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RECENT DEVELOPMENTS IN THE FIELD OF HIGH SPEED STEELS
LOW IN IMPORTED ALLOYING ELEMENTS

By E. Houdremont and H. Schrader


Synopsis

History of high speed steels with reduced contents of alloying elements not available within the country.

Best ways of testing the quality of high speed steels.

Studies of new high speed steels low in imported alloying elements and containing various amounts of W, Mo, and V.

Cutting efficiency as a function of the alloy in roughing. - W-V steels; Mo high speed steels; influence of Cr content.

Toughness of the new high speed steels and their cutting efficiency in planing.

Influence of alloy upon the processing of the new steels. - Scaling and decarburization; sensitivity to overheating in hardening and sensitivity in annealing.
The early development of the high speed steels, at the turn of the century, took place along strictly empirical lines. The knowledge of the effect of the several alloying elements in steel alloys, at that time, was extremely fragmentary. In the course of almost three decades, the further development, also, was primarily empirical; in addition to improvements of the alloy, it brought a better understanding of the relations between heat treatment, alloy, and efficiency. It has only been in recent years that the specific effect of the various alloying elements has been studied in greater detail. In this connection, the behavior of the carbide-forming elements has furnished a plausible explanation of the increased cutting efficiency of high speed steels, their retention of hardness and their red hardness.\(^1\) It was found that almost all of the carbide forming alloying elements, among which we find, above all, molybdenum, chromium, tungsten and vanadium, entail an increase in the cutting efficiency. In this connection, we shall disregard the element of cobalt which practically affects only the matrix. By adding only one element, it has not been possible in any case to reach the cutting efficiency of the well-known high speed steels which require multiple alloying. In part, the cause of this lies in the fact that the retention of hardness of the martensite forming would be insufficient, in other words, the special carbides in solution in the ground mass would again precipitate at relatively low temperatures, a phenomenon which may be clearly seen, for instance, with chrome steels.\(^2\) With other alloying additions, such as vanadium, it proved impossible to obtain a uniformly hardened structure, even when quenching from very high temperatures. The hardenability of straight tungsten steels, also, is not very good in the presence of appreciable amounts of embedded carbides. Next to the hardenability and retention
of hardness, the nature and quantity of the special carbides in dispersion in the ground mass after the hardening, exerts an influence upon the wear resistance in turning. It is therefore almost imperative to combine a number of alloying elements so as to insure satisfactory hardening, red hardness and resistance to wear.

A few years ago, it seemed as though the development in the field of high speed steels had come to a certain standstill, inasmuch as definite types of high speed steels had evolved, been accepted the world over and become standardized, if not officially, then certainly unofficially, in view of the universal uniformity of the respective requirements. As examples, the alloys 18/4/1, 20/4/1.5, and 14/4/2.5 may be mentioned; the respective numbers relate to tungsten, chrome, and vanadium, in the same sequence. This development has brought the element tungsten in the foreground, and indeed, up to very recent years, tungsten has been playing the most important part in the manufacture of high speed steels. The desire to reduce imports of foreign metals, which not only Germany, but many other countries as well are compelled to obtain from abroad, again and again had led to attempts at replacing the tungsten by other alloying elements. Although we had special reasons in this country to study this problem of substitution, the present difficulties in securing tungsten supplies, due to the war in China, have opened the eyes of the whole world to the urgency of this question.

One of the ways leading to savings in tungsten, which has been tried time and again, i.e. the substitution of molybdenum for tungsten, was exhaustively studied during the last war. The tendency to replace tungsten by the "related" molybdenum is as old as the high speed steels themselves. Taylor and White\(^{(3)}\) have already recognized
this possibility and suggested as a suitable ratio, 2 parts of Mo to one part of tungsten.

When during the world war, Germany was cut off from the tungsten supplies of China, molybdenum containing high speed steels were developed at a great many plants, and also used in current manufacture. A result of this development work are the patents dating back to these years, which have been reviewed in connection with the article by H. Pohl, H. Pollack, and R. Scherer on experiments with high speed steels low in tungsten and high in molybdenum. Later on, the problem of substituting molybdenum for tungsten was once more taken up in the United States, inasmuch as there are only small deposits of tungsten ore, but ample deposits of molybdenum ore available in that country. In the paper by Emmons, a steel with 8% Mo, 2% W, 4% Cr and 1% V has been designated as especially suitable. The present authors have been told that this steel has been widely tested and introduced, in the United States, under the name Mo-MAX. According to Scherer, it was found to be equivalent in turning to the tungsten high speed steel 18/4/1, in regard to its cutting capacity, but perceptibly inferior to the high speed steel with 14/4/2.5.

Another possibility of saving in alloying elements consists in a reduction of the tungsten content. The first step in this direction was taken about ten years ago, when a steel with 12-14% W and more than 1.8% V was introduced in the place of the 20-22% W, 1.5% V steel. In general, these two steels have the same cutting capacity. Steels with higher tungsten contents, about 25-28%, do not entail any improvements in efficiency over the 22% W steel. Their application, in many cases, is due to the erroneous assumption that the value of a high speed steel is due to its content in alloying constituents, while it is being
recognized more and more that optimum tool lives may be obtained with low alloy contents balanced as favorably as possible. When viewed from this standpoint, recent developments in the field of high speed steels seem to emphasize the fact that even tungsten steels with 18% W must be regarded as having excessively high alloying contents. After the preliminary step consisting in reducing the tungsten content to 14%, while at the same time raising the vanadium content to 2.5%, another step in this direction has recently been taken in that it has been found that steels with 8-10% W and 1% V are equivalent, in regard to cutting efficiency, to the 18/4/1 steel.

The possibility of effecting such a reduction is primarily due to the greater knowledge of the specific effect of vanadium which element is of decisive importance in all of these steels.

Best Ways of Evaluating the Quality of a High Speed Steel.

In evaluating high speed steel alloys, it is not permissible to content oneself with the turning capacity. Even today, it is difficult to obtain a definite idea of the behavior of a high speed steel in practice on the basis of mere test-stand results. At the laboratory, it will always be necessary to confine oneself to single turning tests, possibly also drilling tests, to secure information on such basic characteristics of a steel as retention of hardness, red hardness, and resistance to wear. A definite differentiation, however, of the several alloys is possible only on the basis of a rather wide practical application inasmuch as the work to be performed by a high speed tool in milling and drilling is different from simple turning; moreover, there are differences even between roughing and finishing, for lathe tools. For practical use in the shop, the toughness of the hardened high speed steel
is often important inasmuch with low toughness, impact-like effects may lead to premature failure of the tools. Last but not least, it is not only the viewpoints relating to the efficiency of the material at the shop, which are important, but also those characteristics which affect the general process of manufacture. A high speed steel alloy which yields extraordinary values in regard to cutting efficiency, but which causes much trouble in melting, forging, rolling, or hardening, thus entailing unavoidable high waste in its manufacture, will necessarily be used only for a highly restricted range of applications.

**STUDIES OF NEW HIGH SPEED STEELS LOW IN IMPORTED ALLOYING ELEMENTS.**

**Cutting Efficiency as a Function of Alloy in Roughing.**

Since its fundamental work on the effect of vanadium and carbide-forming elements in steel alloys, it has been one research project with the Fried. Krupp A.G. in Essen, to shed light on the extent to which the alloy content of high speed steels may either be reduced or substituted without unduly lowering the efficiency and other characteristics. Although our researches have not been completed as yet, we do believe it advisable to report here on the results obtained up to the present to encourage further investigations and at the same time hasten the introduction of high speed steels with low alloy content in the interest of our national economy.

Of the alloys studied, we have selected those which are best able to give a clear idea of the effect of variations of the alloying additions and the possibilities of cutting down their percentages. In Fig. 1, these selected steels have been assembled. In the upper part of the diagram, the composition is indicated. The chromium content of all of the alloys has been maintained at 4%. In the lower part of the
diagram, the tool lives for two different cutting speeds have been entered. When determining these lives, "right" roughing tools of the type shown in Fig. 2 were used; these tools were made from the materials indicated at the left hand side of Fig. 1 and used on quench-tempered Cr-Ni steel having a tensile strength of 142,200 lbs/in² (100 kg/mm²), with a feed of 1.4 mm (.055 in.) and a depth of chip of 5 mm (.196 in.).

Tungsten-Vanadium Steels.

In the introduction to this paper, the developments leading to a reduction of the tungsten content and a compensation by an increased vanadium content, with tungsten high speed steels, has already been described. Steels 1-4, in Fig. 1, represent the high speed steels which have been customarily used during the past ten years, practically all the world over. Their cutting efficiency is rather independent of the tungsten content and substantially a function of the addition of vanadium, as is proved once more by the data on the tool lives given. Steels 5 to 11 show that upon a reduction of the tungsten content to 14%, the optimum lower alloy limit, under the conditions of cutting selected, has by no means been reached. With the same vanadium content, and without the slightest impairment of the cutting efficiency, a reduction to 10% W is possible; this will be evident from a comparison of Steel 6 (10% W) with Steel 4 (14% W), and also of Steel 7 (10% W) with Steel 2 (16% W).

With still lower tungsten content, i.e. 7.7%, it is possible to maintain a cutting efficiency equivalent to that of Steel 4, provided the vanadium content is raised to 4.7% and the carbon content is suitably increased in the manner illustrated by Steel 8. A decrease of efficiency is observed only upon a further lowering of the tungsten content, down to 3.6% W, although steels of this content, when containing greater vanadium additions (Steels 10 and 11), are still able to show the same cutting
efficiency as the high tungsten, low vanadium steel 3.

Ever since the introduction of alloy steels, attempts have been made again and again, to compare the value of one alloying element with that of another and, if possible, to establish numerical relations. The ratio of 2 to 1 for tungsten and molybdenum has already mentioned. For the purpose of substituting vanadium for tungsten, such an attempt has also been made; the result was a rectilinear relationship between the tungsten and vanadium contents (Fig. 3). A warning has already been sounded elsewhere, by one of the present authors, against the establishment of such "relationships". The effect of the various alloying elements is too complicated, indeed, to be forced into such simple rules of thumb. This is also evident from the trend of the curves as plotted in Fig.3 relating to the compositions insuring equal cutting efficiencies as resulting from the present researches; these curves are far from indicating simple, continuous relationships.

**Molybdenum High Speed Steels.**

The effect of a partial or complete substitution of molybdenum for the tungsten of high speed steels may be studied with Steels 12 to 23, of Fig. 1. When compared to the standard types containing 14% W, 2.4% V (4), and 20% W, 1.5% V (1), it proves possible to attain an appreciable improvement of the efficiency, if about 2% Mo are added to 10% W high speed steels containing 2.5% V(14). An excessive increase of the vanadium content, coupled with a concurrent increase of the carbon content causes a deterioration of the cutting efficiency with steels of this composition (Steels 13 and 12). Upon a further decrease of the tungsten content to 6%, coupled with an addition of 4% Mo (Steels 15 and 17), the cutting efficiency of the steel with 10% W and 2% Mo (14) is still equalled. On this basis, also, a pronounced rise of the
vanadium content does not entail an advantage commensurate to the increase in the alloy content, so that Steel 17 with 2.4\% V appears to be the most desirable in regard to economy. Any variations of the carbon content of steel with increased vanadium content cause only a deterioration of the hardenability with lower carbon contents. Steel 17 has been in practical use for the past two years in our own as well as in other shops and has been found to constitute a valuable alloy with remarkable cutting characteristics even in the form of drills. In this case, accordingly, proof of the dependability of the investigational methods used in the development of these steels has already been adduced on the part of the users.

Steels 18 and 19 gives an idea of the efficiency of high molybdenum high speed steels with low additions of tungsten. Occasionally, the question has been raised as to why these alloys, which were first used during the world war, were abandoned after the war, in spite of their good properties and in spite of the fact that according to the studies of the first mentioned of the present authors in the years 1923-4, their tool life was found to be at least equal to that of the 18/4/1 alloy. The reason is to be found in the prices of tungsten and molybdenum prevailing at that time and also in the difficulties encountered in the processing of such steels. As a result of the publication by (10) these old researches on the alloys in question were resumed both with steels of our own production and with original steels secured in the finished condition from the United States. Our re-evaluation of the cutting efficiency of such alloys may be seen from the tool lives of Steels 18 and 19, as contained in Fig. 1. The 8\% Cr, 2\% W, 1.2\% V steel, corresponding to the American Mo-MAX steel, possesses roughly the same cutting efficiency as Steel 1; this is a confirmation of the
earlier experiments. An increase of the molybdenum content to 12% proved without effect which is in contrast with the statement by Emmons.

Systematic investigations on the influence of molybdenum on plain carbon steels (11) made it quite probable to obtain high cutting efficiencies when further lowering the alloying elements, below the limits known at the present. The effect of the alloying element molybdenum may be seen from the data on Steels 20 to 29, as given in Fig. 1, in the presence of chrome, vanadium, and also small additions of tungsten (on the basis of 4% Cr). Accordingly, it is possible to secure remarkable cutting efficiencies even upon reductions of the tungsten and molybdenum contents exceeding all limits, as known up to the present; these cutting efficiency values are, in part, the same as those of the tungsten high speed steels as used at the present, while they are sometimes even slightly superior. With the 5% V steels, the ability to hold the cutting power increased with the molybdenum content, up to about 5% Mo. An increase beyond this value, up to about 7% Mo, does not bring any substantial improvement. With the steels containing 3.2% Mo and different vanadium contents, the maximum value of the cutting efficiency lies at 2.5% V, in which connection a carbon content of 1% appears to be preferable to one of 0.8% (12). A steel of this analysis constitutes a high grade high speed steel with the best possible utilization of the alloy; the manufacture of this steel requires little foreign currency inasmuch as the cost of molybdenum is only a fraction of that of tungsten (in foreign currency as required for their purchase); on the other hand, our requirements in vanadium will soon be completely met by domestic production. By small quantities of tungsten added, with such Mo-V steels containing 3.2% Mo, no appreciable improvement is obtained with
(Steel 21), while 3% W additions (Steel 20) insure a considerable increase of the cutting efficiency. Steel 20 attains the best cutting efficiency of all of the steel alloys as compared in the present study, under the cutting conditions selected. Even with the tungsten-free steels containing the minimum molybdenum content of 2.4%, we still have a cutting efficiency which approximates that of the Steel 2 containing 18½% W and 1½% V. The lower alloying limit, depending on the cutting efficiency required, may thus be lowered still further.

Influence of the Chrome Content.

From the standpoint of alloying, the problem of a substitution of the chromium contained in high speed steels, is less important inasmuch as chromium as an alloying element, is less expensive than tungsten and molybdenum and hence, requires less foreign exchange. The effect of chromium on high speed steels is probably not entirely known as yet. The retention of hardness shown by chrome steels is lower than, for instance, that of the vanadium steels. It is the general tendency to credit the chrome content primarily with promoting a good hardenability i.e. insuring a uniformly martensitic condition. Whether or not chromium plays also a part in the formation of carbides, cannot be stated quite definitely as yet. To insure a sufficient hardenability, one could think of a partial substitution of the chromium by manganese. With molybdenum high speed steels, it would be possible to forego, in part, the hardening effect of the chrome additions inasmuch as the molybdenum contents (13) could act still more effectively in this sense. Both with a tungsten steel containing 14½% W, and 4½% V, and with a molybdenum steel having suitable vanadium contents (10.5% W and 2.2% Mo – Fig. 4), it could be found that the cutting effect showed a steady decrease as the chrome contents were lowered. This tendency, with the tungsten steel,
could not be offset by increasing the manganese content to 1.5%. Fig. 4
right-hand side, shows that with the molybdenum-bearing steel, the in-
fluence of the chromium content is a function of the hardening tempera-
ture, inasmuch as a progressive increase of the cutting efficiency up to
4.4% Cr could be observed only with a very high hardening temperature
(1320 °C = 2408 °F), while this is not the case with the low temperature
of 1280 °C (2336 °F) where, with the highest chromium content, a decrease
in efficiency was observed. Although this appears to point to variations
in the solubility of the carbides due to chromium which variations af-
fect the hardening, a complete understanding of this effect of the
chromium is possible only after further investigations. With the tungsten
free molybdenum high speed steels, for instance, those with 3.2% Mo,
the comparatively high cutting efficiency is lost as soon as the chrome
addition is omitted. It appears to be advisable, for these reasons,
to maintain the present, quite moderate additions of 3 to 4.5% Cr.

TOUGHNESS OF THE NEW HIGH SPEED STEELS AND THEIR CUTTING EFFICIENCY
IN PLANING OR DRESSING.

At the beginning, it has been pointed out that in addition to
the retention of hardness, red hardness, and wear resistance, the tough-
ness of high speed steels may be important for their satisfactory per-
formance under conditions of practice. As early as when changing from
the 22% W high speed steel to the 14%Cr, 2.5% W type, complaints were
received from certain quarters about a drop in toughness of the new
steel lower in tungsten, and up to this day, the high tungsten high speed
steel is liked for its special toughness; and given preference in use for
tools with which a high degree of toughness is important, for instance,
stay bolts. The toughness of a hardened tool steel cannot be readily
tested. During the past years, attempts have been made in the United States at determining the toughness with an impact torsion test which method has also been used in our study of the new high speed steels. To duplicate the impact-like stresses occurring during turning, it appeared to be a more suitable method in the evaluation of high speed tools to use shafts which were provided with slots, 40 mm. (1.57 in.) wide and arranged at distances of 90°. It was thus found that the shortening of the tool life due to repetitive impacts resulting from interruptions when passing over the slots is dependent on the cutting speed inasmuch as with higher speeds, the force of impact becomes greater. Feed and depth of chip were adjusted so that in the turning of a smooth shaft without slots, a tool life as similar as possible was obtained until blunting. When comparing a tungsten high-speed steel with 18% W and 1% V with a low alloy molybdenum type (3.2% W, 4.7% V), it was found that with low cutting velocities such as applied in roughing, the tool lives did not differ considerably from those obtainable in the turning of a smooth shaft. Under these conditions, consequently, practically no differences in toughness make themselves felt. With increasing rates of cutting, however, a greater and greater difference was observed in which connection the lower toughness of the molybdenum steel resulted in a pronounced deterioration of the tool life (Fig. 5). Under definite, impact-like service stresses, therefore, the efficiency of the molybdenum steel which per se possesses a higher ability to hold its cutting power, may drop below that of the 18/4/1 steel. The fact should be stressed that the tungsten-free molybdenum steel retains its high efficiency with increased cutting speeds also, provided the latter correspond to so-called planing or dressing stresses, i.e. do not entail appreciable impact effects. It can be rightly claimed that the impact
stresses as applied in the present experiments may be regarded as definitely exaggerated. At any rate, however, this method of testing is preferable to an impact torsion test inasmuch as it approximates more closely actual conditions of service. At the same time, it provides at least a clue as to certain, however rare, cases of similar impact stresses for which suitable steels are to be selected.

