AMERICA'S OPTICAL EMANCIPATION ACHIEVED WHEN WORLD WAR BREAKS GERMAN TRADE GRIP

One of the Greatest Scientific and Industrial Achievements the United States Ever Accomplished Was Born of Battle Experiences by Uncle Sam's Experts in an Amazingly Short Time.

PHOTOS BY THE GILLIAMS SERVICE, N.Y.

Above—In the making of optical glass satisfactory melting pots are absolutely essential. This is a view of a special pottery where such utensils are manufactured. Below—The glass is broken in pieces in removing it from the pot and these pieces, after passing inspection, are subsequently remelted and pressed into blanks approximately the sizes of the desired lenses.

GERMANY will, in all probability, in a short time, just as soon as trade relations are resumed with her by us, be sending her salesmen to this country to drum up business. Among America's business men the opinion prevails that she is then due for some rather unpleasant surprises, it being more than likely that many orders she most confidently expects will not be given by us for certain lines of goods, on the manufacture of which she held a practical monopoly before the war, and in the making of which she never imagined Uncle Sam would ever be able to compete. One of these, of which the American public has as yet heard but little, although of the very greatest importance, is optical glass.

In its production the Germans imagined they had a cinch which left the entire world well-nigh helpless and in their hands. At the outbreak of the war, this was, at least so far as the United States was concerned, very close to being a fact, as then, broadly speaking, Americans only saw, where artificial stimulated vision was required, through the help of Teuton cunning or, in other words, through the lenses manufactured of the famous Jena glass, as in 1914 no glass fit for optical purposes was produced in this country.

No wonder the Teutons are reported to have laughed up their sleeves and sneered as to what America could do in the war, as they believed that as the war progressed, Uncle Sam, lacking the power of penetrative vision, would be little more formidable than a very near-sighted man, without glasses, who no matter how well equipped he might be otherwise, could not use his arms to advantage because he could not see to do so.

To fully understand this statement, some explanation is necessary.

Back in 1898, when we measured forces with the army and navy of Spain, even the largest of our guns—those afloat—were not expected to have a maximum effective range of more than 5000 yards, and our naval marksmen counted upon doing their work at considerably shorter distances. Optical range finders were then well-nigh in their infancy, and those in our fighting services were few and far between. With the advent of 1914, however, both land and naval ordnance had developed to such a point that range finders, capable of co-operating efficiently with the gunpointers, were available which would give accurate readings up to a distance quite beyond 20,000 yards. At least, range finders equipped with lenses of the best optical glass could do this. Their success depended fundamentally, however, upon the grade of the material from which they were ground.

The great reach of field glasses, high-powered cannon of various sorts, and the batteries of fighting craft, not to mention the increased range of the infantryman's rifle, compelled long-distance observation, and this to the needful degree could be obtained only through optical aids of one sort or another.

The Germans had shrewdly anticipated this demand, and for years before the outbreak of strife had made the world at large very greatly dependent upon them for its indispensable lenses, telescopic gun sights, stadimeter telescopes, field glasses, binoculars, airplane cameras, long-distance cameras, range finders of various sorts, and periscopes for use in the trenches, in turrets, and to prove eyes for the submarine. We were also almost entirely dependent upon Germany for the optical glass in constant demand for spectacles, eyeglasses, goggles and for face masks. To be dependent upon our enemy for such vital essentials was certainly a very serious state of affairs, but one thing the Germans failed to fully appreciate, perhaps they do now, is the wonderful resourcefulness of Uncle Sam's people. Although we entered the war with a tremendous handicap in the way of a continued supply of optical glass, in a comparatively few months, early in 1918, this situation had been entirely reversed, and we were in a position to meet not only our own needs, but to aid our allies, and to export besides excellent optical glass in considerable quantities.

Of course, our success was kept a secret for many months. It was well to keep the Germans guessing how we could make out, but now that peace has come the story as to how this changed condition was brought about can be told.

When the European war started our optical concerns had in store only enough imported glass to meet normal demands for about two years; but times were not normal and in a brief while the entente powers were turning to us both for range finders and binoculars in quantities far beyond the productive capacities of either their own plants or our optical establishments. The glass in store was rapidly withdrawn and worked into vitally necessary military equipment, until in a few months there was none left, and it came home to us that we were facing an inevitable shortage of optical glass. The general public did not appreciate the gravity of the impending deficiency, but our naval and military authorities did and they were profoundly disturbed, and realized that if we were to win the war something must be done quickly.

