with 220 grit silicon carbide. If the flat surface is rough with saw marks start with 80 to 100 grit, then 220 grit, next 600 grit, although some cutters use 400 grit between the 220 and 600.

For each operation I use four to five tablespoons of grit and enough water to cover the pan about one quarter inch. This is for 20 inch lap. For smaller laps use less grit accordingly. Run each operation about eight hours. I make sure the plate is clean of all grit before starting with a finer grit or polish, especially with the polish for just a grain or two can scar the stone.

For polishing I use a piece of carpeting. Often the polishing process is improved by covering the carpeting with imitation leather. The type used in upholstery shops call "naugahyde" I have found to be satisfactory.

For polish use four or five tablespoons of a favorite polishing powder such as tin oxide, cerium oxide, etc. A dash of Linde A helps, but this is a bit expensive, however, I find that the saving in time is worth the added cost.

I NEVER LET THE PLATE RUN DRY. If this happens the stone may be marred badly and the grinding process will have to be repeated. If there are little corkscrew-like markings on the polished surface this is caused by a grain of grit or perhaps a tiny piece of broken stone marring the surface. Then the grinding process will have to be repeated starting with 220 grit.

To polish slabs it is necessary to use a weight to exert more pressure than the slab alone. Otherwise the stone will "dance" and will not polish properly. For a weight a rock may be cemented to the slab or a piece of lead may be used. Plumbers lead may be obtained at the local hardware store or plumbing shop.

If more weight is needed on a stone or geode a weight may be made by pouring melted lead into a container such as a pie plate and when it has cooled use a ball peen hammer and pound into a saucer shape to fit over the geode. To stick the lead saucer to the geode use beeswax and Paraffin in equal amounts. The wax can be cleaned off by immersing the stone in water and heat till the wax melts and rises to the top when it can be poured off or wait until the water cools and the wax will solidify and can be taken off.

To prevent the centers of geodes from becoming contaminated with grit sludge or polish powder, stuff some cotton in the hollow, but leave room to pour melted beeswax and paraffin on top. When the wax has cooled scrape off any excess wax that might be on the flat surface of the stone. Also, to prevent the outside of the stone from becoming badly contaminated with sludge the melted wax may be swabbed over the entire surface of the stone while

the stone is warm. This wax will make a coating that will help keep sludge out of rough surfaces. Or put some wax in water and heat until the wax makes a bad burn. A string may be tied around the stone and the stone dipped in the hot waxed water and it can be immersed without touching with the hands.

To remove the wax put the stone in a metal container and cover with water. Heat until the wax melts and comes to the top, as described before. **DO NOT EXPOSE A HOT STONE TO THE AIR OR TO COOL WATER OR THE STONE MAY CRACK IN A NUMBER OF PLACES.** It is best to let the water cool and take the solidified wax off the top.

The shop tips and methods described in this book are the author's methods and does not necessarily mean the directions should be followed exactly as described. Each cutter has his own methods and these tips are merely that--tips. When you have become adept at cutting and polishing stones, undoubtedly you will work out your own methods.

If you wish to make an unusual cab here is a tip that makes an unusual and beautiful cabochon.

One should use an agate preform with straight sides, such as square, rectangular or diamond shape. A stone with dendrites or "spot" agate should be used. Banded or ribbon agate is not recommended, for this type of agate is too common and does not make an unusual stone.

After the preform is cut with the straight sides, cement small slabs of the same thickness, of black agate or other black stone, to the edges of the preform so that you have a slab of agate surrounded with black agate slabs. The edges of the stones can be cemented together with a good cement and let dry at least twelve hours. I have found the cement called "Ten Ton Cement" is very satisfactory. While this cement leaves a white line along the seams, it does not detract from the beauty of the finished stone.

When the cement is thoroughly dry mark out your cabochon and cut and polish as usual and you have a stone of unique and Unusual beauty.

Sometimes one will cut a Montana agate with red or black dendritic "trees" so close to the edge it is difficult to make a decent looking cab of it. By using the method described a nice cabochon can be made of this slab. If you forget to turn off a hot plate or other electrical appliance in the shop, you can purchase a "pig tail" socket at your hardware store and attach it to the appliance cord by connecting the two wires to the two wires on the cord, then insert a 7 1/2 watt red light bulb. If you leave the appliance on, the red light will show a signal that will be easily seen. Of course the cord will have to be unplugged from the wall outlet, but that is better than leaving the appliance on all night.

Evaluating Montana Agates Found in the Field

Don't expect every agate you find to be a good one. Following is an estimate of the various grades of Montana agates as found in the field ("field run").

20% to 25% of all field run Montana agates are clear, with no markings or inclusions. This does not always hold true, for sometimes some of the "clears" when cut or broken have bands or dendrites that were not visible when candled.

25% are of tumbling quality, that is, agates with few markings, badly fractured or off color. These are used for crushing and for slabbing to use in plastic embedment and other ornamental uses. Some of this grade is good cutting quality, for this grade contains some stones that cannot be candled properly and sometimes contain stones of better quality than examination would indicate.



35% are of good gem quality for slabbing and making cabochons. About 15% are top grade or super grade quality.

As for dendritic agate, about five percent of field run agates are of the dendritic type. Three percent of these are of small dendrites or "salt and pepper" as this type is locally called. About two percent are of the better quality that produce the trees, bushes, sunburst or sunflower design.

The majority of Montana agates of gem quality are banded, ribbon and colored with no dendrites. These agates with the colors of red, brown or orange and often a combination of colors in clear or translucent agate make beautiful top quality cabochons, especially if the stone contains some dendrites with the colors.



The top grade dendritic or "spot agates" are usually sold by the individual stone rather than by the pound. These are the stones that are used for best quality jewelry and for specimens.

The figures given are approximate and sometimes vary but as a whole the percentages given are fairly accurate.



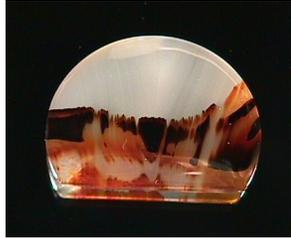
Montana Agate Cabs of Distinction

From Harmon's Agate & Silver, Inc.

From the Brooks Britt Collection



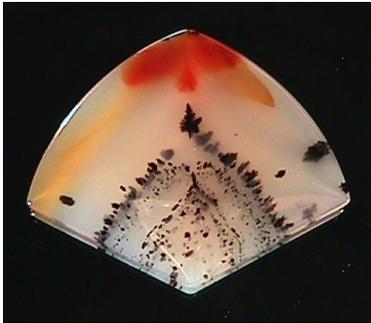
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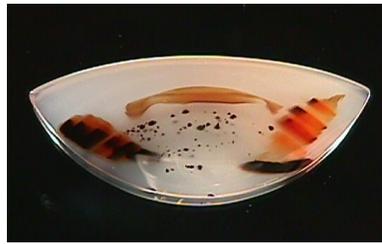
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"Collector Piece"



"Timberline"



"Rainbow"



"Red Oval"



"Red River"



"Red Tree Coulee"



"Red Mountain"



"River Island"



"Single Trillion"



"Lone Tree Mountain"