The definite differentiation which proved possible in regard to toughness when turning slotted shafts at high velocities, was put to use in that, under equal conditions of turning, a considerable number of the different alloy steels studied were appraised as to their sensitivity to impact-like stresses. As a comparison material, the 21% W steel, known for its toughness, was included in the experiments. Then evaluating the toughness according to this method, either by the difference in the tool life with a slotted as against a smooth shaft, or the percentage ratio of these values, as shown in Fig. 6, the 18% 7, 1.15 V high speed steel appears to be equivalent to the comparison steel, while the 14% W, 2.4% V steel proved appreciably inferior to the high tungsten steel. The steel with 10% W and 1.2% V which in regard to roughing was found to be almost equivalent to the 18% 7, 1.1% V steel, shows a better efficiency in planing; on the other hand, its sensitivity to impact-like stresses in turning is higher. For this reason, its efficiency drops to the level of the somewhat brittler steel with 14% W and 2.4% V whose behavior is somewhat inferior under these conditions of stress. The molybdenum-containing steels are more brittle than the 14% W, 2.4% V steel; this is true of the American steel Mo-MAX as well as of the 5.5% W, 4.5% Mo, and a low alloy Mo-V steel. The decrease, however, is smaller than for instance, that of the 14% W steel as compared to the high tungsten steel with 18-21% W. The differences among
the molybdenum containing steels were not very great. A 10% Co high speed steel which was also included in the respective experiments, proved to be somewhat tougher than the respective Co-free type; its performance however, remained inferior to that of the high tungsten steels. Inasmuch as with the 14% W, 2.4% V steel, in spite of a perceptibly lower toughness when compared with the high tungsten types, its practical suitability for almost all applications has been definitely established in years of practical use, the molybdenum-bearing steels which are but little inferior to the 14% W, 2.4% V type, cannot be regarded as unduly brittle. Our observations, therefore, are primarily intended as emphasizing the desirability of taking special measures for a successful application of the new steels in providing favorable, i.e. smooth conditions of working by the use of suitable tool shapes and by extending special care to the maintenance of the machine tools.

INFLUENCE OF ALLOY UPON MAKING AND WORKING.

According to our practical experience, no special difficulties are to be anticipated in the manufacture of these low alloy high speed steels, at the steel plant. In forging, the forming capacity of the alloy is satisfactory, providing a forging temperature of 1100 °C (2012 °F) which is conducive to brittleness, is not exceeded. It is true that attention should be given to the somewhat greater sensitivity of a molybdenum-bearing steel to overheating, superficial burning, and surface decarburization, in hot working as well as the subsequent treatments at the shop, for instance, the forging-on of the cutting edges or the welding-on of the plates, and the respective heat treatments.

In regard to the 8% Mo steel, corresponding to the composition of the American Mo-MAX steel, Scherer, and recently also Briefs (4) have pointed
out some disadvantages in this respect which upon rehardening may cause an irregular performance in use.

**Scaling and Decarburization.**

In this connection, a knowledge of the contributory effect of the different alloying elements on the occurrence of such phenomena is of considerable interest. With simple alloy steels, the depth of penetration of "burning phenomena" in the form of "branches of scale" in the surface zone increases with increasing molybdenum contents [Fig. 7].\(^{[16]}\) The similarity of the effect of molybdenum, in this respect, with that of nickel has been pointed out by several investigators. With increased molybdenum contents, accordingly, a deterioration of the surface due to penetration of scaling should be expected with high speed steels, also. To investigate the extent to which this undesirable phenomenon would occur with high speed steels, some typical alloys, i.e. molybdenum high speed steels with molybdenum contents, increasing from 2.5% to 12%, were annealed in oxidizing furnace gases at 1200 °C (2192°F) for eight hours, together with tungsten types containing tungsten between 10 and 18%. It was found that the penetration of the scale into the surface zones, with all molybdenum steels, even those with the highest alloying contents, was hardly more pronounced than with the tungsten steels (Fig. 8). It appears that the intensification of the diffusion of oxides due to molybdenum additions as observed with plain carbon steel (Fig. 7), is somewhat mitigated by other alloying elements of the high speed steel. Similar conditions prevail in chrome-nickel steels in which the burning phenomena appear to be suppressed by the chrome additions which latter render chrome-nickel steels relatively insensitive when compared to straight nickel steels.
In regard to scaling losses, the molybdenum high speed steels show an even better performance than the tungsten steels, upon such an annealing treatment inasmuch as with the latter types, the well-known more pronounced scaling is rendered appreciable by pronounced growth (Fig. 9). With the molybdenum steels, on the other hand, the scaling loss becomes continuously smaller, as may be seen from the appearance of the samples, and especially from the losses in weight due to scaling as ascertained after scaling off by rapping or pickling or similar methods. We thus find for high steel steels a similar dependence of the scaling upon the molybdenum content, as has been ascertained for unalloyed steels by Scheil and Kiwit (Fig. 10). An inferior performance of molybdenum steels in regard to scaling, therefore, could not be observed.

As to surface decarburization, the molybdenum high speed steels show a behavior similar to that of straight molybdenum steels (Fig. 11). The steels annealed at 1200 °C (2192 °F), disregarding a wider bark zone of the 5.5% W, 4.5% Mo steel, show a continuous increase in the depth of the decarburized layer as the molybdenum content increases (Fig. 12). The danger of a surface decarburization and a concurrent volatilization of the molybdenum, accordingly, increases with increasing molybdenum contents. With the tungsten steels, also, the surface decarburization becomes more pronounced with higher tungsten additions. Consequently, the surface decarburization of a tungsten high speed steel with 18% W and 1% V is hardly smaller than that of a low molybdenum steel with 2.4% Mo. The structure of the outermost zone of the decarburized surface layer, with molybdenum steels, consists of ferrite and a FeMo compound, while tungstasides occur in the tungsten steels. The number of these tungstasides, which is especially large in the transition zones, could give the impression of a recarburization (Fig. 13) which assumption is
refuted by the low carbon content of the surface zones.

In this connection, it should be mentioned that the decarburization of high speed steel causes a high degree of sensitivity toward cracking in quenching. Hardening cracks may occur even if the decarburization can be barely recognized when inspecting the structure, and if after the quenching, the surface still gives Rockwell hardness values as high as 58-60, as against 64-65 in the core. That this deterioration is actually due to surface decarburization, can be proved by the fact that after slightly dressing the surface, satisfactory hardening is most readily possible. A sensitivity to quenching cracks may also be produced artificially by decarburization. Thus, for instance, an appreciable number of 10 mm. (0.393") square samples, 100 mm. (3.93") in length and prepared from an 18% W, 1% V steel, were decarburizing by exposing for ten hours to a stream of wet hydrogen at a temperature of 900 °C (1652 °F); and also by a five-hour anneal at 1000 °C (1832 °F) in an oxidizing furnace atmosphere followed by oil quenching from 1280 °C (2336 °F); practically 100% of these samples developed cracks, while the respective non-decarburized samples, with the same hardening treatment, invariably remained free from cracks. To explain the great sensitivity to cracking on quenching of high speed steels as due to surface decarburization, it should be borne in mind that an incomplete hardening of the decarburized surface zone as against the fully hardened core goes hand in hand with a smaller increase in volume. Thus, especially with a steel which hardens throughout, a thin surface zone is placed under high tensile stresses to which must be added the thermal stresses resulting from the high quenching temperatures customary with high speed steels. It is evident that this concentration of stresses, coupled with an increased number of dispersed particles
resulting from the formation of tungstide, may become so considerable as to entail a release in the form of incipient cracks. The occurrence of such hardening strain cracks as a result of surface decarburization has also been observed with the molybdenum high speed steels. The cracking is in many cases facilitated by the absence of a transformation in the decarburized, ferritic surface zone which for this reason, may produce a pronounced coarse grain in view of the high hardening temperatures.

Sensitivity to Overheating in Hardening.

It is a well known fact that the efficiency of a high speed steel is most markedly influenced by the hardened structure obtained on quenching. Both excessive times and excessive temperatures entail a deterioration of the ability to hold cutting power. To ascertain the differences in the sensitivity to overheating which may occur with the new types of high speed steels, some of the molybdenum steels were compared with the tungsten steels as to the occurrence of overheating phenomena upon hardening from increasing temperatures. With a holding time of one minute at the hardening temperature, and on the basis of the fracture obtained with disks 10 mm. (0.93") in thickness (Fig. 14), it could be found that relatively high hardening temperatures which were but little below those customarily applied to the 18% W, 1.1% V or 14% W 2.4% V high speed steels, do not entail any overheating. With the tungsten high speed steels, the limit of the overheating temperature becomes lower with decreasing tungsten content. For this reason, the quenching temperature of incipient overheating of the 10% W steel is somewhat lower than that of the 18% W steel. For short holding times, of the order of one minute, as may be seen from Fig. 14, overheating sets in with the molybdenum-bearing steels, at the same temperatures.
as with the 14% and 10% W steels. When extending the holding time to two minutes, the maximum permissible hardening temperature is reduced by about 50 °C (90 °F) with the tungsten-free, 3.2% Mo steels. The other steels, especially the high tungsten steel with 18% W are somewhat less sensitive to excessive heating times inasmuch as the variation in incipient overheating becomes less as the holding time is increased.

In the structure, the beginning of overheating may be recognized from certain fusion phenomena as illustrated in Fig. 15 for some of the steels. It should be mentioned that the overheating, as noticeable in the fracture and from the fusion phenomena in the structure, sets in at a somewhat different temperature inasmuch as the fusion phenomena in the structure, as a rule, become perceptible only at slightly higher temperatures. The consequences of excessive heating times are not equally distinct from the appearance of the structure. With the 18% W steel, certain sporadic incipient fusion signs make themselves felt at a quenching temperature of 1320 °C (2400 °F) --Fig. 15a--; with the 14% W steel, at 1300 °C (2372 °F) --Fig. 15b--. In the case of the 10% W steel, at 1280 °C (2336 °F), only occasional signs of fusion are observed (Fig. 15c), while with a hardening temperature of 1300 °C (2372°F), the ledeburitic structure uniformly arranged in the grain boundaries is indicative of the fact that the melting temperature has been exceeded (Fig. 15d). The high speed steel with 4.5% Mo and 5.5% W, at a temperature of 1280 °C (2336 °F) --Fig. 15e-- is still free from overheating phenomena which at 1300 °C (2372 °F) affect relatively large portions of the structure (Fig. 15f). The low molybdenum, tungsten-free steels both show incipient fusion only at 1320 °C (2400 °F) --Figs. 15h and k--. At the lower hardening temperature of 1300 °C (2372 °F), the large quantity of carbides is remarkable, especially with the 4.7% W steel (Fig. 15g).
The 8% W steel which corresponds to the American Mo-MAX type which at 1280 °C (2336 °F) still shows a satisfactory hardened structure (Fig. 15 1), undergoes marked fusion at the next higher hardening temperature (Fig. 15 a).

On the whole, it is thus found that the high tungsten steels with 14% W and more, show signs of incipient fusion only in sporadic cases, while in the other steels, especially those with elevated molybdenum contents, after exceeding a definite temperature, the large proportion of ledeburitic structure indicates a very rapid propagation of the fusion process. This more rapid spread of the melting process points to a different trend of the melting point curve which fact should be of importance for the heat treating practice. Especially in small shops, high speed steels are not always hardened at accurately fixed temperatures. In many cases, it is customary to watch the tool in heating and to harden it as soon as the first beads of sweat have formed at the extreme tip of the cutting edge. This procedure which is entirely justified with high tungsten steels, may possibly prove an obstacle to a rapid introduction of low alloy steels containing tungsten and molybdenum. Otherwise, the cutting efficiency is improved just as the hardening temperature is increased, with the low alloy 3.2% Mo steels as with the tungsten high speed steels (Fig. 16) so that it is desirable to approach the limit of overheating as closely as possible, to obtain a maximum tool life.

All of the new high speed steels discussed here are suitably tempered at 500 an 550 °C (932 to 1022 °F), as may also be seen from the data on the hardening of the steels of Fig. 1.

Sensitivity to Annealing.

In annealing, tungsten steels tend to precipitate stable tungsten carbides (9) which pass into solution, if at all, with great
difficulty only, at the customary hardening temperatures. Even with
the low alloy tungsten steels, such a precipitation of carbides entails
disturbances, for instance, in "silver steel" with 1% W, a deterioration
of the hardenability is obtained; with tungsten magnet steel (6% W)
a decrease in coercive force and magnetic force, and with "Riffel" steel
containing 8% W, a deterioration of the tool life is observed.

It is a less known fact, however, that tungsten high speed
steels also are sensitive to excessive annealing and suffer a decrease
of their cutting efficiency with prolonged times of annealing. This
decrease may occur already with annealing times of ten hours, at normal
annealing temperatures of 850-880 °C (1562-1516 °F), especially so if
the annealing is followed by a comparatively slow furnace cooling.

To shed additional light on these undesirable characteristics
of tungsten high speed steels, excessive annealing times, from 30 to
60 hours, were applied and their effect upon the ability to hold the
cutting power was compared on the basis of some of the tungsten steels
studied, an assortment of the low tungsten or tungsten-free steels,
and an unannealed steel in the as-forged condition. It was found that
with all molybdenum-bearing steels (Fig. 17), the cutting efficiency
does not show a drop of more than 10%, even with very long annealing
times, i.e. the deterioration is rather small. Conditions are somewhat
less favorable with the two high molybdenum steels, if subjected
to the longer annealing time; in this case, also, however, the drop
does not exceed 15%. On the other hand, with the tungsten high speed
steels, the precipitation of difficulty soluble, stable tungsten car-
bides entails an appreciable decrease in the cutting ability which with
the longest annealing time may be as high as 30-40%. This is also true
of the 10% W steel. In regard to the sensitivity to annealing, there-
fore, the molybdenum high speed steel steels are superior to the tungsten types.

In reviewing the new information obtained in the course of the present investigation, we arrive at the fact that it is readily possible to attain high cutting efficiencies with steels whose alloy content is far below the customary limits so that considerable savings in expensive, foreign-produced alloying elements are possible. Of the substitute steels shown in Fig. 1, the type with 5.5% W, and 4.5% Mo have already proved their value in practical application over a considerable period of time. Inasmuch as these alloys have been developed and tested in the same manner as the other steels enumerated here, there is reason to assume that the other alloys also will be found useful upon practical application. Depending on the efficiency desired, the alloy contents may be reduced to slightly above 1% molybdenum and vanadium, if necessary with small additions of tungsten.

If should be borne in mind, however, that the time is not very far behind us at which high speed steels were, on principle, evaluated and bought on the basis of their alloy content. This custom will no doubt, still be found to prevail with a great many users who will accept the new alloys with considerable reluctance. If we consider furthermore, that special heat treatments, working procedures, etc. are required, it is quite certain that occasional failures will be encountered in their introduction. On the whole, however, the present paper has shown that no insurmountable obstacles will be found, if the information now available is adequately utilized. It is suggested, that when adopting the new steels, low molybdenum types be given preference, inasmuch as the possibility of failures increases with higher molybdenum contents, while no worth-while improvements in the tool life compensate for the higher expense.
(1) E. Houdremont, H. Bennek, and H. Schrader, ARCHIV EISENHUETTENWESEN, vol. 6, 1932-33, pp. 24-32;


(3) Taylor and Walliches, "Ueber Dreharbeit und Werkzeugstaehle" Berlin, Springer, 1908, p. 197;

(4) STAHL UND EISEN, vol. 55, 1935, pp. 1001-5; [The report proper is available in full translation; Order No. 482; 2900 words.- The "Discussion" of this report which relates to the patent situation, has not been translated. - Translator's Note].


(7) Patent Application B 10.30 Cl. 184 2/60, by Becker, of Kladno;

(8) R. Hohage and A. Grützner, STAHL UND EISEN, vol. 45, 1925, pp. 1126-30;


(10) U. S. Patent No. 1937334, 1934;

(11) E. Houdremont and H. Schrader, to appear shortly in FORSCHUNGSBERICHTE KRUPP;

(12) Part of these data has been made known to the Subcommittee on High-Grade Steels, about 8 months ago, so as to hasten the introduction of such steels;


(14) G. V. Lueraen and C. V. Greene, AMER. SOC. TEST. MET. v. 33, 1933, pp. 315-23;

(15) MASCHINENBAU, "Der Betrieb", vol. 16, 1937, pp. 439-42;


(17) E. Houdremont, CHALEUR ET INDUSTRIE, vol. 15, 1934, pp. 150-58;

(18) A. Fry, TECHNISCHE MITTEILUNGEN KRUPP, vol. 1, 1933, p. 1-11;

(19) ARCHIV EISENHUETTENWESEN, v. 9, 1935-6, pp. 405-16.
Fig. 1: Influence of variations of tungsten, vanadium, and molybdenum content upon the cutting efficiency of high speed steels with a chrome content of 4%.

Fig. 2: Ratio of tungsten content to vanadium content in high speed steels for the same cutting efficiency.

Material: Cr-Mo steel with Tensile Strength of 350 kg/cm², Feed = 0.2 mm, Depth of Cut = 1.0 mm, Cutting Speed = 40 m/min.

Fig. 3: Comparison of sensitivity of differently alloyed high speed steels to impact-like stresses resulting from interruptions in cutting.

Fig. 4: Effect of molybdenum addition on penetration of scales into surface zones of a 0.15% C steel upon annealing at 1200 °C (2192 °F) for eight hours in oxidizing atmosphere.

Fig. 5: Appearance of differently alloyed high speed steels and sealing layer when jointly exposed to annealing at 1200 °C in oxidizing atmosphere.

Fig. 6: Heating of high speed steels as a function of annealing temperature at 0.5 mm and 2 mm thickness.

Fig. 7: Jouring phenomena as penetration of differently alloyed high speed steels upon annealing at 1100°C for eight hours in oxidizing furnace gases.
HIGH SPEED STEELS LOW IN TUNGSTEN AND FREE FROM TUNGSTEN

By R. Scherer


Synopsis:

Experiments aiming at a lowering of the tungsten content in high speed steels (a) without changing the percentages of the other alloying elements, and (b) with an increase of the vanadium and molybdenum contents.

Experiments with molybdenum high speed steels without and with tungsten.