Happily, some of our government agencies had in time of peace given consideration to ultimate creation of a native optical glass industry, the United States bureau of standards being an official pioneer in this direction. At the time we entered the war the bureau had been actively interested for several years in the problem of producing optical glass in this country. It was the belief that America could be a producer of first-class optical glass, and the bureau planned when the time arrived to do its part in stimulating such production, both by experiment and research and the closest possible co-operation with the industries concerned.

When we became a belligerent the problem was no longer one of national pride or revenue or independence of foreign supplies. The production of optical glass in America became an acute, vital and immediate necessity. The bureau, therefore, expended its force and assigned the needed assistance to the existing glass section of the bureau, with instructions to develop the methods of producing glass of all varieties required on a commercial scale.

The technical literature in various libraries contained a sufficient variety of acceptable formulas, but little as to technique. Experiments in this direction were conducted by the bureau and every detail of the manufacture was worked out by study of theory, by actual experiment and by the study of each factor affecting the optical quality of the glasses produced.

The optical glass laboratory, called into being by the bureau of standards during the summer of 1917, was installed at the plant of the Pittsburg Plate Glass company, and during the succeeding few months 200 melts of glass were made in large pots—one of these being big enough to hold 1000 pounds. In consequence of that experience, the officials of the bureau finally mastered in practically every detail the processes of manufacturing optical glass equal to the best German products, and succeeded in producing even types of the material having different characteristics. In addition to actual production, the researches covered a wide field, and the amassed information is now of such extent and nature that it is confidently predicted we can henceforth meet all of our own needs and have some to export.

In addition to the bureau of standards, the geophysical laboratory of the Carnegie institution in Washington lent its aid generously in dealing with difficult problems that confronted us in preparing to do battle with the central powers. At one time more than two-thirds of the scientific staff of that laboratory were at work in the different domestic glass factories, and by reason of their professional attainments helped to surmount the many obstacles that stood in the path to that goal which only the Germans were thought to have reached.

A party of six was assigned by the geophysical laboratory in April of 1917 to the plant of Bausch & Lomb Optical company, and for more than a year all the efforts of the laboratory were practically concentrated at the Rochester plant. By the end of 1917 the Bausch & Lomb works were turning out optical glasses of good quality in considerable qpantities. Thereafter the geophysical laboratory extended its operations to the Spencer Lens company and to the Pittsburg Plate Glass company.

Optical glass it must be understood differs radically from the commonplace window glass. Without going into the technicalities of the making, both crown glass and flint glass are employed in the get up of optical instruments. Crown glass is made of purified sand, chalk, or limestone, and sulphate of soda. Flint glass is made of very fine white sand, red lead and a little nitre. For optical purposes the glass has to be homogenous, and if it is not then it is apt to be striated, i. e., there are threadlike streaks which, while transparent, seriously affect the capacity of the glass to transmit an image undeformed. There are other defects in the form of bubbles, seed, etc. No wonder, then, that for some grades of glass a pot will yield but 20 per cent of usable material. This is the principal reason why such glass is so costly.

In the manufacture of optical glass, it was discovered that one of the things that contribute greatly to the homogeneity is continued stirring, which must be started when the molten mixture is quite fluid and kept up for hours, during the succeeding gradual cooling, until the mass has the consistency of workable taffy. For this purpose, Uncle Sam's experts have found it was best to use a fire clay stirrer attached to a water-cooled tubular shaft. The movement of this attachment is in ever-changing circles and so directed that it will not engage the inner side of the pot and thus grind away the surface and mix the foreign matter with the vitreous composition.

To guarantee satisfactory optical glass, it was not enough to develop stirring mediums; to determine the character and the proportion of the ingredients; to find ways to supply the necessary heat and to vary the temperature carefully over wide ranges of the thermometer, the pots in which the glass is heated were also, it was discovered, of the most vital importance as they must be resistant to the corrosive action of the glasses and very low in iron contents.

When we began the manufacture of optical glass no such pots were to be found in this country, and Uncle Sam was obliged to establish a pottery in which to make them and devote considerable attention to the work before satisfactory utensils were turned out. These containers have to withstand a temperature of 2550 degrees Fahrenheit—somewhat higher than the melting point of steel. Besides the necessity for their being sufficiently refractory to withstand great heat, they have also to be of such purity that they will not taint and impair the glass in the making.

The Germans imagined that they enjoyed another advantage in the secret of the manufacture of these pots but we finally discovered it along with the other secrets of making fine optical glass.