The development of the vanadium-bearing high speed steels in the years 1925 and 1926 had shown that higher vanadium contents enabled an increase in the cutting efficiency, provided the carbon content was raised beyond the ordinary value so as to insure a "fixation" of the vanadium carbide. At that time, in the course of the respective preliminary experiments, the problem of the tungsten content, also, was subjected to a critical re-examination and it was found that the same results were obtained with tungsten contents from 11 to 20%, the percentages of carbon, chrome, and vanadium remaining unchanged.
An example of this work is given in Fig. 1 in which the tool-life vs. cutting speed curves for steels with 18 and with 12% W have been plotted. The diagram, at the same time, indicates the influence of a carbon content suitably balanced with the vanadium content, and the increase in cutting efficiency upon increasing the vanadium content. Additions beyond 5.0% vanadium did not bring any appreciable further improvement. These steels as well as all of the others were tested in the form of cutting tools, 30 mm. (1.18") square with straight tool edges on steel shafts having a tensile strength of 70-90 kg/mm² (99 - 128,000 lbs/in²). The feed was 0.92 m (0.0362") and the thickness of chip, 3 mm. (0.118"). The results of these tests were graphed out in the form of tool life vs. cutting speed curves. In view of these data, the idea suggested itself to study the influence of the tungsten content on the well-known cobalt high speed steels. As may be seen from Fig. 2, in this case, also, the efficiency remained unimpaired when the tungsten content was reduced from 18 to 14%, while the other constituents remained constant. In spite of the lower tungsten content, an increase of the vanadium content from 1.5 to 2.0% led to an appreciable increase in the production. With 10% Co steels, a similar result was obtained.

From what has been said before, there results that the widely held opinion according to which high speed steels must have a tungsten content of about 18% to be satisfactory, is quite erroneous. Additional lathe tests were then made with low tungsten steels without cobalt and with low vanadium contents. The high speed steels tested in this connection contained 12 and 8% W, and were compared, on the basis of turning tests, with steels having 18% W, 4% Cr and 1% V, or 0.75% V, respectively. From Figs. 3 and 4, it may be seen that the high speed
steels with 8 to 12% W very closely approached the output of the 18% tungsten steels. In summarizing, it may be said that

(1) High speed steels with 11-12% W, 4% Cr, and 0.8% V are equivalent to 18% W, 4% Cr, 0.8% V steels as regards production;

(2) high speed steels with about 8% W, 4% Cr, and 1% V are definitely inferior to the 18-4-1 type; the difference, however, is relatively small, in view of their low tungsten content.

In drilling tests, also, the low tungsten high speed steels make a surprisingly good showing (Fig. 12). These tests were run under shop conditions and all of the tools were used until the edges became blunt. In all cases, the typical blunting sign were observed on the drills. Drill 1 with 8.93% W and 1.07% V gave a smaller production than the comparison drill; on the other hand, Steel 2 with 10.68% W and 1.25% V very closely approached the customary 18% W, 0.86% V steel in regard to the tool life. From the economic viewpoint, the inferiority of Steel 2 is inconsiderable, inasmuch as the more than 100% higher W content of the 18% W steel insures only a small improvement. By reducing the cutting speed by only 0.5 m/min. (1.6 ft./min.), the low W drill No. 2 reaches the production of the steel with 18% W, 4% Cr, and 0.8% V. It should be borne in mind that Drill 2 has a higher vanadium content, while the comparison drill contains 0.60% Mo.

In another series of experiments with low tungsten steels containing from 10 to 6% W, 1.0 to 2.5% V, and 0.1 to 1.1% Mo, an attempt was made at ascertaining in how far a lower tungsten content can be balanced by an increase of the vanadium content and by additions of molybdenum. The respective results have been given in Fig. 5. Steel 1 with 10% W and 1.2% V shows the same production as a steel with 18% W,
4% Cr and 1% V. With Steel 2 a slight addition of molybdenum (0.89%) compensates for the lower contents of W (8.85%) and V (1.0%) so that this steel shows almost the same tool life as Steel 1. A comparison of Steel 2 with Steel 5 shows that a reduction of the chrome content to 2.5%, with otherwise unchanged analysis, results in a small drop in production. Similarly, Steel 4 which does not contain any molybdenum and whose tungsten content is 1% less than that of Steel 2, gives a production which is below that of Steel 2. With Steel 3, it is found that it is possible to reduce the tungsten content to about 6%, provided at the same time, the vanadium content is raised to about 2.4%. The 10% W steels containing 1.2% V, consequently, are equivalent to the 18-4-1 steels. A lowering of the tungsten content to about 8% can be compensated for by a molybdenum content of about 0.9%, while another reduction of the tungsten content, coupled with a corresponding increase of the vanadium content, again leads to almost equal productions. The heat treatment of the low tungsten steels was the same as with the high tungsten steels of the customary analysis, i.e. quenching from 1280-1300 °C (2336-2372 °F) in oil from a gas heated muffle furnace, a one-half hour's tempering at 570 °C (1058 °F) with subsequent cooling in air.

In an earlier report on experiments with molybdenum high speed steels (3) containing 2% W and 1% V, it was stated that these steels gave the same production as a high speed steel containing 18% W, 4% Cr and 1% V. The data given in this earlier report on the heat treatment should be supplemented in the sense that a decarburization of this steel in forging and rolling may be avoided with the use of borax. The latter is either spread on the hot ingots or billets in the form of a powder, or is preferably applied in aqueous solutions. It could be proved that no loss of molybdenum is incurred with these steels. Table 1 gives the
carbon and molybdenum contents which were ascertained upon repeated, unprotected heating to 1200 °C (2192 °F) in the outer layers of rods.

Whereas the decarburizing effect is very marked, the molybdenum contents in core and rim zones are about the same. The evolution of fumes as observed in forging and rolling must be ascribed to volatile molybdenum; however, the latter originates merely from the scale. As a consequence, it must be assumed that there is only a volatilization of the molybdenum oxide and not of the molybdenum from the steel. On the basis of further, more exhaustive and repeated experiments, it may be said on the basis of data now available that the molybdenum containing steels show the same rough-turning production as the high speed steels with 18% W and 1.5% V (cf. Fig. 11). The tool life in drilling, on the other hand, corresponds to that of a steel with 18% W, 4% Cr and 1% V.

Fig. 6 gives the result of experiments which were intended to shed light on the influence of an increased tungsten content with a simultaneous lowering of the molybdenum portion, and also on the influence of the vanadium content with otherwise unchanged compositions. As may be seen, a steel with 6% W, 4% Mo, and 2% V surpasses by far the steel with 8% Mo, 2% W and 1% V, and also the steel with 18% W, 4% Cr, and 1.5% V. Its production is between that of the steels with 12% W and 2.5% V, and of the 5% cobalt high speed steel. This steel, there-

<table>
<thead>
<tr>
<th>Samples Taken</th>
<th>Sample 1</th>
<th></th>
<th>Sample 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0039 to 0.0197 inch from surface</td>
<td>0.16</td>
<td>8.57</td>
<td>0.19</td>
<td>8.40</td>
</tr>
<tr>
<td>0.0236 to 0.0315 * below surface</td>
<td>0.25</td>
<td>8.62</td>
<td>0.38</td>
<td>8.36</td>
</tr>
<tr>
<td>0.0354 to 0.0393 * below surface</td>
<td>0.38</td>
<td>8.62</td>
<td>0.49</td>
<td>8.38</td>
</tr>
<tr>
<td>Core</td>
<td>0.78</td>
<td>8.50</td>
<td>0.76</td>
<td>8.26</td>
</tr>
</tbody>
</table>

Table 1 - Influence of Anneal at 1200 °C (2192 °F) Upon Carbon and Molybdenum Contents in the Outer Layers of Molybdenum High Speed Steels.
fore, has an excellent production; moreover, thanks to the reduced molybdenum content, it does not show the marked tendency toward decarburization, and hence, lends itself to heat treating practically in the same manner as the tungsten steels. The heat treatment of this steel consisted in an oil quench from 1280 °C (2336 °F), a 30-minutes' draw at 570 °C (1058 °F), followed by cooling in air. The influence of the vanadium content in Mo-W steels with 6% or 2% W respectively, 4% Mo and 8% Mo may be seen from Figs. 7 and 13. An increase of the vanadium content from 0.5% to 1.0% leads to a doubling of the turning efficiency, while an increase from 1% to 2% does not bring the expected improvement, i.e., as it can be obtained with the customary tungsten high speed steels. The tool life curve (Fig. 7) of a Mo-W steel with 7% W, 1.5% W and an addition of 4% V lies between that of the Mo-W steel with 8% W, 2% W and 1% V and that of the 6% W, 4% Mo and 2% V steel. Inasmuch as the quantity of carbide which has passed into solution is of great importance, the dissolution of a maximum amount of carbide was to be attained by increasing the quenching temperature and extending the heating time; however, no success was obtained.

Our further experiments related to tungsten-free Mo-high speed steels and more specifically, to a study of the influence of vanadium contents in excess of 2%. From the tool life vs. cutting speed curves of Fig. 8, the conclusion may be drawn that the tungsten-free Mo high speed steels with about 7% Mo and 2.5% V show a much lower production than the tungsten steel with 18% W, 4% Cr and 1.5% V, or the Mo-W steel with 8% Mo, 2% W and 1% V. By increasing the carbon content, in accordance with the increased vanadium content, an improvement could be obtained. It was only with a vanadium content of 3.6% and a corresponding carbon content, that about the same tool life was obtained as with the
8% Mo, 2% W, 1% V steels and the 18% W, 4% Cr, 1.5% V steels. A lowering of the Mo content to about 3% Mo with a simultaneous increase of the vanadium percentage to about 4% gives a steel whose production approaches that of the W high speed steel with 18% W, 4% Cr and 0.5% V, but does not reach that of an 18-4-1 steel (Fig. 9). In summarizing, it may be said that in tungsten-free Mo high speed steels with 7% Mo, only a vanadium content of more than 3.5% insures a production of the type shown by the Mo-W steels with 8% Mo, 2% W and 1% V.

It was then tried to increase the production of the Mo-W steels by additions of cobalt. The increased tool life of cobalt high speed steels is due to the fact that cobalt increases the dissolving capacity of the ground mass for carbides and enables the application of higher quenching ranges and hence, a higher degree of dissolution of the carbides. In Fig. 10, the tool life vs. cutting speed curves of a Mo-W steel with 8% Mo, 2% W and 1% V with and without cobalt (5% Co) have been plotted. The curves show that the addition of cobalt does not bring about an increase in production. It proved also impossible to affect the results by the application of different hardening temperatures, ranging from 1200 to 1300 °C (2192 to 2372 °F). Table 2 contains the test results on molybdenum-tungsten steels melted and heat-treated in the United States and containing additions of 5 and 8% Co and vanadium contents of from 1% to 2%. The values do not show a clear trend. Additions of 5% Co give a small extra production, while with additions of 8% Co, no increase in production as compared to the cobalt-free Mo-W steel has been obtained (for Table 2, see page 6 of translation). A vanadium content of from 1 to 2% is without importance. These experiments show that the influence of the cobalt and vanadium content on these steels is still obscure and in need of further investigations.
Table 2— Influence of Varying Cobalt Contents Upon Tool Life of Mo-W High Speed Steels. (Material Machined had a Tensile Strength of 73 kg/mm² [103,800 lbs/in²]; Feed - 0.92 mm. [0.0362"]; Depth of Chip - 3 mm. [0.118"]).

<table>
<thead>
<tr>
<th>Composition in %</th>
<th>Tool Life With Cutting Speed of 19 m(62.3')/min.</th>
<th>20 m(65.6')/min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Cr Mo W V Co</td>
<td>47 min. 30 sec.</td>
<td>20 min. 35 sec.</td>
</tr>
<tr>
<td>0.79 3.95 8.29 1.80 1.08 5.74</td>
<td>46 * 27 *</td>
<td>19 * 50 *</td>
</tr>
<tr>
<td>0.84 3.81 6.37 2.05 2.02 4.60</td>
<td>38 * 27 *</td>
<td>20 * 15 *</td>
</tr>
<tr>
<td>0.63 3.70 9.46 1.00 1.36 8.02</td>
<td>38 * 25 *</td>
<td>19 * 10 *</td>
</tr>
<tr>
<td>0.85 3.56 8.50 1.15 2.05 8.51</td>
<td>37. * 10 *</td>
<td>20 * 50 *</td>
</tr>
<tr>
<td>0.78 4.10 8.57 1.90 1.09 -</td>
<td>47 min. 30 sec.</td>
<td>20 min. 35 sec.</td>
</tr>
</tbody>
</table>

Special attention will have to be given to the possibility of influencing the solubility of the carbides by cobalt and to the composition of the double carbide.

Summary:

With the cobalt high-speed steels, a reduction of the tungsten content from 18% to 14% is without influence, while an increase of the vanadium content, with reduced tungsten content, insures an increase in efficiency. Steels with 10-11% W, 4% Cr and 1.2% V are equivalent in production to the high speed steels with 18% W, 4% Cr, and 1% V. A lowering of the tungsten content to 8% can be offset by a molybdenum content of about 0.8% to 1.0%. High speed steels with 6% W and a V-content of about 2.5% show good productions which approach those of the 18-4-1 steel.

The tool life of the Mo-W high speed steels with 8% Mo, 2% W and 1% V is the same as that of the steels with 18% W, 4% Cr and 1.5% V. An increase of the tungsten content with a simultaneous lowering of the molybdenum percentage (6% W and 4% Mo) leads to steels whose production lies between that of steels with 12% W and 2.5% V and that of the 5% Co high speed steels.
The problem of the advisability of adding cobalt to Mo—W steels with 8% Mo, 2% W, 4% Cr and 1% V is in need of further investigation.

The solubility and the composition of the double carbides of molybdenum-tungsten steels cannot be influenced by cobalt additions in the same manner as with the tungsten high speed steels.

Tungsten-free molybdenum steels with about 7% Mo show the same production as 8% Mo, 2% W, 4% Cr, 1% V Mo—W—steels or as 18% W, 4% Cr, 1.5% V W—steels only if their vanadium content is higher than 3.5%.

A reduction of the molybdenum content to 3%, with vanadium additions of 4%, enables tungsten-free steels to show almost the same production as a steel with 18% W, 4% Cr, and 0.5% V.

References:

(1) German Patent Application Filed by E. Becker of Kladno, under Class 18d; Group 2.60; B 10.30;


Fig. 1-4: Cutting Speed in Meters Minute.

Material Cut - Steel with a tensile strength of 85 kg/mm² (120,900 lbs/in²).

Material Cut - Cr-Mn Steel: tensile strength = 87 kg/mm² (122,700 lbs/in²).

Material Cut - C-steel: tensile strength = 73 kg/mm² (108,800 lbs/in²).

Material Cut - Mn-Mo Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - Mn-Si Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - Mn-Si Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - M-steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Fig. 5-8: Tool Life in Minutes.

Material Cut - Cr-Mn Steel: tensile strength = 87 kg/mm² (122,700 lbs/in²).

Material Cut - Mn-Mo Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - Mn-Si Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Fig. 9-12: Tool Life in Minutes.

Material Cut - Cr-Mn Steel: tensile strength = 87 kg/mm² (122,700 lbs/in²).

Material Cut - Mn-Mo Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - Mn-Si Steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - M-steel: tensile strength = 85 kg/mm² (120,900 lbs/in²).

Material Cut - C-steel: tensile strength = 73 kg/mm² (108,800 lbs/in²).

Material Cut - Plain C-steel: tensile strength = 75 kg/mm² (106,700 lbs/in²).

Fig. 10-11: Tool Life vs. Cutting Speed Curves of High Speed Steels with Different Alloy Contents.

Fig. 10 and 11: Tool life vs. cutting speed curves of high speed steels with different alloy contents.
DIGEST OF MOLYBDENUM HIGH SPEED STEELS

This digest is intended to give a picture of the commercial molybdenum high speed steels which will permit the contact men of Climax Molybdenum Company to present these steels for consideration by prospective users in a manner which makes our position clear. It includes a complete list of the commercially produced molybdenum high speed steels, the names and addresses of the producers, the composition ranges for the various types, general information on fabrication and heat treating technique, specific information and recommendations on some types, and suggestions regarding the manner in which producers of tools, producers of tools and ultimate consumers should be approached.

From the point of view of Climax, THERE IS NO INCENTIVE WHATSOEVER TO RECOMMEND ONE TYPE OVER ANOTHER except when specific conditions in some particular application point to the advisability of such action. This can best be determined by the contact man on the job. It is hoped this digest will permit him to select the molybdenum steel best suited to the job.


<table>
<thead>
<tr>
<th>Taper No.</th>
<th>00°/56°</th>
<th>00°/3°</th>
<th>00°/6°</th>
<th>00°/12°</th>
<th>00°/18°</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°/50°</td>
<td>00°/18°</td>
<td>00°/6°</td>
<td>00°/12°</td>
<td>00°/18°</td>
<td>00°/24°</td>
</tr>
<tr>
<td>10°/90°</td>
<td>00°/3°</td>
<td>00°/6°</td>
<td>00°/12°</td>
<td>00°/18°</td>
<td>00°/24°</td>
</tr>
<tr>
<td>15°/90°</td>
<td>00°/3°</td>
<td>00°/6°</td>
<td>00°/12°</td>
<td>00°/18°</td>
<td>00°/24°</td>
</tr>
<tr>
<td>20°/90°</td>
<td>00°/3°</td>
<td>00°/6°</td>
<td>00°/12°</td>
<td>00°/18°</td>
<td>00°/24°</td>
</tr>
<tr>
<td>25°/90°</td>
<td>00°/3°</td>
<td>00°/6°</td>
<td>00°/12°</td>
<td>00°/18°</td>
<td>00°/24°</td>
</tr>
</tbody>
</table>

*Note: Taper No. is the angle of the taper, while 90° is the standard angle.*
## Digest of Mo High Speed Steels

A complete list of the present brands is as follows:

### MoMax (Type 1)

**6% No. 45 Cr. 1% V. 1.5% W**

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Manufacturer</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Star Max</td>
<td>Carpenter Steel Co.</td>
<td>Reading, Pa.</td>
</tr>
<tr>
<td>Rex T.Mo</td>
<td>Crucible Steel Co. of America</td>
<td>New York, N.Y.</td>
</tr>
<tr>
<td>H.M. Blue Chip</td>
<td>Firth-Sterling Steel Co.</td>
<td>McKeesport, Pa.</td>
</tr>
<tr>
<td>Trazo</td>
<td>Latrobe Electric Steel Co.</td>
<td>Latrobe, Pa.</td>
</tr>
<tr>
<td>Motung</td>
<td>Universal-Cyclops Steel Co.</td>
<td>Titusville, Pa.</td>
</tr>
<tr>
<td>Mohican</td>
<td>Bethlehem Steel Co.</td>
<td>Welland, Ont. (Canada)</td>
</tr>
<tr>
<td>Bethlehem H.M.</td>
<td>Henry Disston &amp; Sons</td>
<td>Bethlehem, Pa.</td>
</tr>
<tr>
<td>Molza</td>
<td></td>
<td>Lockport, N.Y.</td>
</tr>
</tbody>
</table>

### Super MoMax (Type 2)

**1.25/2.50% V. 6% No. 5.00/8.00 Co**

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Manufacturer</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Motung</td>
<td>Universal-Cyclops Steel Co.</td>
<td>Titusville, Pa.</td>
</tr>
</tbody>
</table>

### Straight Molybdenum, High Vanadium (Type 3)

**8% No. 45 Cr. 1.50/4.00% V**

<table>
<thead>
<tr>
<th>Molybdenum</th>
<th>Manufacturer</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molybdenum</td>
<td>Columbia Tool Steel Co.</td>
<td>Chicago Heights, Ill.</td>
</tr>
<tr>
<td>Rex T.M.</td>
<td>Crucible Steel Co. of America</td>
<td>New York, N.Y.</td>
</tr>
<tr>
<td>VanLon</td>
<td>Vanadium Alloy Steel Co.</td>
<td>Latrobe, Pa.</td>
</tr>
<tr>
<td>MoVan</td>
<td>Universal Cyclops Steel Co.</td>
<td>Titusville, Pa.</td>
</tr>
<tr>
<td>V.M. Dreadnaught</td>
<td>Halco Steel Co.</td>
<td>Syracuse, N.Y.</td>
</tr>
<tr>
<td>Metrot (High C-V)</td>
<td>Vanadium Alloy Steel Co.</td>
<td>Latrobe, Pa.</td>
</tr>
</tbody>
</table>

### Molybdenum-Cobalt-Boron (Type 4)

**6% No. 45 Cr. 1.00/2.00% V. 2.00/8.00% Co+B**

<table>
<thead>
<tr>
<th>Molybdenum</th>
<th>Manufacturer</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoChip (1% V, 2.50% Co)</td>
<td>Firth-Sterling Steel Co.</td>
<td>McKeesport, Pa.</td>
</tr>
<tr>
<td>Super MoChip (1.50% V 8.00% Co)</td>
<td>Firth-Sterling Steel Co.</td>
<td>McKeesport, Pa.</td>
</tr>
</tbody>
</table>

### Molybdenum-Tungsten Balanced Ratio (Type 5)

<table>
<thead>
<tr>
<th>Double Six</th>
<th>Manufacturer</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoTung 6-6</td>
<td>Latrobe Electric Steel Co.</td>
<td>Latrobe, Pa.</td>
</tr>
<tr>
<td>6-6 + Cu</td>
<td>Universal-Cyclops Steel Co.</td>
<td>Titusville, Pa.</td>
</tr>
<tr>
<td>6-6 without Cu</td>
<td>Bethlehem Steel Co.</td>
<td>Bethlehem, Pa.</td>
</tr>
<tr>
<td>6-6 Reg.</td>
<td>Henry Disston &amp; Son Co.</td>
<td>Welland, Ont. (Canada)</td>
</tr>
<tr>
<td>Twin Six (High C)</td>
<td>Breaeburn Alloy Steel Co.</td>
<td>Breaeburn, Pa.</td>
</tr>
<tr>
<td>5-1/2 Mo - W</td>
<td>Crucible Steel Co. of America</td>
<td>New York, N.Y.</td>
</tr>
<tr>
<td>5-6 Spec. (1% C, 2.50% V)</td>
<td>Vanadium Alloy Steel Co.</td>
<td>Latrobe, Pa.</td>
</tr>
</tbody>
</table>
Density

Molybdenum high speed steels have a lower density than tungsten high speed steels. The H11A type is approximately 9 to 10% LIGHTER than 18-4-1. The 6-6 type is about 1% LIGHTER than 18-4-1. This is an important item in arriving at the economy of substituting molybdenum steels for tungsten steels.

Carbon Content for Various Tools or Uses

In molybdenum high speed steels the carbon usually runs about .10% higher than that used in the 18% W type and varies in the same way, according to use. The following is a rough table of these carbon ranges which might be helpful:

<table>
<thead>
<tr>
<th>Suggested Carbon Range</th>
<th>Rockwell &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools of Max. Hardness</td>
<td>.79/.85</td>
</tr>
<tr>
<td>Tools of Max. Hardness &amp; Toughness</td>
<td>.72/.78</td>
</tr>
<tr>
<td>Tools of Max. Toughness</td>
<td>.64/.71</td>
</tr>
<tr>
<td></td>
<td>64/68</td>
</tr>
<tr>
<td></td>
<td>62/65</td>
</tr>
<tr>
<td></td>
<td>58/64</td>
</tr>
</tbody>
</table>

But work tools have been made from most of the types for certain applications. Generally, the carbon is reduced to .35/.45%, the vanadium held around .75/1.00%, and the silicon raised to about double the usual range. In extreme cases, such as extrusion dies and daisy blocks, cobalt is added in varying quantities.

Forging

1. The usual precautions for forging tungsten high speed steels should also be applied to molybdenum steels. It is advisable to have the material in the annealed condition before forging.

2. The temperature recommendations vary a little from one type to another. Forging can be started on all types at a temperature from 1850 - 2050°F. Care should be taken to avoid the temperature dropping below 1650 - 1700°F before reheating on any subsequent forging or rolling operations.

3. It is essential that the temperature be uniform throughout the piece before the forging operation is started in order to allow the metal to flow freely and prevent any heater burns or cracking due to unequal flow.

4. Due to an inherent tendency of some of the molybdenum high speed steels to decarburize when heated for forging, it is necessary to protect these by coating with borax.
Digest of No High Speed Steels

5. After forging and prior to annealing all billets, bars or forgings should be allowed to cool slowly either in dry ashes, silicoflag, or some similar material.

6. Protection against decarburization is not necessary on the 9% type although some producers have protected this type as well.

7. The yield on molybdenum high speed steels in the forge shop will be found to be equal to the corresponding straight tungsten steels. High carbon and other elements in composition will detract from the forgeability just as in tungsten steels.

Annealing

An annealing treatment should always be given after forging. It is carried out in the same manner as for 1% W steels. The bars or forgings are placed in boxes or tubes, packed with sand, spent charcoal, lime, iron borings or some similar material, heated very slowly to 1600 - 1800°F. until thoroughly soaked, and then allowed to cool in the furnace. This will usually produce a Brinell hardness of 200-250, which hardness meets most of the requirements although a little more rapid cooling can be used on special applications where a smoother machined surface is required. In fact, in some cases blanks are given a special anneal to increase the hardness to prevent tearing on fine thread tools and holes. Quite often complaints of hard stock are heard when the material is actually too soft. This generally occurs when the Brinell drops below 200, causing the stock to load up on the cutter or ahead of it, rather than break off in short chips or long spirals.

Methods for Prevention of Decarburization on Hardening

Molybdenum steels can be hardened in all types of hardening furnaces normally used for high speed steel work. If they are the semi-muffle, standard-fired, oil or gas furnaces, it will be necessary to protect the steel with some type of flux. If electrically heated without an atmosphere control, protection is also necessary.

Borax is applied by immersion in a water solution of borax, by sprinkling dry borax on pre-heated tools, by immersion in a liquid bath of molten borax, or by using a coating of borax on top of the molten lead bath where lead is used for preheating. In some cases a regular air spray gun, containing a mixture of borax and water, is used. The pieces are suspended by wires or hooks, which allows a thin film to be deposited on them, sufficient to protect their surface. There are also several commercial pastes on the market for providing surface protection. Chief among these is Sel-Car, made by the National Copper Paint Co. of Chicago, Ill. This material has to be removed by sand blasting after hardening, whereas borax may generally be removed by a water wash or by dilute acetic acid. Rarely is sand blasting necessary.

Several makes of atmosphere curtain furnaces now on the market provide freedom from decarburization when operated under ideal conditions, but they are most successfully used when the work has an allowance in size for grinding after hardening. There is also the Sentry Diamond block which is a carbideous receptacle freedom from decarburization when operated under ideal conditions, but they are most successfully used when the work has an allowance in size for grinding after hardening. There is also the Sentry Diamond block which is a carbideous receptacle...
Digest of No High Speed Steels

The salt bath is another means of hardening, which protects molybdenum high speed steel from decarburization. Salt baths are generally heated by means of two electrodes immersed in the salt. Barium chloride or some combination of barium chloride and other salts are common. This method of hardening works out very well provided the bath is given proper care. Sludge should be removed from the bottom of the pot which, if allowed to remain, will cause pitting and decarburization. This sludge can be avoided to some extent by the use of silicate additions, a patented process. The pot should be checked periodically and the necessary additions made. Care should be taken to keep work a safe distance from electrodes, otherwise arcing may occur between the tool and the electrode, causing fusing of the surface. Tools hardened in the high temperature salt bath should be quenched in a heated salt bath about regular draw temperature before the final quench in oil. By quenching at this temperature, the high temperature salt is reduced to a point where it is soluble in water, permitting easier cleaning.

Heat Treating

Aside from the desirability of protecting some molybdenum high speed steels during hardening, important changes in the heat treating temperatures are necessary. As a general rule, it will be observed that the optimum hardening temperature decreases as the molybdenum content increases. The carbon content and variations in the remainder of the compositions also affect the hardening temperature to an important extent.

While high speed steels will frequently be found to develop apparently satisfactory hardness over a broad temperature range, it must not be concluded that hardness alone will measure the performance of the tool.

Recommended temperatures for the various types follow:

<table>
<thead>
<tr>
<th>Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preheat, °F</td>
<td>1250-1500</td>
<td>1250-1500</td>
<td>1250-1500</td>
<td>1450-1550</td>
<td>1400-1600</td>
</tr>
<tr>
<td>High heat for</td>
<td>2150-2250</td>
<td>2175-2275</td>
<td>2150-2250</td>
<td>2000-2100</td>
<td>2225-2325</td>
</tr>
<tr>
<td>Hardening, °F</td>
<td>950-1100</td>
<td>950-1100</td>
<td>950-1100</td>
<td>1000-1100</td>
<td>975-1125</td>
</tr>
</tbody>
</table>

The above are broad ranges. The actual temperatures must take into account the size and shape of the tool, the extent to which toughness or extreme hardness is desired, as well as the specific condition in any particular hardening room. All of these types respond in a normal manner to modified practices such as double drawing, hot quenching, air hardening, hard casing, and quick annealing. On drawing the steels respond with an increase in hardness of from 2 to 4 points Rockwell "C".

Molybdenum high speed steels, like tungsten high speed steels, MUST BE COOLED TO ROOM TEMPERATURE BEFORE BEING PLACED IN THE HEAT TREATMENT FURNACE if normal response in regular practice is to be realized.
Inspection

In the hardening room, inspection of some kind, however casual, is employed. The hardener desires some assurance that full hardening without injury to the tool surface has been effected. This requires knowledge of whether or not significant scaling or decarburization has occurred and whether or not the desired specific hardness has been attained.

File testing is still very widely used, either in conjunction with the Rockwell test or alone. Even in cases where Rockwell hardness is satisfactory, tools have been rejected by the file test because the Rockwell does not measure the hardness of the extreme surface. In some plants file testing is used as the main inspection until tools are finished ground, then they are checked to see if they meet Rockwell specification. They are also file tested to check for grinding skin which the Rockwell does not detect. The file test is useful so long as it is regarded as qualitative. It is not a reliable method of measuring the extent to which decarburization has occurred.

In using the Rockwell test and in accepting the result, one should be certain that the surface on which the test is made has been properly prepared. The surface must be flat and free from scale. Also, the contact between the anvil and the piece must be solid. As yet, no satisfactory substitute for micrographic examination has been devised for determining decarburization quantitatively.

Grinding of Tools

Tungsten high speed tools should be ground the same as high M tools as far as shape is concerned. Overheating in grinding should be avoided, although lubrication is not necessary. In fact, when free hand grinding is employed it is just as well not to have a lubricant. Avoid cooling TOO DRAMATICALLY. If tool has been discolored or heated in grinding allow it to cool normally in air.
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SECTION III

Recommendations on GMo-6W Balanced Ratio Type

The material in this section is not intended to convey any emphasis on this steel. It is included since the merit of the composition was first recognized at Climax and it is important to understand why and where it fits into the general molybdenum high speed steel picture.

Primarily, GMo-6W high speed steel offers a molybdenum composition much less susceptible to decarburization than other molybdenum types. All those familiar with it grant this improvement. Most concede it to be the equal of 18-4-1 in this respect. Secondly, it offers a molybdenum high speed steel with better cutting ability than any other steel in its immediate price range. (See chart, Figure 1, showing red hardness values.) Thirdly, GMo-6W high speed steel offers a molybdenum composition well suited to our economic situation from three angles:

a) It can be successfully treated in shops not now equipped, nor not likely to be equipped in the near future, with modern heat treating facilities.

b) It lines up well with the economic factors pertaining to the supply of W and Mo in this country.

c) It does not restrict the producer to one type of scrap.

Whereas the several producers of Types 1, 2, 5 and 4 are as well qualified to make definite recommendations regarding their various brands as are we, with respect to GMo-6W we feel our information is founded as yet on wider experience.

The recommended practice for this composition is summarized as follows:

**Composition**

<table>
<thead>
<tr>
<th>Component</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>.79 - .84%</td>
</tr>
<tr>
<td>Manganese</td>
<td>.20 - .30</td>
</tr>
<tr>
<td>Silicon</td>
<td>.20 - .30</td>
</tr>
<tr>
<td>Chromium</td>
<td>5.75 - 4.25</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>6.00 - 6.50</td>
</tr>
<tr>
<td>Tungsten</td>
<td>6.00 - 6.50</td>
</tr>
<tr>
<td>Vanadium</td>
<td>1.40 - 1.75</td>
</tr>
<tr>
<td>Copper</td>
<td>2.40 - 2.60 (optional)</td>
</tr>
</tbody>
</table>

**Fabrication and heat treating temperatures**

<table>
<thead>
<tr>
<th>Process</th>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forging and Rolling</td>
<td>2000 - 1850° F.</td>
</tr>
<tr>
<td>Cogging</td>
<td>2000 - 1650</td>
</tr>
<tr>
<td>Rolling</td>
<td>1500 - 1600</td>
</tr>
<tr>
<td>Annealing</td>
<td>1500 - 1800</td>
</tr>
<tr>
<td>Preheating</td>
<td>2250 - 2520</td>
</tr>
<tr>
<td>Hardening</td>
<td>1000 - 1100</td>
</tr>
<tr>
<td>Drawing</td>
<td></td>
</tr>
</tbody>
</table>

The typical structures of this molybdenum high speed steel are shown in Figures 4, 5 and 6.
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Figure 1
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6% Mo-6% W
2-20, 100-100, 2-130, 2-20, 6-20, 6-70, 6-70, 6-180.

Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66
Rockwell 60-66

Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit 
Grain Deposit

Figure 2
Digest of Mo High Speed Steels

Figure 5

Fig. 5: Hardness - Draw Temperature Curve. Quench 2300°F 9/16" Section, 4 1/2 Minutes at Heat 2 New Draw Composition: C-0.28, Mn-0.23, Si-0.29, Mo-6.29, W-5.70, Cr-4.07, V-1.62.
Figure 4
60-40 High Speed Steel
Annealed by slow purpose cool from 1250°F.
F.D.M. 150
10000 etched in 10% Nital
Figure 5
6Mo-6W High Speed Steel
Quench 2520° F., 4 minutes at heat
5/8" section, Rc 64
X1000 Etched in 10% Nital
Figure 6

BNP-6X high speed steel
Quench 1200°F, Draw 80 minutes at 1000°F
Ac 87
X1000 Etched in 3% nitric acid
SECTION IV

Suggestions for Promoting the Case of Molybdenum High Speed Steel

There is available today sufficient background to permit us to maintain, without any apology, the position that molybdenum high speed steels are equal in performance to tungsten high speed steels. There are two specific and direct factors which should always be brought out.

1. Molybdenum high speed steel is cheaper per pound than the equivalent tungsten high speed steel with which it competes.

2. Molybdenum high speed steel is less dense than tungsten high speed steel.

Example: Buying 1/2" square stock for tool bits, 4" long.

<table>
<thead>
<tr>
<th>Base prices:</th>
<th>18-4-1 = 67¢</th>
<th>MoMax = 54¢</th>
<th>6-6 = 60¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>100# 18-4-1 at .963/ft. = 104 ft. = 312 bits = $67.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100# MoMax at .875/ft. = 114 ft. = 342 bits = $84.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100# 6Mo-6# at .692/ft. = 112 ft. = 336 bits = $60.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With this introduction to the matter of price, the question of scrap value will arise. Before the war of 1914 tungsten scrap was of little value. During the war the scarcity of tungsten created a market for tungsten scrap when the steel producers were forced to learn to use it. Molybdenum steels, increasing from month to month, will soon put molybdenum scrap on the market in significant tonnages. The producer of steel already knows he can use it and already the price of MoMax scrap is as stable as, if not more stable than, the price of tungsten scrap. Admittedly, tungsten scrap will carry a higher price than molybdenum scrap. In some quarters this factor has been perverted to the argument that in the long run 18-4-1 costs no more than molybdenum high speed steel. When reduced to figures this argument disappears as follows:

Example: It is required to purchase tools for a given job where no scrap is on hand for credit purposes. The job requires 100# 18-4-1, 91# MoMax, or 95# 6-6.

<table>
<thead>
<tr>
<th>18-4-1</th>
<th>MoMax</th>
<th>6-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price per #</td>
<td>$0.67</td>
<td>$0.54</td>
</tr>
<tr>
<td>Cost of stock for tools</td>
<td>67.00</td>
<td>49.00</td>
</tr>
</tbody>
</table>

After average life at equal performance 50% of purchased stock will be used up or ground away. 50% will be available for credit on new purchase. To replenish stock of tools to original number we must again purchase 100# 18-4-1, 91# MoMax, or 95# 6-6, but this time we can obtain credit for scrap available.

<table>
<thead>
<tr>
<th>Price of stock for tools</th>
<th>$67.00</th>
<th>$49.00</th>
<th>$56.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrap value per #</td>
<td>.25</td>
<td>.125</td>
<td>.145</td>
</tr>
<tr>
<td>Value of scrap</td>
<td>11.50</td>
<td>5.70</td>
<td>6.75</td>
</tr>
<tr>
<td>Net cost to reposition</td>
<td>55.50</td>
<td>43.30</td>
<td>49.25</td>
</tr>
</tbody>
</table>
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It will be seen that the higher price of the tungsten scrap, plus the fact that more pounds of tungsten scrap are obtained, has failed to upset the price advantage which the molybdenum steels hold when no scrap enters the transaction.

The suggestion is made that whenever possible (and it is always possible if the annual consumption of steel is known) the saving by using molybdenum steels be based on annual savings rather than price per pound. Savings in thousands of dollars hit home better than savings in terms of cents per pound.

Field of Contacts

1. Types of shops
   a. Tool makers
   b. Manufacturers who make their own tools
   c. Steel producers
   d. Tool users

   Tool makers and manufacturers who produce their own tools are especially interested in the price situation.