AUCTION BRIDGE

By Auntie Blanche Shelby.

A COMMUNICATION signed J. H. B. asks what the partner of a player making the informatory double is expected to do, or should do, when the intervening player puts in a bid.

The informatory double, it will be recalled, is the double of a one-trick contract. When made over a no-trump bid, it says: "I also have a no-trump hand." When made over a suit bid, it says: "I have a no-trump hand save that I lack protection in the suit which is called." In either and both cases it gives specific information and directs one's partner definitely what to do. In the first case if he has even moderate help for a no-trumper, he should call "2, no trumps"; lacking this strength, two of his longest suit. In the second case, if he has one or more stoppers in the suit, with some help besides for a no trump, he should call no trumps; if unprotected in the suit, two of his longest suit. This is on the assumption that the intervening player passes.

When this player makes a bid—and many of the objectors to the informatory double assert that he should do so, if at all feasible, to make it awkward, if not impossible, for fourth player to comply with his partner's request, as embodied in the double—the matter assumes a different phase and calls for special analysis.

Answering the question, however, as briefly as possible, when the intervening player bids, fourth player is released from all obligation in the matter and need make no announcement which his holding does not fully justify. If, though, he is strong, and more especially if he has a fairly good five-card major suit, with one or more side tricks, he should generally name the suit, regardless of the third hand. If, on the other hand, he is weak, and more than ever, if the takeout is in a minor suit, and the score is such that there is little or no prospect of its going game—though especially at duplicate small gains are not to be despised—he should usually pass, taking comfort in the thought that as his partner enjoys the advantage of position, and is himself strong, he may be able to defeat the contract, whereas they might be unable to carry a bid. Having passed, if his partner again doubles, he no longer has any option in the matter—he must bid. A second double made by the original doubler under conditions of this nature is not a business double made in the hope to defeat the contract, but it also is an informatory double and carries with it the same significance as the informatory double made in the first instance, telling one's partner emphatically that he must bid—that in his (the doubling player's) opinion it is not well the adversaries should be left at their bid.

This phase of the informatory double which I do not think is generally understood develops as follows: Z, we will say, bids no trumps. A doubles; Y calls "2 clubs"; B, who is thus released from any obligation in connection with the double and who is weak, passes. Z also passes and A again doubles. This does not mean that he wants the hand played at the doubled club, but that it is imperative his partner make a bid. In his proper turn therefore he and his partner must announce his longest suit.

I give below a couple of hands where the informatory double was used and where the results were various according to the particular use that was made of it:

	♥ 5 ♠ A Q J 5 3 ♦ J 8 4 ♣ 8 7 5 2	
♥ K Q 9 6 ♠ K 10 2 ♦ 9 7 ♣ A J 10 9	A Y B Z	♥ J 10 8 4 3 ♠ 8 4 ♦ A Q 10 5 ♣ 6 3
	♥ A 7 2 ♠ 9 7 6 ♦ K 9 3 2 ♣ K Q 4	

The score is love all second game, Z who is the dealer bids no trumps. A who also has a no-trump hand doubles. Y bids "2 clubs." The question is what shall fourth player do? Had third player not made a bid, his course would be simple. Not having help for a no trumper he would call two of his longest suit, hearts. Now, however, he is released from all obligation in the matter and it is largely a matter of individual judgment whether he bid or pass, trusting if he do the latter that his hand in combination with that of his partner's will defeat the contract, or, at best that the opponents will secure but a small score. It is interesting to note the varying results secured at different tables, according to the particular action which the doubling player's partner, takes in the matter. Where he passes and the hand is played at "2 clubs," Y makes two by cards, or 12, which, with simple honors, gives him a total of 24. Where the hand was played at "2 hearts," AB makes two by cards, or 16, plus 4 honors, a total of 48. At one of the tables where B bid "2 hearts," Z went to "3 clubs," and A doubled (a business double). The side defeated the contract and secured aside a score in excess of what it makes when the hand is played at "2 hearts."

Played at "2 diamonds" the hand is somewhat interesting. It went as follows:

Trick.	A	Y	B	Z
1	6♥	5♥	4♥	A♥*
2	10♣	J♣*	4♣	5♣
3	7♦	J♦	A♦*	2♦
4	Q♥	3♣*	5♥	2♥
5	9♦	4♦	5♦	K♦*
6	2♣	Q♣*	8♣	6♣
7	K♣	A♣*	3♣	7♣
8	A♣*	2♣	6♣	Q♣
9	K♥*	8♦	8♥	7♥
10	9♥	5♣*	10♥	3♦
11	9♣	5♣	10♦	K♣*
12	10♣*	7♣	J♥	4♣
13	J♣*	8♣	Q♦	6♦

*Denotes winner of trick.