   Tool users who do not make tools usually buy on performance basis. The saving is not always passed on to them and they must be sold on the basis of superior cutting quality. In dealing with this class one must always check both with the user and tool supplier to be sure that the correct information is obtained.

2. Persons to Contact
   a. Tool makers-
      Purchasing agent
      Metallurgist or superintendent
   b. Manufacturers who make their own tools-
      Purchasing agent
      Tool supervisor (large shops)
      Superintendent (small shops)
      Production foreman
   c. Steel Producers
      Metallurgist
      Salesmen
   d. Shops buying on performance
      Purchasing agent
      Tool supervisor
      Production foreman
Digest of No High Speed Steels

Obviously, hard and fast rules cannot be set down. Because our contact is in the nature of missionary rather than direct sales work, the purchasing agent should not prevent shop contacts. IF HE DOES, THE INGENUITY OF THE CONTACT MAN MUST COME INTO PLAY SINCE THE SHOP CONTACTS ARE ESSENTIAL. It is taken for granted that many PERSONAL FRIENDSHIPS will be cultivated to reach this end.

The good will of the tool steel mill must be maintained. We cannot expect, however, that they will do our sales job. The advent of molybdenum steels is really a serious problem with them. The faster it comes the worse off their transition period will be. Primarily, the mill's job is to supply steel not to specify it. Their problem is quite different from ours. By experiment the new comes in and the old goes out. If we sell molybdenum to the tool users without losing the good will of the producer the successful expansion of molybdenum high speed will take care of itself. The natural factors of supply, price, and merit are in our favor. The producers know this and will not resist it indefinitely. That they will, if left to their own devices, proceed much slower than we desire is a foregone conclusion.

NOTWITHSTANDING COMMERCIAL PUBLICITY TO THE CONTRARY THE TUNGSTEN MARKET IS UNCERTAIN, AND IT TIES UP THE STEEL PRODUCERS CAPITAL IN A GAMBLE RATHER THAN A SOUND INVESTMENT. WORLD CONDITIONS MAKE THIS AN OPPORTUNE TIME TO SUPPLANT FOREIGN TUNGSTEN IN THE HIGH SPEED STEEL FIELD WITH MOLYBDENUM.

CLIMAX MOLYBDENUM COMPANY OF MICHIGAN

FLA-A78
EKF
November 17, 1939.
March 25th, 1939

REPORT ON HIGH SPEED STEEL CONTAINING
10% MOLYBDENUM, 25 TUNGSTEN

The purpose of this report is to correlate the latest information obtained in the development of a high speed steel containing 10% Mo and 25% W, which information will be helpful in determining the best policy for introducing this composition to the trade. The subject matter has been divided as follows:

1. Composition
2. Manufacture
3. Heat treatment
4. Cutting tests
5. The question of copper
6. The patent situation
7. Merit of the development.

COMPOSITION

The high speed steel discussed in this report falls within the following composition limits:

Carbon   .70 - .90%
Manganese .20 - .30
Silicon   .20 - .30
Molybdenum 6.00 - 6.50
Tungsten  6.00 - 6.50
Chromium  3.75 - 4.25
Vanadium  1.00 - 2.00

A specific analysis, such as would be recommended by us for ordinary small lathe tool service, is as follows:

Carbon   .60
Manganese .25
Silicon   .25
Molybdenum 6.00
Tungsten  6.00
Chromium  4.00
Vanadium  1.50

As will be pointed out later, certain advantages can be derived by the addition of 2.5% copper to this composition. When copper is added, a range of 2.50 - 2.80 is acceptable.

The carbon content in the composition of a particular heat should depend upon the type of service to which that heat is put, and follows the same general carbon gradation as is found when 12-4-1 is applied to different types of service. In general, however, this molybdenum high speed steel, like other molybdenum high speed steels, will carry...
a carbon content from 5 to 10 points higher than the straight tungsten high speed steel with which it compares. There is every reason to believe that the base composition will respond to additions of cobalt to produce a so-called super high speed steel, but this point has not been studied and is not covered in this report.

MANUFACTURE

This high speed steel has been produced over a period of eighteen months in the laboratory. The first heat in the laboratory was made October 6, 1937. At no time during the laboratory production of this material has there been any evidence that its commercial production would involve practices with which commercial mills are not already familiar and which are not already regularly employed in the production of 18-4-1.

Shortly after our earliest laboratory work, several ingots were made by the Ludlum Steel Company. These were from a 4000 lb. heat and the producer claimed that he realized 76% recovery from ingot to 4" billet. The heat contained copper and due to objections, of which we are all now well aware, in spite of satisfactory cutting properties, no support was given to the composition by this producer and no authoritative information regarding the cutting characteristics was obtained until recently.

Commercial heats have been produced both with and without copper. The latest commercial production has confirmed the fact that entirely satisfactory recovery can be secured. A specific example of the commercial manufacture can be cited in the heat made by Latrobe Electric Steel Company for the Chicago Latrobe Drill Works. This was a 25000 lb. heat, produced in a one ton direct arc furnace (overcharging as is customary practice), no change in furnace practice, such as nature of scrap, melting time, melting temperatures, slag practice, teeming temperature, or ingot size was made. The composition of this heat was:

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>.80%</td>
</tr>
<tr>
<td>Manganese</td>
<td>.25</td>
</tr>
<tr>
<td>Silicon</td>
<td>.22</td>
</tr>
<tr>
<td>Chromium</td>
<td>4.06</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>6.88</td>
</tr>
<tr>
<td>Tungsten</td>
<td>6.51</td>
</tr>
<tr>
<td>Vanadium</td>
<td>1.98</td>
</tr>
</tbody>
</table>

The ingots from this heat were hammer copped to 4.5" square billets. Reliable information on the actual forging temperatures for the heat was not obtained, since it was produced before we had time to go to the mill. (Forging temperatures as high as 2100°F are entirely safe, in fact, material has been forged in our laboratory at considerably higher temperatures, 2200°F.) The recovery on the heat in customer sizes was 70%, which compares with 18-4-1 recovery.
Further confirmation of the adaptability to commercial practice is to be found in heats which were produced for Henry Disston & Sons by Carpenter Steel Company. These 1000° heats were produced in an induction furnace and contained copper. Samples of these and all other heats commercially produced to date which have been in our laboratory have been fully satisfactory from the standpoint of soundness and response to heat treatment. (For cutting quality see Tables later in report.)

HEAT TREATMENT

The heat treatment of 6 Mo - 6 W high speed steel involves some temperature changes from that regularly used on 18-4-1.

The steel is successfully annealed to a Brinell hardness of 217 to 241 by a slow furnace cool from 1550° F. The excellent structure of the annealed steel from a commercially produced heat is shown in Figure 1. In hardening, a preheating temperature of 1530 - 1600° F. is recommended. The steel will respond to quenching from a hardening temperature in the range 2250 - 2350° F. As is common in all high speed steel hardening, the higher temperatures are used for heavier solid sections and the lower temperatures for fine edged or intricately shaped tools. No appreciable grain growth is encountered until temperatures above 2300° F. are used. For example, quenching at 2300° F. produced a grain size of 12, at 2500° a grain size of 11, at 2875° a grain size of 3. Since the hardening temperatures are appreciably higher than those recommended for other types of molybdenum high speed steel (Moly about 1200° F.), the length of time at quenching temperature is roughly equal to that of 18-4-1, which will be looked upon favorably by production tool shops. The common quenching temperatures for 18-4-1 would be about 25° F. higher. The fine-grained, uniform structure of a properly quenched sample of this composition is shown in Figure 2. The response to drawing is substantially the same as that of other high speed steels. A draw-temperature-hardness curve made in our laboratory for the heat produced for Chicago Latrobe Drill Works is shown in Figure 3, and the structure after a 1050° F. draw appears in Figure 4. This structure shows excellent carbide dispersion and uniform development of martensite.

This steel should be heat treated in the same furnace atmospheres and by the same practices as is found to give the best results on 18-4-1, except for the recommended change in quenching temperatures. The steel does not require borax, salt-baths, etc. for its successful handling.
CUTTING TESTS

The cutting characteristics of this composition have been compared with common grades of high speed steel available today in a cutting test conducted at the Department of Engineering Research, University of Michigan. The nature of the test and the procedure followed are covered fully in the reports by Prof. O. K. Boston to the Climax Molybdenum Company, dated December, 1926, February 27, 1929, February, 1929 and March 6, 1929, copies of which are attached. These reports present data which permit the calculation of the permissible cutting speed for a given tool life.

The relationship between cutting speed and tool life can be stated by the simple formula:

\[ V T^{n} = C, \]

where \( V \) is cutting speed in feet per minute, \( T \) is the tool life in minutes, and \( n \) and \( C \) are factors describing the tool in test. \( C \) is a constant for any given heat of steel with a specific heat treatment and for a standard tool shape. \( n \) is the slope of the curve which becomes greater as the qualifications of the steel for long service decrease. Values of \( n \) and \( C \) are determined experimentally. Having determined them for each type of steel submitted, the results can be presented in a very practical form, namely: the cutting velocity for a tool life of, say, 0 hours. The equation is solved as follows:

1) \( V T^{n} = C \)

Take logarithms of both sides,

2) \( \log V + n \log T = \log C \)

3) \( \log V = \log C - n \log T \)

\( V = \text{antilog} (\log C - n \log T) \).

Using this simplification, the results of the tests at Ann Arbor have been reduced to the following values, giving cutting speed for various tool steels at a tool life of 400 minutes, or eight hours.
### Permissible Cutting Speed for Eight Hour Tool Life

**Type of High Speed Steel**

<table>
<thead>
<tr>
<th>Supplier</th>
<th>18-4-1</th>
<th>18-4-2</th>
<th>Helmax</th>
<th>Moly-Vanadium</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>76.2</td>
<td>64.4</td>
<td>71.7</td>
<td>75.4</td>
</tr>
<tr>
<td>O</td>
<td>74.7</td>
<td>90.4</td>
<td>66.5</td>
<td>76.0</td>
</tr>
<tr>
<td>S</td>
<td>72.2</td>
<td>66.4</td>
<td>82.4</td>
<td>79.9</td>
</tr>
<tr>
<td>T</td>
<td>70.6</td>
<td>97.9</td>
<td>80.6</td>
<td>65.8</td>
</tr>
<tr>
<td>MA</td>
<td>78.3</td>
<td>92.1</td>
<td>80.6</td>
<td>82.8</td>
</tr>
<tr>
<td>Average</td>
<td>76.2</td>
<td>84.7</td>
<td>82.7</td>
<td>79.6</td>
</tr>
</tbody>
</table>

**Laboratory Produced 6 Mo - 6 W**

| Heat 1851A | Induction Furnace | 50# | 106.4 |
| Heat 1852A | Induction Furnace | 50# | 104.1 |
| Heat 1855A | Induction Furnace | 50# | 102.6 |
| Heat P-119  | Direct Arc Furnace | 150# | 61.1 |

**6 Mo - 6 W - 2.5 Cu**

| Heat 1851B | Induction Furnace | 50# | 90.1 |
| Heat 1852B | Induction Furnace | 50# | 101.9 |
| Heat 1855B | Induction Furnace | 50# | 99.5 |
| Heat P-119  | Direct Arc Furnace | 150# | 77.2 |

**Commerially Produced 6 Mo - 6 W**

**Manufacturers**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Size of Heat</th>
<th>Heat Treated By</th>
<th>Heat Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Ludlum</td>
<td>4000#</td>
<td>Gorham</td>
<td>81.6 with copper</td>
</tr>
<tr>
<td>b) Carpenter</td>
<td>1000#</td>
<td>Manton</td>
<td>77.1</td>
</tr>
<tr>
<td>c) Carpenter</td>
<td>1000#</td>
<td>Climax</td>
<td>91.1</td>
</tr>
<tr>
<td>d) Latrobe Electric</td>
<td>2500#</td>
<td>Gorham</td>
<td>95.5 no copper</td>
</tr>
</tbody>
</table>

**Ludlum's DM**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Size of Heat</th>
<th>Heat Treated By</th>
<th>Heat Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climax</td>
<td>50#</td>
<td>Gorham</td>
<td>82.3</td>
</tr>
<tr>
<td>Ludlum</td>
<td></td>
<td>Ludlum</td>
<td>77.5</td>
</tr>
</tbody>
</table>

Because we have had access to all of the information and data pertaining to these tests, we are bound to feel they are reliable.

These tests support the generally accepted opinion of the improvement which can be gained in 18-4-1 by increasing the vanadium to 18-4-2. They indicate that Helmax closely approaches the cutting properties of 18-4-2, supporting the contention of Mr. Emmas that
One of the most important conclusions drawn from this work is that the steel which first gives the best cutting properties is the steel containing 10\% of molybdenum and tungsten. It is interesting to note that the cutting properties of this type of steel are better than straight molybdenum steel. The results in the table produced in the laboratory are given to illustrate this. The best of the steel which first gives the best cutting properties is the steel containing 10\% of molybdenum and tungsten. Although, as in the case of the results obtained in the laboratory, the value obtained at room temperature of 220°F is a little better than 1/2. The value of 77°F obtained at 77°F is substantially higher than the results obtained in the laboratory. The value obtained in the laboratory is substantially higher than the results obtained at 77°F.

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THE PATENT SITUATION

It is our understanding that high speed steel compositions containing molybdenum and tungsten which are not within the ratio range patented by Bunsen and applied for by Bresler and containing the equivalent of 18% tungsten were disclosed in the Watertown Arsenal work, but not patented by anyone.

If this is the case, the 6-6 high speed steel should be available to the trade without patent difficulties and the addition of copper to such a steel is covered in the high speed patent which we own. Evidence in support of this is found in the following factors:

1) Claims in our original patent application covering this range of tungsten and molybdenum were rejected by the Examiner.

2) Bunsen disclosed compositions in this range but rejected them on the basis of poor performance and did not patent them. (ASM 1953, Pg. 211 and 219)

3) The Watertown Arsenal work discloses the range. (Pg. 6, Table I, Watertown Arsenal, June 30, 1930 - 4.44 W, 7.06 Mo.)

4) Bresler's alleged patent application avoids that range. (ASM 1936 preprint)

5) Climax filed with patent office a statement dated November 2nd, 1937 disclosing 6% Mo - 6% W.

SUMMARY OF THE DEVELOPMENT

It appears that we can say that with the acceptance of a composition containing 6% Mo and 6% W, there will be available to the high speed steel trade a composition not involved in patent difficulties, free from the old problem of decarburization, and with the ability to cut better than any straight tungsten high speed steel of the same price class on the market. Judging by the price agreed on between Latrobe Electric and Chicago Latrobe Drill Company, 6% Mo - 6% W will sell around 62¢ per pound base (present price). It would line up with common grades as follows:

<table>
<thead>
<tr>
<th>High Speed Steels</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-6</td>
<td>62¢</td>
</tr>
<tr>
<td>6-4-1</td>
<td>67¢</td>
</tr>
<tr>
<td>10-4-2</td>
<td>77¢</td>
</tr>
</tbody>
</table>
Figs. 2. 6 Ho-6 F High Speed Steel, Quench 2300° F, 4 minutes at heat, 
3/8" Section, Re 64. 
X3000, Etched in 10% Nital.
Fig. 3. Hardness - Draw Temperature Curve. Quenched 2320°F
3/8 inch section, 4 minutes at heat; R.C. 64. Draw 1 1/2 hours.
Elevated Temperature Hardness Tests of *18-1-1* & 6-6 High Speed Steels

Impression made with tungsten carbide ball

\[ x = Latrobe's \text{ } 18 \text{ } \text{High Speed Steel } (18 \text{ } \text{W}, \text{ } 1 \text{ } \text{Cr}, \text{ } 1 \text{ } \text{V}) \]

\[ 6 = \text{Latrobe's } \text{ } 6-6 \text{ } \text{High Speed Steel } (0.80 \text{ } \text{C}, \text{ } 6.38 \text{ } \text{Mo}, \text{ } 6.51 \text{ } \text{W}, \text{ } 4.36 \text{ } \text{Cr}, \text{ } 1.58 \text{ } \text{V}, \text{ } \text{No } \text{Co}) \]
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These remarkably low power and maintenance costs are due to the revolutionary design of this new machine. Every cubic foot of each cell's effective volume (176 cu. ft.) contributes to efficient capacity. And all the power goes to provide proper agitation, aeration and circulation.

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Easing Money in New York

F I N A N C I A L, it is said, is the key to success in New York. It is important to have a solid financial foundation in order to succeed in the business world. This feature will discuss various financial strategies for success in New York City.

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and substantial in the industry which produced them in a large amount. The metal was not entirely without protest when it was announced that the management was going to increase its prices. However, in the event that this plan was carried out, the management decided to announce the increase in prices at the evening meeting. According to the company's president, the increase was necessary to meet the company's expenses and to maintain the quality of the product.

In the meantime, the workers in the industry were preparing for the strike. They were determined to fight for their rights and to demand better working conditions and wages. The workers organized a strike committee and held meetings to discuss the situation. They also tried to negotiate with the management to reach a settlement that would be beneficial for both parties.

The strike began on the morning of the announced increase in prices. The workers were determined to continue the strike until their demands were met. The company, on the other hand, was prepared to deal with the strike in a firm manner. They threatened to fire any worker who participated in the strike.

The situation escalated rapidly, and the strike soon spread to other companies in the industry. The workers' organizations formed a national strike committee to coordinate the actions of the different strikes.

The strike lasted for several weeks, and it caused significant disruption in the industry. The company had to operate at a reduced capacity, and the reduction in production affected the overall economy. However, the company was able to maintain its profitability by increasing its prices and reducing its workforce.

In the end, the workers were able to achieve a number of their demands, including a wage increase, better working conditions, and recognition of their union. The strike served as a reminder of the importance of collective bargaining and the power of organized labor.

Commodity Prices

The accompanying chart shows graphically the average annual prices of selected commodities in the state of industry and business. The data is based on monthly averages for the past few years. The chart shows the trend in prices and the fluctuations in the metal market.

The price of copper and iron has been relatively stable, with a slight upward trend. The price of steel has remained relatively constant. The price of aluminum has shown a steady decline, while the price of lead has remained relatively stable.

The price of gold has shown a significant increase, reflecting the demand for precious metals. The price of oil has shown a fluctuating trend, with a slight downward trend in recent months.

Student Problems

NOT long ago a distinguished student named John was admitted to the engineering school. He had been working for several years in a small factory and was eager to pursue a career in engineering. John was bright and motivated, and he quickly adapted to the rigors of engineering school.

However, John encountered several difficulties early on. He struggled to keep up with the coursework, and he often felt isolated from the other students. He also had to juggle his coursework with his part-time job, which left him little time for studying.

Despite these challenges, John remained determined to succeed. He sought out help from his professors and classmates, and he began to work more efficiently to manage his time. Slowly but surely, John began to see improvements in his grades and his confidence.

In the end, John graduated with distinction and went on to have a successful career in the engineering field. His story is a testament to the value of perseverance and hard work.

answer, or at least commented on, five questions propounded by two Student Associates residing at 115 W. Gilman St., Madison, Wis.

1. **What phases of mining engineering after the best future?**

Of course, the question arises as to the student's individual conception of a "best future." Does it mean, to him, success and contentment in his work; or does it mean the accumulation of material wealth? Fortunately, the two need not, by any means, be mutually exclusive. A few mining engineers have made money as entrepreneurs, as promoters, or as investors. Still more have done well financially as independent consulting engineers. However, the opportunities in either of these directions are dwindling. On the other hand, more and more mining engineers are getting to the top as managers, executives, and administrators in the employ of corporations. Generally speaking, the best path to this goal is in operation: typically, the successive steps are shift boss, foreman, superintendent, manager. The reason is that the personnel executive must be able to "win friends and influence people." Highly technical abilities, such as research and engineering design, are not as likely to lead to more remunerative positions. On the other hand, the young man who, by temperament, is best fitted for this kind of work may be much happier doing it than anything else.

2. **How would you suggest breaking into the field?**

Where a young man attains the title of "B. E." after his name, he has laid a foundation and is ready to begin the process of becoming an engineer. If he is convinced that the laboratory and drill board are not for him, he should seek the assistance of a soundly and scrupulously trained industry in which he hopes to become a member. Widely experienced men are the best friends for college graduates that have the stamina and the man that desires muet to be on the get-up-and-go. His best course is to learn everything he can about the business, as should be prepared when opportunity comes.

3. **Should the young engineer attempt to specialize upon leaving college or should he first gain experience in a number of phases of the work?**

The god of chance usually answers this question. Often the superintendant with an eye on a likely young man shifts him around to various jobs. This is not so much to find out where his best fit, as to give him a broader conception of what is going on. Specialization fits better with the research type of man—the one who will become expert in a relatively narrow technical field, rather than the one who will some day manage the enterprise. This is not to say that men of the former kind are not quite as necessary as the others.

4. **Does a job in a foreign country offer more opportunity than a good job in the United States?**

For the reason that mining operations in many parts of the world are fostered by American capital and controlled by American corporations, there always will be a demand for American mining engineers to go abroad in minor as well as in more important positions. The fact that, in general, higher salaries must be paid for foreign service, is of little importance in comparison to the fact that foreign environment is not so attractive to most men. A man who has spent five or six years in a foreign country has acquired an asset that enables him to command better pay in a foreign country than he could get at home. Consequently, it frequently happens that he spends his entire career outside the United States. A few men (and a much smaller number of wives) can adapt themselves to a foreign environment. Nine men out of ten are likely to fare better in a career in the United States.

5. **What special courses, other than the usual courses in mining engineering, should be taken in the last year at the university?**

One answer to this question is this: Take the absolute minimum of technological and engineering courses that will enable you to win your sleepless nights. Take as much as you can of psychology, philosophy, social science, business, and administrative management. The basis for this suggestion is that in no case have you the foundation of a successful mining career. The man who has you will have to build additional. Also, after graduation, you will be obliged to learn more to achieve real success, a deal about these so-called cultural arts.

For example, suppose, you have taken a course in foreign languages. Even if it is supposed, you have given you an insight into the basic principles that will make mining and mining in future life more meaningful and profitable.

The foregoing suggestions are made with due humility, in the hope that they will provide food for thought some of the thousands of young men who are soon to have the warm huts of learning for the cold outside world.

**Germany's Drive for Mineral Self-Sufficiency**

**Metallurgy**

At the entrance to the Mining Institute Building on Transbay Island, at San Francisco's World's Fair, is a large panel bearing the following inscription:

**MAN AND METALS**

Metal was not accidentally discovered at some time in the beginning of the world. We, as a result of the labors of mankind, have learned now as the same time as the men of old, to obtain iron, the sun's rays so that the metal and the sun's rays have been used by European nations for its own advantage. Germany has been one of the several countries which has been able to increase its output from its own resources, and to make Germany one of the leading nations of the world.

Among the European nations, Germany is the center of interest economically as well as politically, and of progress. It is a natural for Europe as a whole, Germany's ability to produce mineral products the permanent and her export importance, the impact of the essential supplies to maintain its industries. So far as minerals are concerned, Germany is among the leaders in the production of coal and iron. Among other goods, it has the ability to increase output from its own resources, and to make Germany one of the leading nations of the world.

**AMONG the European nations, Germany is the center of interest economically as well as politically, and of progress. It is a natural for Europe as a whole, Germany's ability to produce mineral products has an even more importance than in the past, and her export importance is an essential element for the impact of the essential supplies to maintain its industries. So far as minerals are concerned, Germany is among the leaders in the production of coal and iron. Among other goods, it has the ability to increase output from its own resources, and to make Germany one of the leading nations of the world.**

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The Government has been working to meet the situation by a comprehensive search for the mineral raw materials, by improving methods of exploitation, and by finding satisfactory substitutes for imports. Economic as well as political penetration in the central European states and belligerent agreements with South American and other countries, as well as being made to obtain required raw materials.

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A glance at the chart will show the average annual production and consumption of the essential raw materials. From 1906 to 1921 this will help one to visualize Germany's present predicament and the future possibilities with respect to the mineral commodities shown in the chart as well as the present source of imports.

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The small output of bauxite in Germany is used in the chemical and steel industries. Hungary, Belgium, and the Netherlands are important suppliers of bauxite, and it is used in the production of aluminum. Germany has significant bauxite deposits in the Saar and the Rhineland. These deposits are used in the production of aluminum and other metals. Germany has about 10 million tons of bauxite reserves, which is enough to supply the country for many years.
Germany's export oil and coal and its products have shown a steady rise since 1930 and have now reached higher figures than ever before. These exports are principally to Italy, France, Belgium, and the Netherlands. Both Czechoslovakia and Austria, as well as all the Balkan States, are importers of coal and therefore represent a potential market for future coal exports from Germany.

Petroleum: Deficiency Important

*Dependence on foreign sources for petroleum products is one of Germany's weakest spots in her industry's present and future economic condition.*

A notable increase occurred in the output of crude oil in 1934, principally from a new field of Rhenish-Baden extraction resulting in improved operations of the plants.
Recently
Elected Director,
A.I.M.E.
Fuel-burning Equipment

In the fuel-burning equipment field, great improvements have also been made. While the well-known types of underfeeder and chain-grate stokers have been improved, pulverized-coal firing equipment, which had advanced above fifteen years ago, has seen great development, and is now widely used, especially in the large plants. The spreader stoker, an overhead type, which entered the scene five or six years ago, has found its niche and is being accepted, particularly for use with those coals that had a limited application with previous burning equipment. It is apparently well adapted for the use of lignite.

Of great interest is, of course, the phenomenal development that has taken place in the domestic stoker production of which has been labeled "America's fastest growing new industry." As proof of its progress, there are approximately 350,000 stokers of all types in the United States today, and of this number nearly 300,000 are the products of this new branch of the stoker industry. This includes the commercial and small industrial models manufactured by the domestic stoker companies. Approximately 100,000 of these stokers were manufactured in 1937. This industry actually thrived well during the depression years and promises to continue to accelerate its annual sales volume.

Coal men are indebted to the stoker manufacturers for providing this machine to meet automatic gas and oil burner competition. So today automatic coal heating is, indeed, a reality and is now being given such public acceptance that its future is most promising.

Labor

Average employment in the coal industry, with that incident in railroad transportation, amounts to approximately one million men, making the coal industry a big labor market. Approximately 350,000 out of every dollar of income tax and 15,000 are miners.

The annual income for this group is probably around one billion dollars and it supplies a demand to approximately 55 million people. These wage-earners are among the country's best spenders and their money goes quickly into circulation in the business cycle. A typical example is the fact that this group is a prodigious layer of autonomous advertising, absorbing between 100,000 and 200,000 yearly.

Research

In recent years coal and allied research has received great stimulus. Those not closely associated with this field would probably be surprised at the volume of work now going on in this country. In 1937 44 organizations were carrying on coal research on 232 projects. The U.S. Bureau of Mines has done more work than any other agency. Its annual expenditure for testing fuel amounted in 1937 to $184,736. A vast amount of accurate and valuable information pertaining to all phases of the coal industry has been made available through its work.

Anthracite Industries, Inc., the coal research laboratory of the Carnegie Institute of Technology, and the Illinois Geological Survey also are outstanding in this field. The work of the latter organization being devoted mainly to practical problems encountered daily by retail coal merchants and industrial consumers.

This great industry is the geologists, the paleobotanists, the petrographers, the chemists, the engineers who are exploring, studying, experimenting, and writing on coal, which is perhaps the most complex mineral with which man has to deal. Three thousand different types of coals are in existence and each month brings forth hundreds of articles on new developments in its use.

Public Relations

People today know more about solid fuel and automatic heating with coal than they did ten years ago. The coal industry and its allies, especially the stoker manufacturers, have taught that coal can be glamorous, that coal merchants advertise quality and service, that their coal will go in comfort, convenience, a better heat, and health. Thanks to the stoker industry, the public is studying coal and the results of 

progress in combating silicosis.

Silicosis is a term known to almost everyone today. Yet, in spite of a great deal of study, much is still to be learned regarding the disease. Government organizations are still continuing their investigations, but not fully successful in the battle with courage and optimism. The only thing wrong with the industry today is that we dig coal faster than we learn it. It is this lack of knowledge that is harassing new customers and by supporting research is driving new men and women.

Coal bases at Columbus, Oct. 5-7

Plans are already forming for a joint meeting of the Institute's Coal Division and the local chapter of the American Industrial Hygienists. The meeting is to be held in Columbus, Ohio, Oct. 5-7, and will be addressed by coal merchants and industrial plant officials, and industrial plant officials and consulting engineers. The meeting will be held at the Columbus Athletic Club. In addition, there will be an address by a noted industrial engineer, who will speak on the prevention of silicosis in the coal mining industry. It is expected that this meeting will be of great interest to all those engaged in the coal and mining industries.

Progress in Combating Silicosis

A Summary of the Recent Geneva Conference

By R.R. Sayers

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From time to time international conferences have discussed or discussed the disease in progress in the control of the disease. In 1933 such a meeting was held in South Africa under the auspices of the International Labour Office. In 1936 the National Silicosis Conference was held in the United States. This conference summarized the knowledge under four committees, as follows: Committee on the Prevention of Silicosis Through Medical Control, Committee on the Prevention of Silicosis Through Engineering Controls, Committee on Regulatory and Administrative Plans, and the Committee on Economic, Legal, and Insurance Plans. The reports of these committees emphasized the need for early detection and prompt treatment of silicosis, which can be prevented by the use of protective measures.

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The results of the examination revealed that the concentration of silica in the workplace was within the limits prescribed by law. It was determined that the magnitude of the exposure was not sufficient to cause any harmful effects on the health of the workers.

The committee recommended that the current level of silica in the workplace should continue to be monitored and that further studies should be conducted to ensure the continued safety of the workers.

The committee also emphasized the importance of implementing effective dust control measures and ensuring proper ventilation in the workplace to minimize the exposure to silica dust.

In conclusion, the committee concluded that the current conditions in the workplace were not hazardous and that the measures already in place were sufficient to protect the health of the workers.

The committee's findings and recommendations were submitted to the relevant authorities for implementation.
Gold Output and Dividends of Canada and the World

By Arthur Ashmore
Mining Economist of Canadian Metal Mining ACEM

To present some idea of the magnitude of the gold mining industry of Canada and the world, the records of 106 gold-mining companies currently paying dividends have been studied. Forty of these are in Canada, and 62 on the Rand in South Africa, these being all the straight gold-mining companies that paid dividends in the two areas in 1938. None of the base-metal companies that produce gold as a byproduct, or even as a major portion of the value of their total product, have been included. In addition, a group of 22 smaller companies from Southern Rhodesia and the Gold Coast in Africa, India, Australia, Mandchuria, Philippine Islands, the United States, and South America have been included. All of the group are base metals. They produced approximately 1,500,000 ounces of gold at an average of 2.0778 per ounce, at a cost of 2.794 per ounce, taking the average London gold price to be $46.78 per ounce. This is equal to 40.57 ounces of silver. Accordingly, the average yield of 6,531 troy ounces per ton is approximately 3.38 per cent. The average yield of the South Africans and the Canadians is 1.2 per cent, whereas that of the other group is 8.29 per cent.

Measured in value of product or as an index of the gold-mining industries of the world is a reliable yardstick provided compared with any of the really important world industries. It furnishes much valuable data on the wealth and the standing of this country and its standards.
Ore and Dividend Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Ounces</th>
<th>Value of Ore, Dollars</th>
<th>Dividends, Dollars</th>
<th>Per Cent</th>
<th>Gold</th>
<th>Silver</th>
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</thead>
<tbody>
<tr>
<td>1928</td>
<td>20,000,000</td>
<td>2,000,000</td>
<td>200,000</td>
<td>10.00</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>1929</td>
<td>15,000,000</td>
<td>1,500,000</td>
<td>150,000</td>
<td>10.00</td>
<td>55</td>
<td>45</td>
</tr>
</tbody>
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The average price of gold in the United States in 1928 was $35.00 per ounce, and the average price of silver was $0.90 per ounce.

- The gold mine at the Rand, 300 ft. beneath the surface.

In 1928, the Rand gold mine produced 12,000,000 ounces of gold, valued at $420,000,000.

- In 1929, the Rand gold mine produced 9,000,000 ounces of gold, valued at $324,000,000.

- The average per cent of gold in the ore at the Rand is 5.5 per cent.

- The average per cent of silver in the ore at the Rand is 4.5 per cent.

- The Rand is located in the Transvaal, South Africa.

- The Rand is one of the largest gold mines in the world.

- The Rand is the largest producer of gold in the world.

- The Rand is the second largest producer of silver in the world.

- The Rand is the largest producer of silver in South Africa.

- The Rand is the largest producer of mineral wealth in South Africa.

- The Rand is the largest producer of mineral wealth in the world.

- The Rand is the largest producer of mineral wealth in Africa.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of value.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of volume.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of employment.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of exports.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of tax revenue.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of foreign investment.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of research and development.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of education.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of infrastructure.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of technology.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of innovation.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of entrepreneurship.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of social development.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of cultural development.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of environmental sustainability.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of community development.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of international cooperation.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global influence.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global competitiveness.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global leadership.

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- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global information.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global communication.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global energy.

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- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global peace.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global democracy.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global human rights.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global justice.

- The Rand is the largest producer of mineral wealth in Africa, outside of South Africa, in terms of global equality.

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THE DRIFT
As followed by
EDWARD H. ROBIE

THE COAL IMPASSION

A dependable source of supply for the American iron and steel industry is a factor of great importance to the nation. The United States, like most of the major industrial nations, is dependent on coal for the production of virtually all of its iron and steel. The coal industry, therefore, is crucial to the nation's economy. The coal industry has been hit by a series of strikes and labor disputes, which have had a significant impact on the production of iron and steel. The coal industry is facing severe labor shortages and the cost of coal has increased significantly. This is leading to higher costs for the steel industry, which is already facing competitive pressures from abroad.

OSIRICHEDEFICIENCY

Our quicksilver deficiency is one of the major issues facing the industry. The quicksilver is needed for the production of steel. The quicksilver is produced from mercury, which is a toxic substance. The production of quicksilver is regulated by the Environmental Protection Agency (EPA). The EPA has imposed strict regulations on the production of quicksilver, which has led to a decrease in the supply and an increase in the price of quicksilver. This has had a negative impact on the steel industry, which relies on quicksilver for its production processes.

AMERICAN STEEL OUTPUT

According to the American Iron and Steel Institute, the production of steel in the United States has increased significantly in recent years. The increase in production is due to a number of factors, including the expansion of existing facilities, the construction of new facilities, and the increased demand for steel products. The production of steel has increased by 25% since 2010, with the largest increase in production occurring in the automotive and construction sectors. The production of steel is expected to continue to increase in the coming years, driven by the growing demand for steel products.

QUALITY ASSURANCE

The steel industry is committed to ensuring the quality of its products. The industry has implemented a number of quality control measures to ensure that its products meet the highest standards. These measures include the use of advanced testing equipment, the implementation of rigorous quality control procedures, and the use of high-quality raw materials. The industry is also committed to continuous improvement, with a focus on reducing defects and improving efficiency. The industry is working closely with its customers to meet their needs and to ensure that its products meet their requirements.

DEFINITION OF AN ENGINEER

The engineering profession is one of the most important in society. Engineers are responsible for designing and building the structures and systems that make our modern world possible. They are responsible for ensuring the safety and reliability of these structures and systems, and for minimizing their environmental impact. Engineers are also responsible for ensuring the economic viability of their projects, and for working within budgetary constraints.

PRACTICALITY-DEPRESSION PROOF

In the current economic climate, the steel industry is facing a number of challenges. The industry is facing increased competition from abroad, and it is also facing increased regulatory scrutiny. The industry is working hard to meet these challenges, and it is committed to ensuring the long-term viability of its operations. The industry is also committed to ensuring the safety and health of its workers, and to minimizing its environmental impact.
PREVIEWS OF Tomorrow's Metallurgy
Edited by Louis Jordan

Staffordshire Proceedings

Metal Products in National Defense
A successful program of metal products for national defense is dependent upon the development of new and improved alloys. The National Metallurgical Research Association (N.M.L.R.A.) has been formed to study the problems of national defense and to develop new materials for use in the military forces.

High Up in the Air Again
The Metallurgical Society of the American Institute of Mining Engineers holds its annual meeting in New York City this September. The meeting will feature presentations on the latest developments in the field of aeronautical metallurgy.

The Folklore of Iron
Several of the most highly revered tales of the ancient world deal with the story of the iron age. These stories, which have been preserved from the earliest times, have been adapted and retold throughout history. The tales tell of the discovery of iron and the exploits of the heroes who used it in battle.

Periods of Romance in Metallurgy
CONSTANT readers of the Journal of the Institute of Metals will have noticed an increase in the number of articles devoted to the history of metallurgy. This is not surprising, as the field of metallurgy has undergone a great deal of development over the past century.

The evolution of the iron age is well documented, and the use of iron in warfare and industry is a fascinating subject. The stories of the iron age heroes, such as Hercules and Perseus, are still popular today.

The development of steel, with its many applications, is another important aspect of the history of metallurgy. Steel was first used by the ancient Greeks, and its use increased over the centuries as the technology improved.

The future of metallurgy is also an area of great interest. The development of new alloys and the discovery of new processes are constantly changing the field.

The Journal of the Institute of Metals is an excellent source of information on the latest developments in the field of metallurgy. It is published monthly and is available at a subscription price of $25 per year.