Trick 1 B leads fourth best of his heart suit. Dummy at once puts up ace to lead the trump from the right hand for the finesse. At

Trick 2 dummy leads nine of clubs, trumps. A covers with 10 and declarer finesses jack and wins, declarer at

Trick 3 boldly comes out with jack of diamonds hoping at a later stage to make re-entry of dummy's king and have a second round of trumps from his dummy's hand. B puts up the ace in the hope to prevent trumps from being early exhausted. B at

Trick 4 has another round of hearts which declarer trumps and at

Trick 5 puts the dummy in with a diamond.

Trick 6, dummy leads another trump, declarer winning with queen and leading at

Trick 7 the trump ace which brings down A's king.

Trick 8, declarer now leads a small spade, dummy putting up queen and A winning with ace.

Trick 9, A leads the commanding heart which holds the trick, as declarer who sees the play will gain him nothing, refuses to trump.

Trick 10, A leads his remaining heart which declarer trumps, at

Trick 11 leading the spade which dummy wins with king. Whatever the dummy now leads AB take the two remaining tricks.

Played at "2 hearts" the play was as follows:

Trick.	A	Y	B	Z
1	A♠*	2♠	7♠	K♠
2	6♥	5♥	10♥	A♥*
3	10♣	J♣*	4♣	2♣
4	9♣	5♣	6♣	Q♣*
5	2♣	Q♣*	5♣	8♣
6	K♣	A♣	3♥*	7♣
7	Q♥*	7♣	4♥	3♥
8	K♥*	2♣	8♥	7♥
9	J♣*	8♣	5♦	4♣
10	10♣*	5♣	10♦	2♦
11	7♦	4♦	Q♦	K♦*
12	9♦	J♦	A♦*	3♦
13	9♥	8♦	J♥*	6♦

*Denotes winner of trick.

Trick 1 Z opens with king of spades which Dummy wins with ace, and leads at

Trick 2 a small trump, hearts, declarer putting up the 10 and Z winning with ace. Trick 3 now leads his partner's suit, clubs. Why he did not do so in the first instance is not clear but since the opportunity early develops for his doing so, nothing is lost. It is unusual though to show a re-entry before responding to your partner's suit, except when you hold both ace and king. However, Y successfully finesses the jack and leads at

Trick 4 a small spade, dummy getting in with queen and leading at

Trick 5 another club which Y wins with queen.

Trick 6 The ace of clubs falls to a trump played by B who at

Trick 7 takes another round of trumps, dummy getting in with queen and following at

Trick 8 with the trump king exhausting the adversaries.

Tricks 9 and 10 go to dummy with his established spades. Dummy's next lead is a diamond to which declarer unsuccessfully finesses queen. It falls to Z with the king. Z, however, is compelled to lead a diamond and

Tricks 12 and 13 go to declarer with the diamond ace and the heart jack.

I am asked what authority, if any, there is for the player who cuts the cards previous to a deal to place the packet he removes toward the dealer.

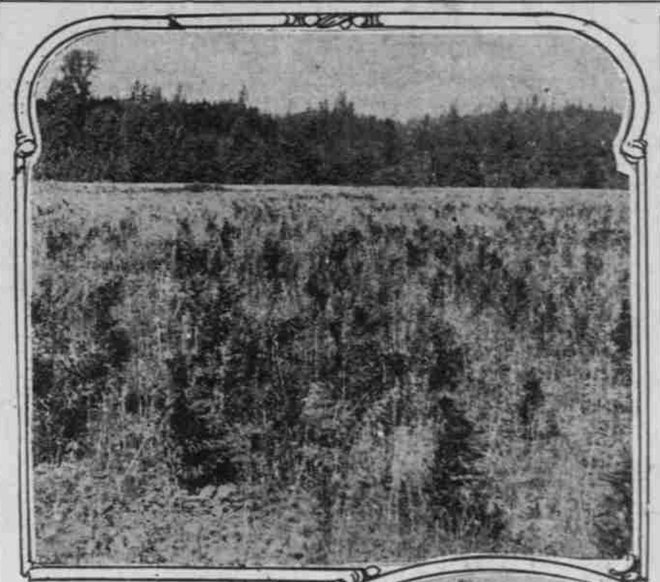
Nothing with reference to the form appeals in the laws or even in the etiquette of the game; still it is a custom sanctioned by long usage, and tending to system and uniformity, and as such should be observed. For one thing if the attention of the dealer be comes distracted before he reunites the packets, he need never be in any doubt as to the respective order in which they should be placed. The packet, which is toward him belongs always to the bottom. There are two things which I always insist upon in connection with cutting, first, that there be at least four cards in each packet, secondly, that the packet removed be placed toward the dealer. The first of these conditions is a law and reads as follows: "Immediately before the deal, the player on the dealer's right cuts, so that each packet contains at least four cards."