The editors of the Journal of the Institute of Metals are pleased to announce the appointment of a new editorial board. The board includes some of the leading experts in the field of metallurgy, and their contributions will greatly enhance the journal's value to readers.
CORRESPONDENCE AND DISCUSSION

A Visit with the Papers and Publications Committee

The Editor:

My recent stay in the Institute has been long and varied, ranging from my time at the Papers and Publications Committee. I have noticed odd papers to the Institute in the past twenty years with results not to be accurate. I believe that the papers was completely and arbitrarily handled, but in the absence of any action without dissenting voice or comments, I was also interested in the quality of the Institute's publications. I have observed that the quality of the papers is not always high, but the publication process is sometimes slow. In fact, I have noticed that the publication process can be quite slow at times, with many papers taking months to be published. It is clear that the Institute needs to improve its publication process to ensure that the quality of the papers is maintained.

Engineering College Graduates on Business Education

The Editor:

In an article in the February issue of the Engineering Education magazine, Professor D. H. Johnson presented an interesting argument for the importance of business education in engineering curricula. He argued that the traditional engineering curriculum should be expanded to include business education, as it is essential for engineers to understand the business world in which they operate.

Western ores too far from market

The Editor:

While the cost of transportation is a major concern for the mining industry, the distance from the ore deposits to the market is also a significant factor. In the case of Western ores, the high cost of transportation can make it difficult to compete with other sources of ore.

Getting away from the ideals of the American Constitution

The Editor:

In an article in the American Sociologist, Mr. J. A. Smith discussed the problems facing the American Constitution. He argued that the Constitution is not as strong as it once was, and that it is time for a new constitution to be written.

Rock has become one

The Editor:

In an article in the Science News, Dr. L. E. Johnson discussed the phenomenon of rock formation. He argued that rocks are not just formed by cracks in the earth, but are also formed by the action of water and the movement of the earth's crust.

The Editor:

I do not think that there is much value in the ideas presented in the previous articles. In my opinion, the ideas presented are not original, and are not of much value.

The Editor:

I have noticed that the ideas presented in the previous articles are not very original, and are not of much value.

The Editor:

I have noticed that the ideas presented in the previous articles are not very original, and are not of much value.
AMONG THE NEWER BOOKS

Books reviewed in these pages, as well as others, may be purchased through the Book Department of Mortimer, Inc., 150 Nassau St., New York City, at prices not in excess of $1.00; payments must be made in advance.

Reviewed by H. A. Branca

This book presents opportunities for the writer, who has a good sense of the possibilities of new ideas, to develop his own style and to realize his potential. It is a collection of articles, reviews, essays, and book reports, all dealing with aspects of the art and craft of writing, with emphasis on the techniques used in fiction, poetry, and drama. The essays are written in a clear, concise style, with a strong emphasis on the importance of the writer's voice and the need for originality in the creation of new works.

The book also contains a number of useful exercises and guidelines for writers, along with suggestions for further reading and resources. Overall, the book is an excellent resource for anyone interested in improving their writing skills or exploring new avenues of creative expression.

The World Coal Industry

The World Coal Industry

This book is a comprehensive guide to the world coal industry, covering the production, consumption, and trade of coal worldwide. It includes detailed statistics and data on coal production by country, as well as information on coal consumption and exports.

The book also examines the geopolitical and economic factors that influence the coal industry, and provides insight into the future prospects for coal as a fuel. Overall, it is an indispensable reference for anyone interested in the coal industry or its impact on the global economy.

LATEST ARRIVALS

Elements of Geology

Elements of Geology

This book is an introduction to the field of geology, covering the basic principles and concepts of the subject. It is written in an accessible and engaging style, with a focus on practical applications and real-world examples.

The book covers a range of topics, including the history of the Earth, the processes that shape its surface, and the development of life on our planet. It also includes sections on the geology of specific regions, such as the United States and Canada.

The book is an excellent resource for students and anyone interested in learning about the Earth and its geological history. It is well-illustrated with maps, diagrams, and photographs, and includes a wide range of exercises and activities to help reinforce the concepts discussed in each chapter.

The Principles of Geologic Laboratory Practice

The Principles of Geologic Laboratory Practice

This book is a comprehensive guide to the principles and practices of geologic laboratory work. It covers a range of topics, including rock and mineral identification, sediment analysis, and geochemical and isotopic methods.

The book is written in a clear and accessible style, with a focus on practical applications and real-world examples. It is an essential resource for students and professionals working in the field of geology, and includes a wide range of exercises and activities to help reinforce the concepts discussed in each chapter.

The book is an excellent resource for anyone interested in learning about the principles and practices of geologic laboratory work, and includes a range of exercises and activities to help reinforce the concepts discussed in each chapter.
INSTITUTE AFFAIRS
LOCAL SECTION ACTIVITIES—

Special Funds to Finance Milling Methods Volume
and Vocational Booklet

At the regular meeting on April 20,
the Board of Directors approved
a recommendation from the Rocky
Mountain Income Committee, Henry
Kretch, chairman, to appropriate
from the income of the Fund, $1,200
at the cost of publishing during
1939. TRANSACTIIONS Volume 134, on
"Milling Methods," will be issued
from the Sody W. Moll Memorial
Fund Committee was also approved
by the Board of Directors as follows;
$700,000 copies of the vocational
guidance booklet "Ceramics in the
Mineral Industries." The first edition
of 1,500 copies was distributed
in May. Advertise for publication
of the second edition of the
Mineral Industry Education Divi-
Ceramics in the Mineral Industries.

The first edition of 1,500 copies was
distributed in May. Advertise for publication
of the second edition of the
Mineral Industry Education Divi-
section, 1939.

May Dinner, Iron and Steel
Division, on May 24

The May dinner of the A.I.M.E.
Iron and Steel Division will be
held on the 24th at 8:30 p.m. (D.S.T.)
at the Engineers' Club, 42 W. 57th
St., New York City. Proceeding
this evening there will be a meeting at
4 p.m. for the members of the
Division at A.I.M.E. headquarters.

President Gillies Plans Annual
Spring Trip

M E E T I N G  P L A N S  H O U S E  B U I L D I N G

Chicago        May 17-20

Reno, Nev.     May 21         Reno, Nev.

Los Angeles     May 22         Pomona, Calif.

San Francisco  May 23-24

Yachats, Calif. May 24         Portland, Ore.

Las Vegas      May 24-25

President Gillies will spend the
second and third weeks of May making
official visits to several local
sections. The dates are:

Chicago, Ill.     May 17-20

Bakersfield, Calif. May 22-24

San Francisco  May 25, 1939

The dinner preceding the meeting
will be held at the Engineers' Club, Henry B.
Slosson was given the Legion of Honor
medal and pin by President Gillies. He
was introduced by H. G. MacInnes,
C. R. Waterhouse spoke interestingly
on his trip to the Tata steel works in
India, where he gave new infor-
mation on the Tata steel plant in
the British Empire. L. E. Young,
took from the Steelworkers con-
dermarking the reorganization
of the Cleveland Section, a new
purchase of the meetings except Chicago.

Functions and Procedure of the Papers
and Publications Committee

Chairman of the Committee, 1939

DURING the course of travel in
recent parts of the country I have
personally had occasion to see the
work of the Papers and Publica-
tions Committee of the Institute. So
frequently have I been asked questions
about the committee that I have been
able to accept the Chairmanship—
Editor that indicated a serious, even
if, perhaps, not surprising lack of un-
derstanding of the committee's
problems and activities.

Not long ago a prominent and active
member of the Institute attended a
meeting of the Papers and Publications
Committee for the first time. To his
surprise he declared that he had just
read an article in the American
metallurgical journal which he
found was a perfect rehash of his
paper. This text is not new, it is
rehashed and it is rehashed constantly.

Many of these remarks, he supposed
by the chairman or other officers of the
Technical Committee, and of the
sections, committees, and the Associa-
tion as a whole, and I am privileged
to subscribe to this, it is not new,
and the rehashes are inspired.

If an author wants to make a
good impression through a
paper he should send three copies
to the three officers of the
Technical Committee, and
himself a copy; and if the
officers are able to publish
them in the A.M.I.E. Journ-
als then they are published;
and if they are not in
the A.M.I.E. Journals, they
are not published. The
papers have been rehashed
without the permission of the
author, and are rehashed with
the permission of the author.

If a member wants to publish a
paper which is new, it is
newly published; if it is
newly published, it is
newly published.
Trend of Future Practice to Be Theme of 151st A.J.M.E. Meeting in San Francisco

In all other industries, change is the normal thing in today's world. Mining may therefore expect noting to go to be radically different from what holds from now on in the present. On the basis of previous meetings of the Institute of Mining Engineers, and looking at what is going to be the conditions in mining, what trends of change can be detected definitely? This has been a general subject of discussion at the recent meetings of the A.J.M.E. in San Francisco. July 13-16. At this meeting, the latest standard practices will be discussed as well as the attitudes of the mining industry toward new developments in mechanization and new developments in rail and road transportation. The meeting will be held on Tuesday at the Hotel Majestic in San Francisco.

Exceptionally attractive rates and fees will be available for those attending the meeting. The fee for attending the entire conference will be $25.00, which includes all meals and transportation to and from the airport.

African Mining Life Described for Nevada Section and Lodges

JOINING with the Woman's Auxiliary of the Nevada Section of the A.J.M.E., will be at the annual meeting of the Nevada Section, March 24, at the Nevada Hotel, Reno. At the meeting, Mr. Howard S. Hensley, for the American Institute of Mining and Metallurgical Engineers, will give an address on "The Role of the Engineer in Society." The meeting will be held at 7:30 p.m., and all members are invited to attend.

MINING geology was the theme of the March meeting of the Utah Section held at the Hotel Newmeyer and attended by 41. J. B. Brown, of the Utah Geological Survey, gave a talk on the broad general features of the geology of the Bingham and Park City mining districts. The meeting was held at the Hotel Newmeyer and attended by 41. J. B. Brown, of the Utah Geological Survey, gave a talk on the broad general features of the geology of the Bingham and Park City mining districts.

Beezos and Murphy Speak for Utah Section

JOINING with the Woman's Auxiliary of the Nevada Section of the A.J.M.E., will be at the annual meeting of the Nevada Section, March 24, at the Nevada Hotel, Reno. At the meeting, Mr. Howard S. Hensley, for the American Institute of Mining and Metallurgical Engineers, will give an address on the broad general features of the geology of the Bingham and Park City mining districts. The meeting will be held at 7:30 p.m., and all members are invited to attend.
Dr. Nix on Metal Structures
Detroit Section

About fifty attended the March meeting of the Detroit Section, March 16, at the Detroit Landmark Hotel. Dr. C. Nix, of the Bell Telephone Laboratories, spoke on "Super Structures in Metallic Systems."

Dr. Nix discussed the somewhat complicated subject of a metal, not, I believe, the manner. With the copper-gold alloy, which is his chief example, he first differentiated between the ordered and disordered systems by illustrating the relative position of the copper and gold atoms in the space lattice. Ordering is obtained by annealing an appropriate alloy at a high temperature, then cooling it slowly. Ordered states can be distinguished from the corresponding disordered states by means of the additional super-lattice lines in the X-ray patterns; provided the alloying constituents do not have similar atomic characteristics, such as de iron and nickel. Ordered systems have a lower energy than disordered systems and also occupy a lesser volume. This latter property permits differentiating between ordered and disordered systems by means of dilatometric measurements, which method succeeds also in cases where the X-rays fail. Dr. Nix described the interferometer apparatus by which he is detecting the recent dilatometric investigations, and presented some of his results on the extent of ordering and its variation with change in temperature. Finally, it was shown that ordered systems have a lower electrical resistance than the corresponding disordered systems, and different (temperature measurements indicate the extent of ordering and its variation with temperature. Ordered systems are transformed into the disordered state by cold-working, the extent varying directly with the amount of cold work.

Interesting discussions followed. F. W. Ross, Secretary.

Joint Meeting on Oil and Gas
Pittsburgh Section

On April 10, the Pittsburgh Section held a high grade talk on "Oilfield Gas." Mr. H. W. Campbell, E. R. E. T. Pittsburg Steel Co., discussed the paper. Mr. W. R. Dunn's and the discussion dealt with the difficulties encountered in making and handling electrical drill strings and casing in deep wells. The questions of joints came in particular attention.

Following Mr. Dunn's paper, Dr. E. E. Davis, consulting engineer of the Bureau of Mines, discussed the "Possibilities of Romanian Gas Observations in that Country." He is highly praised and production is declining in recent years. The production rate of the Romanian gas field is held to be east of the Carpathian Mountains.

Yarnan Tin Mining Described
New York Section

TIN mining and milling as reviewed in actual practice to-day in Yunnan province in China was described by Joseph S. Martin of the New York Section, April 10, at the Williamsburg Hotel.

Benedict Discusses Copper
Chicago Section

SOME geological facts about the Lake Superior copper region were the subject of an interesting talk given by C. P. Benedict, of the Chicago Section, April 12, at the Odd Fellows' Club on the 12th Avenue building. He started his talk with a quotation from the late John Anderson, President of the National Geographic Society, "When the young men of the future are of a proper age, they should be taken to the site of the old mining camps and told the story of the development of the American copper industry and its development."

Metamorphic Batholith
Described by Goodspeed
Oregon Section

WITH Chairman Neslin presiding, the Oregon Section held its annual banquet in the University Club, April 13, at which Albert Barlow submitted his paper from the Board of the Section, entitled "Regional Geology of the Western Gneissous." His address was well received and his paper has been published in T.B. 1933, in the March Memoirs, Transactions. The discussion centered on the use of the "Western Gneissous" as an area of area of metamorphism.

In the evening 274 people gathered in the William Penn Hotel to listen to a short talk on "Geology Today" by Ralph E. Goodspeed, a new appointment at the University of Washington, gave an address on the geology of the Northwest area of the Cordillera. The address was well received and is scheduled for an appointment at the University of Washington.

The committee in charge of the evening awards has met and decided on the prizes. These are being awarded to students at Wisconsin, Illinois, Purdue University,Arts and Sciences Institute, Joliet Institute, and the students of the University of Chicago. The winners were announced at 10:30, and the prizes consisting of bound volumes of the Transactions of the American Society of Mining Engineers, commerce, and other modern plants, and W. C. H. Jell, Executive, as outlined.

San Francisco Section Meets a Talk on Copper

As MIGHT have been expected, the subject of earthquakes proved a most interesting topic to 56 members of the San Francisco Section, who gathered at Engineers' Club, San Francisco, on April 12 to hear Perry Byers, formerly with the Geologic Department of the University of California, give a talk on "The Earthquakes that appeared before the fault line of the great 1906 earthquake was moved, and the idea of being truly an igneous rock was perhaps metamorphic." - Earl K. Nix, Chairman.

Yarnan Tin Mining Described
New York Section

TIN mining and milling as reviewed in actual practice to-day in Yunnan province in China was described by Joseph S. Martin of the New York Section, April 10, at the Williamsburg Hotel.
AMONG THE STUDENT ASSOCIATES
Colorado Passes the 200 Mark—Michigan's Showing
Colorado's Student Association has surpassed the 200 mark, representing a new high for the Colorado College Students' Association, with 215 members. The Student Association consists of various groups and organizations with a total membership of 215.

The Student Association has been growing steadily over the past few years. In 1924, there were only 150 members, and by 1926, the number had doubled to 300. The current figure of 215 members represents a significant increase from last year's total of 186. Swelling strongly into another place is the Michigan College of Mining and Technology, which had one Student Association in 1924, 49 in 1928, and 150 last year. This year, the number has increased to 215, making it the largest in the state.

Student Associates, A.I.M.E.

Colorado School of Mines, Denver, has a membership of 215 members, and 115 women. The Student Association includes various groups and organizations, with a total membership of 215.

University of Arizona—The student association has been growing steadily over the past few years. In 1924, there were only 150 members, and by 1926, the number had doubled to 300. The current figure of 215 members represents a significant increase from last year's total of 186. Swelling strongly into another place is the Michigan College of Mining and Technology, which had one Student Association in 1924, 49 in 1928, and 150 last year. This year, the number has increased to 215, making it the largest in the state.

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New Patients Dated to Members
William Suggion, Jr., Del Ray Heights, Va.
2304456. Ophthalmology.

Henry K. Beitz, Minneapolis, assigned to the
333-100 M. Mental hygiene.

Julian M. Assman, Bloomfield, assigned to the
3435 B. L. B. T. T., Inc.

Harold B. Nesbitt, Cedar Rapids, assigned to the
24238. Production of organic gases.

Frank E. Meriwether, Washington, assigned to the
23439. Production of pharmaceuticals.

Harold F. Perry, and Frances B. Perry, assigned to
33-474. Philosophy.

Artillery W. Peterson, North Attleboro, assigned to
23393. Metal and Die Castings.

James W. Webster, assigned to the
25141. Gold alloy casting.

Robert C. Hall, who was fatally
1957-1958 in Oklahoma

Herbert H. Schap, a member of the
1907, and died in 1908.

James O. Bevis, a former president of the
24581. President.

S. Bowles, general manager of
24396. European insurance.

William S. Mead, president of the
government of the
25140. Pergamino.

Chas. B. Murray, consulting
333-100 M. Medical.

Harold Aihnov, who was
1902 in Osaka, Japan.

Mr. and Mrs. Charles B. Murray
333-100 M. Medical.

Charles B. Murray, who was
1902 in Osaka, Japan.

Mr. and Mrs. Charles B. Murray
PROPOSED FOR MEMBERSHIP

TOTAL A.M.R.S. MEMBERSHIP ON APRIL 22, 1939:

MEMBERS

STUDENT ASSOCIATE TO JUNIOR MEMBER

STUDENT ASSOCIATE TO JUNIOR MEMBER

STUDENT ASSOCIATE TO JUNIOR MEMBER

STUDENT ASSOCIATE TO JUNIOR MEMBER

STUDENT ASSOCIATE TO JUNIOR MEMBER

STUDENT ASSOCIATE TO JUNIOR MEMBER

CHANGE OF STATUS
ABSTRACTS OF INSTITUTE PAPERS

TECHNICAL PUBLICATIONS

The following papers have been published as Technical Publications and have been added to the Institute's library and available to all members through the Institute's library network. The papers cover a wide range of topics in the field of transportation, including railroad, road, and waterway engineering, and are intended to provide technical insights and advancements to the field.


A commercial development of the method of producing aluminum in the presence of large amounts of magnesium, nickel, and iron, has been made by the Aluminum Company of America. The method involves the use of an electrolytic cell in which a stream of current is passed through a solution containing the metallic elements. The resulting aluminum is then recovered by electrolysis. The process is described in detail in the paper. The use of this method has resulted in a significant increase in the production of aluminum and has led to a decrease in the cost of the metal.

The Plastic Flow of Metals—By W. W. McMaster, T. P. N. 8194, April 7, 1928.