The only reference I find in any book concerning the packet removed being placed toward the dealer (and this is simply a statement, not a law) appears in "The Gist of Auction Bridge," by C. E. Coffin. The paragraph reads thus: "The dealer presents the pack to the adversary on his right hand to be cut; the adversary must take a portion from the top of the pack and place it toward the dealer; at least four cards must be left in each packet. The dealer must reunite the packets by placing the one not removed in cutting upon the other. Some would-be polite players think they must complete the cut, but this is not in accordance with the etiquette of the game. It is the privilege of the dealer to complete the cut."

The following has been submitted: Z, the dealer, bids a club. A passes. Y bids a heart and B "two diamonds." Z goes to "two hearts," supporting his partner, and B to "three diamonds." Another spade raise causes B to go to "four diamonds." A has repeatedly passed. His holding is three small hearts, three clubs to the king, nine, three diamonds to the jack and four spades to the ten. The question is, is he justified in calling "five diamonds." I would say in reply that if B can rebid his hand twice without any assistance from his partner, an honor in diamonds and a stopper in Z's original bid, clubs, should entitle A to one assist.

PROPER FEEDING ONLY PRECAUTION NEEDED TO PROTECT HORSES FROM FERN STAGGER

Hay Containing One-Third or More of Bracken Plant Is Dangerous at Any Season of the Year—Farmers Are Advised to Feed Roots and Bran in Order to Avoid Loss of Stock.



Bracken Fern. About ½ of Total Crop.

Bracken Fern Plant. Above Ground Part is Single, Much Divided Leaf.

FERN STAGGER is undoubtedly the most common trouble caused by poisonous plants in western Oregon and its prevention is so simple that by using good feed any horseman can absolutely prevent it.

Fern stagger is caused by a plant, common bracken fern, generally called simply "the fern." The names horsetail fern, etc., belong only to other ferns which are sometimes responsible for the same disease.

The disease is confined almost entirely to horses, although occasional reports that cattle have been poisoned on ferns are made. It is doubtful whether fern stagger is of any importance except among horses.

Ferny Hay Responsible.

Danger of poisoning from ferns is found mostly in fern-infested hay. Most of this ferny hay is unsalable and is usually fed on the farm where it is cut, hence fern stagger is largely confined to the ferny districts. It appears to be more prevalent in dry seasons, probably because of the shortage of good hay.

Staggers from ferny hay have been known in western Oregon since the time of the pioneer and still continue. Every year numerous horses become sick and some die of fern staggers. So common is this trouble that every farmer or other persons feeding horses ought to know not merely the fern but what constitutes "ferny hay." As usually rated, ferny hay contains about one-third of common bracken fern.

This fern is a slow-acting poison, requiring about a month of feeding upon ferny hay to cause fern staggers. Conditions leading to this poisoning are not fully understood and exceptions to this general rule are sometimes found. Because the poisoning develops so slowly it becomes all the more dangerous since this fact gives rise to the impression that the danger point has not been reached and that the hay is entirely safe.

During severe and protracted winters fern staggers are more common, because horses get but little exercise and feed is often poor.

Cured Fern Always Poisonous.

Hay containing one-third or more of fern is dangerous at any time of the year. Most losses, however, occur from August on during the fall and winter following the season of hay harvest.

Contrary to common belief fern poisoning is caused by a chemical poison in the leaves and is not due to the presence of the large quantity of spores or "rust" found on the under side of the leaves. This has been demonstrated by experimental feeding and appears to be well established.

Plant Easily Recognized.

No description of the fern is necessary to the farmers, because almost all of them know the plant. The occasional purchaser of poor hay needs some help in knowing the poisonous nature of ferny hay and how to detect it.

All the plant that comes above the ground is one large leaf which becomes very much divided. On the under side of this leaf is an overturned margin, along or under which are produced many reproductive bodies that yield many small spores. The spores are produced so abundantly that the under side of the leaf and sometimes the hay are coated with a brown powder. Hay cut before the spore-producing season is just as dangerous as that cut after. The brown powder of the spores is commonly referred to as the "rust," but it is not so and is not a disease at all.

Stems of the bracken fern all grow horizontally underneath the surface of the ground, which makes it difficult to eradicate.

Danger Zone West of Cascades.

Although growing throughout the mountainous districts of Oregon, bracken fern is of economic importance west of the Cascades only, where it grows in sufficient abundance to cause staggers. It may be found almost anywhere there is sufficient moisture or depth of soil for the underground stems to grow.

Fern stagger is more likely to occur in the foothills of the Cascades or Coast mountains. Ferny hay is sometimes shipped away from the section where it was grown and causes poisoning in unexpected places.

Fern-Free Hay Averts Staggers.

Here, as in all other cases, prevention is the best cure. If good fern-free hay is fed all the time fern staggers will never appear. Some farmers claim even that if a sufficient quantity of good hay is fed along with the ferny hay and plenty of good feed given all the time horses will pick the good feed and leave the fern, which may be thrown out of the manger and used for bedding. But horses may acquire a taste for the fern when forced to feed upon ferny hay, and they should never be fed hay with fern in it. For these horses it is not possible to use the ferny hay for bedding, because they will eat it.

"Affected horses in nearly all cases have received but little else than hay for feed," say Dr. S. Hadwen and Dr. E. A. Bruce. "No trouble of this nature occurred with animals that were given plenty of hay and roots, with occasional feeding of bran and oats."

Cottage Grove Editor Has Trouble With Buzz Wagon.

Elbert Bede Finds Operations of Motor Car Strain Advertised Veracity.

COTTAGE GROVE, Or., July 19.—(Special.)—Albert Bede is beginning to believe that when a country editor acquires a buzzwagon he is getting into realms where he has no business going. Giving advice upon any matter from the proper manner in which to adjust a pinning blanket to the reframing of a league of nations peace treaty are comparatively simple matters and within the horizon and jurisdiction of the country editor, but the operation of a motor car presents problems from which an editor who advertises that he says what he thinks may well shrink from assuming if he wishes to remain a respected and useful member of society.

Some time ago it was advertised that the editorial car had climbed Skinner's butte at Eugene with the emergency set. Friends who doubted the editorial veracity asked to see the performance duplicated upon a Cottage Grove hill of about the same grade, but the car refused to make the requested exhibition and stopped like a balky mule in the center of the grade with a wheeze in one lung like a bay horse with the heaves. The editor demanded a chiropractic examination to determine that the fault was not chronic, but some temporary internal disturbance.

The examination would have made old Doc Yak green with envy. When the manifold was amputated, out dropped a brass bolt head about the size of a half dollar and a copper washer that had been burned to a crisp. Neither one of these had ever performed any function inside the engine, so far as the auto chiropractic was able to discern, and their only service had been to jam a valve and cause the wheeze that resulted in the fiasco in the exhibition that had been staged. The editor is in doubt as to whether they were sucked in with the gasoline or whether some mechanic left a stock of hardware in there when making repairs and that the remainder of the stock has been scattered over the landscape of the county through the exhaust.

Monster Cake Fed 10,000.

LOS ANGELES, Cal., July 19.—Ten thousand persons were served with "cuts" from a single cake at Lincoln park here. The monster confection was six feet high, four feet thick and weighed nearly half a ton.

WOMAN STRIKES GOLD

Mrs. Alice Boyd of Bend Locates Paying Claim.

BEND, Or., July 19.—(Special.)—That gold in paying quantities has been discovered on the southwest side of the Three Sisters was the report brought in to Bend Monday by H. E. Vincent, forest ranger, from the town of Sisters. A claim which was located on the mountain slope near Green Lakes by Mrs. Alice Boyd of Bend three years ago is said to be yielding good pay ore and machinery is to be installed this summer.

Mrs. Boyd is personally superintending operations at the mine.

Japanese Warships in South Seas.

TOKIO, July 19.—In connection with the control of the Caroline, Marshal and other South Pacific islands intrusted to Japan by the peace conference, the Japanese government is contemplating the organization of a special squadron of warships to be stationed in the South Sea region.

Chinese Students Oppose Japan.

TOKIO, July 19.—Representatives of 150 Chinese students in Tokio will return home shortly to arouse national opinion in China against the occupation of Shantung by Japan, it is announced.