A new process for the production of high-speed steel is described. The process involves the melting of a mixture of steel and tungsten under a vacuum, followed by the quenching and tempering of the resulting steel. The resulting steel is then ground to the desired shape and size. The process is described in detail in the paper. The use of this process has resulted in the production of high-quality high-speed steel with improved properties.


Suggestions to Institute Authors.

In compiling the index to the papers and publications, authors of papers and publications are requested to submit a list of the papers and publications that they wish to be included in the index. This will facilitate the compilation of a comprehensive index of papers and publications that are related to the subject matter of the papers and publications. The index will be updated periodically to include new papers and publications as they become available.

CAST IRON AND CONFIDENCE

A Molybdenum addition to cast iron has often proved the best way to get the most out of money spent to improve materials.

The selection of a gray cast iron with 0.75% Moly for 1440 rubber mild steel is a typical example. The Moly is strong in tensile strength 60,000 psi and holds up to at least uncounted service. Despite the necessary hardening, machining presents no difficulties.
NEW A.I.M.E. TECHNICAL PUBLICATIONS

May, 1939
Published in METALS TECHNOLOGY, April, 1939

Frank Pick

1956-5 C-231

Fraction of Scale at Elevated Temperatures After Sustained Loading. By W. B. Truesdell and W. Parmelee (19 pp.)

1954-5 C-231

The Flotation of Rods. By W. W. Worthington (177 pp.)

1954-5 E-251

The Supposed High-Temperature Polymeric Bondage of Tin. By C. W. Mason and E. E. Pullenier, Jr. (151 pp.)

1954-5 C-231


Books for Review:

The Publication listed above have been selected and published at the discretion of the Editor of Metallurgical and Engineering News. The inclusion of these publications cannot be endorsed, however, and their appearance in this publication does not indicate that they are in any way connected with the Institute. The opinion expressed is that of the authors alone, and no responsibility is assumed by the Institute for the views expressed therein.

American Institute of Mining and Metallurgical Engineers
20 West Thirty-sixth Street
New York, N. Y.
ENGINEERING SOCIETIES
EMPLOYMENT SERVICE

EQUIPMENT OPEN

MINING

Mining Engineer, junior, single. Have
ning of coal mining experience on general
and small scale. Must have satisfactory
references.

Mining Engineer, junior, single. Have
ning of mining experience on general
and small scale. Must have satisfactory
references.

Metallurgist, 20 years' experience. Must
have satisfactory references.

Mining Engineer, 20 years' experience. Must
have satisfactory references.

Mining Engineer, 20 years' experience. Must
have satisfactory references.

Welder, certified. Must have satisfactory
references.

Welder, certified. Must have satisfactory
references.

Welder, certified. Must have satisfactory
references.

EQUIPMENT OPEN

MANUFACTURER

AUTODRIVERS
for World's Greatest Tunnel Job

One of the contractors working on Delaware Aqueduct—117 miles of tunnel—purchased a number of CP AUTODRIVERS when he started his first contract. They have so definitely proved their superiority in FASTER DRILLING SPEED—LOWER AIR CONSUMPTION—LOWER MAINTENANCE—EASY HANDLING—that he has again ordered CP AUTODRIVERS. Write for a folder which fully describes CP AUTODRIVERS.

CHICAGO PNEUMATIC TOOL COMPANY

Regraded Unclassified
SAVE MONEY in drilling test holes! Use Sperry-Sun's CORE ORIENTATION SERVICE

Directions and angle of dip of core samples with visible indication of bedding planes are determined in our laboratories. The North and South sides of the core are identified through residual polarizers in the heavy minerals of the sample. Cores as small as 1" in diameter and 2½" in length can be oriented.

The method is RAPID, INEXPENSIVE and
    VERY ACURATE. Cores hand-picked out of
    cores (200 to 300 chosen for bedding planes and sides
    properly marked top and bottom, can be shipped
    to our Laboratories from any distance.

We have successfully oriented cores sent in as
    from Europe and Asia. Write for Price List
    No. 260.

Current and applications pending.

SPERRY-SUN WELL SURVEYING CO.
1608 Walnut Street, Philadelphia, Pa.

Employment Service
Professional Directory
A. I. M. E. Publications
Technical Books
* In previous issues.

Directory of Advertisers

THE ENSIGN-BICKFORD COMPANY - SIMSBURY - CONN. - U. S. A.
Manufacturers of Safety Fuse Since 1850

ROTA TION FIRING

For Safety and Efficiency Use

THE ENSIGN-BICKFORD MASTER FUSE LIGHTER

You can fire two to thirty-six holes by lighting only one at the pilot time. This reduces possibility of overworking a fuse at wrong time of incorrect lighting.

1. You can use smaller, more economical fuse firing, because each pilot time can be any length enough to allow the time to reach a place of action before any of the fuses leading to the bore holes are ignited.

2. When the lighter is used in war work the shell can be turned up so water cannot run down bore and extreme end of the fuse of ignition compounded to the lighter.

3. You can light many shots with greater safety and efficiency.

WHAT IT IS

The Master Fuse Lighter consists of a strong, water-proof shell capped with a flexible capillary.

Each time, when the fuse has been unwound the proper location and placed through the lighter, the shell is in contact with the igniter and fuses in the fuse of time of the shell.

The idea of using a smaller, delayed, fuse firing for both water and ground operations is as efficient as the shell and fuse of time of the shell. The result being the use of the lighter is necessary.

The Master Fuse Lighter is wound with the fuse of time of the shell and fuse of time of the shell. The Master Fuse Lighter in wound with the fuse of time of the shell and fuse of time is very effective.
MEMORANDUM FOR SECRETARY MORGENTHAU:

I told the President about my plan to bring General Arnold and Colonel Burns to see you, and that you had graciously asked us to lunch tomorrow. He says the plan is O.K. with him.

E.M.W.
THE WHITE HOUSE
WASHINGTON

CONFIDENTIAL

MEMORANDUM FOR
THE SECRETARY OF THE TREASURY

THAT you aren't to be
about this?

F. D. R.
THE WHITE HOUSE
WASHINGTON

November 14, 1939.

MEMORANDUM FOR THE PRESIDENT

Re: RFC Act, No. 4

In connection with the deficit and the cash requirements of the Treasury, a possibility in connection with the RFC might be kept in mind.

According to Section 12 of the RFC Act, "the Corporation may also, at any time pay to the Treasurer of the United States all miscellaneous receipts at any stage belonging to the Corporation or from time to time receive by it in the course of its business or otherwise in excess of reasonable limits reserved to meet its requirements during legislation." The capital amounts to $500 million and the earned surplus to $258 million as of the end of September. In addition, the Corporation has unearned profits. Its loans and investment are listed in the accompanying table.

Obviously the Corporation has capital funds far in excess of its probable losses. An appraisal of such losses, prepared in connection with the Byrd resolution, will shortly be available. It would appear that from a quarter to a half billion dollars might be taken at any time by the Treasury as miscellaneous receipts, which, of course, would reduce the deficit and the necessity for incurring open market debt.

Lansing Currie
**Loans and Investments as of October 31, 1939**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans to financial institutions</td>
<td>172,795</td>
</tr>
<tr>
<td>Loans on preferred stock of banks and insurance companies</td>
<td>37,137</td>
</tr>
<tr>
<td>Preferred stock, public issues, and certificates</td>
<td>523,200</td>
</tr>
<tr>
<td>Loans to railways (including receivers)</td>
<td>436,550</td>
</tr>
<tr>
<td>Loans for self-liquidating projects</td>
<td>49,072</td>
</tr>
<tr>
<td>Loans to industrial and commercial businesses</td>
<td>132,363</td>
</tr>
<tr>
<td>Loans to mining, levee, and irrigation districts</td>
<td>83,482</td>
</tr>
<tr>
<td>Other loans</td>
<td>23,274</td>
</tr>
<tr>
<td>Securities purchased from Public Works Administration</td>
<td>96,069</td>
</tr>
<tr>
<td><strong>Total loans and investments, other than interagency</strong></td>
<td>1,608,911</td>
</tr>
<tr>
<td>Preferred stock of Export-Import Bank</td>
<td>41,000</td>
</tr>
<tr>
<td>Loans to Rural Electrification Administration</td>
<td>46,493</td>
</tr>
<tr>
<td>Capital stock of, and loans to R. F. C. Mortgage Co.</td>
<td>55,102</td>
</tr>
<tr>
<td>Capital stock of, and loans to Fed. Natl. Mortgage Co.</td>
<td>50,323</td>
</tr>
<tr>
<td>Loans to Tennessee Valley Authority</td>
<td>8,200</td>
</tr>
<tr>
<td><strong>Total loans on investments</strong></td>
<td>1,914,133</td>
</tr>
</tbody>
</table>

**Capital Surveys as of September 30, 1939:**

- Capital: 500 million
- Surplus: 253
- Deferred credits: 15
- Sustained credits, etc.: 17
DEC 19 1939

Mr. Currin:

In reply to your letter of December 8, 1939, there are enclosed tables containing the following information:

1. A table showing the estimated gross and net amounts of non-Federal securities outstanding, interest on which is exempt from the Federal income tax, as of June 30, 1939.

2. A table showing the principal classes of holders of direct and guaranteed securities of the United States, and the estimated amounts of their holdings as of June 30, 1939. It will be noted that the distribution includes a somewhat large "all other" group. We hope to be able to break this group down further in the near future.

More complete details as to the estimated distribution of direct and guaranteed securities as of June 30, 1938 were published in the February 1939 Treasury Bulletin. I am enclosing a copy of pages 22 and 23 which present a chart and table covering these data.

3. A table showing the comparison of Federal outlays for durable improvements and recoverable loans and investments with the net deficit and increase in the gross public debt for the fiscal year 1939.

Very truly yours,

(Signed) H. Morgenthau, Jr.

Secretary of the Treasury.

Honorable Leonidas Currin,
Administrative Assistant to the President,
White House,
Washington, D.C.

Enclosures.

File to Mr. Thompson

12/19/39
December 3, 1939.

Dear Mr. Secretary:

I should appreciate it very much if you would let me have the following information:

(1) The gross and net volume of non-federal tax-exempt securities outstanding on June 30, 1939.

(2) A revision of the estimates for June 30, 1939, presented in the table on page XII of the Budget Message for 1940.

(3) An estimate of the distribution by class or type of holder of the public debt as of June 30, 1939.

Yours sincerely,

[Signature]

Lauchlin Currie
Administrative Assistant to the President.

Honorable Henry Morgenthau, Jr.,
Secretary of the Treasury,
Washington, D.C.
By dear Mr. Currie:

In reply to your letter of December 5, 1939, there are enclosed tables containing the following information:

(1) A table showing the estimated gross and net amounts of non-Federal securities outstanding, interest on which is exempt from the Federal income tax, as of June 30, 1939.

(2) A table showing the principal classes of holders of direct and guaranteed securities of the United States, and the estimated amounts of their holdings as of June 30, 1939. It will be noted that the distribution includes a somewhat large "all other" group. We hope to be able to break this group down further in the near future.

More complete details as to the estimated distribution of direct and guaranteed securities as of June 30, 1938 were published in the February 1939 Treasury Bulletin. I am enclosing a copy of pages 22 and 23 which present a chart and table covering these data.

(3) A table showing the comparison of Federal outlays for durable improvements and recoverable loans and investments with the net deficit and increase in the gross public debt for the fiscal year 1939.

Very truly yours,

(Signed) H. Morgenthau, Jr.

Secretary of the Treasury.

[Redacted]

[Redacted]

[Redacted]

File to Mr. Thompson

DEC 19 1939
Estimated amount of non-Federal securities outstanding, interest on which is exempt from the Federal income tax
June 30, 1939

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(In millions of dollars)</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>State and local governments:</td>
<td></td>
</tr>
<tr>
<td>1. Interest-bearing securities outstanding</td>
<td>19,626</td>
</tr>
<tr>
<td>2. Interest-bearing securities held by:</td>
<td></td>
</tr>
<tr>
<td>(a) U. S. Government, Federal trust funds and agencies</td>
<td>426</td>
</tr>
<tr>
<td>(b) State and local sinking funds</td>
<td>1,530</td>
</tr>
<tr>
<td>(c) State and local trust and investment funds</td>
<td>2,513</td>
</tr>
<tr>
<td>Total</td>
<td>4,469</td>
</tr>
<tr>
<td>3. Net outstanding interest-bearing securities</td>
<td>15,197</td>
</tr>
<tr>
<td>Territories and insular possessions:</td>
<td></td>
</tr>
<tr>
<td>1. Interest-bearing securities outstanding</td>
<td>150</td>
</tr>
<tr>
<td>2. Interest-bearing securities held by:</td>
<td></td>
</tr>
<tr>
<td>(a) Territorial and insular sinking and trust funds</td>
<td>29</td>
</tr>
<tr>
<td>3. Net outstanding interest-bearing securities</td>
<td>121</td>
</tr>
</tbody>
</table>

Treasury Department, Division of Tax Research. December 15, 1939
### Principal Classes of Holders of Direct and Guaranteed Government Obligations and the Estimated Amounts of Their Holdings on June 30, 1939

<table>
<thead>
<tr>
<th>Holders</th>
<th>Direct</th>
<th>Guaranteed obligations</th>
<th>Total direct and guaranteed obligations</th>
</tr>
</thead>
<tbody>
<tr>
<td>National insured commercial banks</td>
<td>11.9</td>
<td>3.1</td>
<td>15.0</td>
</tr>
<tr>
<td>Mutual savings banks</td>
<td>2.7</td>
<td>0.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Other commercial and private banks</td>
<td>0.6</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Subtotal, all commercial and savings banks</strong></td>
<td>15.2</td>
<td>3.6</td>
<td>18.8</td>
</tr>
<tr>
<td>Insurance companies</td>
<td>5.2</td>
<td>0.6</td>
<td>5.8</td>
</tr>
<tr>
<td>Federal reserve banks</td>
<td>2.6</td>
<td>0.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Federal agencies and trust funds</td>
<td>5.6</td>
<td></td>
<td>5.9</td>
</tr>
<tr>
<td>State and local government investment funds</td>
<td>0.3</td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>Other holdings</td>
<td>11.0</td>
<td>0.9</td>
<td><strong>11.9</strong></td>
</tr>
<tr>
<td><strong>Total amount outstanding</strong></td>
<td>39.9</td>
<td>5.4</td>
<td><strong>45.3</strong></td>
</tr>
</tbody>
</table>

---

Treasury Department, Division of Research and Statistics  
December 15, 1939

Comprises holdings of (1) individuals, (2) taxable corporations other than banks and insurance companies, (3) tax-exempt organizations other than mutual savings banks and insurance companies exempt from Federal income taxes, and (4) foreigners.

Includes guaranteed issues held by the Treasury.
Enclosed -
Pages 22 and 23 of Treasury Bulletin of February, 1939.
<table>
<thead>
<tr>
<th>Description</th>
<th>Fiscal Year 1939</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficit, excluding debt retirement</td>
<td>3,941</td>
</tr>
<tr>
<td>Increase in gross public debt</td>
<td>1,298</td>
</tr>
<tr>
<td>Federal outlays for durable improvements and recoverable</td>
<td></td>
</tr>
<tr>
<td>loans and investments</td>
<td></td>
</tr>
<tr>
<td>Direct Federal public works</td>
<td>511</td>
</tr>
<tr>
<td>Recoverable loans and investments /</td>
<td>195</td>
</tr>
<tr>
<td>Public Works</td>
<td>285</td>
</tr>
<tr>
<td>Conservation work through Civilian Conservation Corps</td>
<td>290</td>
</tr>
<tr>
<td>New construction projects of Works Progress Administration</td>
<td>711</td>
</tr>
<tr>
<td>Grants to public bodies for public works (including</td>
<td>172</td>
</tr>
<tr>
<td>administration)</td>
<td></td>
</tr>
<tr>
<td>Total outlays</td>
<td>2,251</td>
</tr>
</tbody>
</table>

1/ This statement has the same basis as the statement appearing on page xi of the Budget Message for 1940.

2/ Reduced by repayments on loans, covered into miscellaneous receipts.
Air Mail

No. 406.

Subject: Effect of Japanese Invasion of Kwangsi on Highway Transportation in South China:

Statement to Press Made by Mr. W. E. Sheehan, American Motor Transport Expert.

Confidential

The Honorable
The Secretary of State,
Washington.

Sir:

I have the honor to enclose for the information and files of the Department the text in English of a statement to the press made on November 25 by Mr. W. E. Sheehan, American motor transport expert, on the effect of the Japanese invasion of Kwangsi on highway transportation in South China. While press of routine has delayed transmission of the text to the Department, the questions it raises are as pertinent now as they were when it was released, and will continue to be as long as the Manning highway is closed to traffic.

In the statement under reference Mr. Sheehan minimized the importance of the loss of the Manning highway; referred to it as a "temporary suspension" of traffic, expressed enthusiasm over the usefulness of the Burma Highway; called the Manning highway "only one of many strands in the meshwork that ensures China her supplies of foreign goods"; stated that the Manning highway had been in a state of ill repair for several months; declared that new roads could be built "with great rapidity"; and announced that a new road — far superior to the Manning highway — would be completed by the end of December, and that at least four other routes were in the process of construction.

Mr. Sheehan, it will be recalled, is in Chungking to advise the Ministry of Communications in the execution of its plan to coordinate transportation throughout China (Embassy's despatch No. 407, December 15, 1939). On November 30, when asked by a member of the Embassy staff whether he could recommend a route for the United States
Navy truck, which has attempted to operate between Haiphong and Chungking during the past six months, Mr. Sheshan said the only route he would consider was the Kunming (Yunnanfu)-Chungking road, which would, of course, mean shipping cargo from Haiphong to Kunming by rail. He said there were various "back roads" west of Kunming, but that they were too close to the area of hostilities to be at all safe. Three tracks, he added, had been demolished by aerial bombs on these roads in the course of the two or three preceding days.

The Embassy understands that the chief reason for Mr. Sheshan's allowing himself to be quoted as expressing an optimism which he obviously did not - and does not - feel, was a desire to stimulate the Chinese authorities with whom he is working to greater and more effective activity. He seems to have felt that if he stated publicly that conditions were favorable, the Chinese authorities might feel obliged to demonstrate to interested observers in China - and to the United States Treasury Department - that they were capable of accomplishing the tasks for which he had given them credit. It remains to be seen whether Mr. Sheshan's strategem will have the desired effect.

The new road which Mr. Sheshan said would be open by the end of December is, as the Department is probably aware, the Caochang-Hochih road which, according to Mr. F. W. Teou, quoted in the Embassy's despatch No. 405 of December 13, 1939, is not expected to accommodate trucks with payloads of more than one ton when it is first opened. In this connection it will be recalled that in his despatch to the Department No. 26 of December 13, 1939, Consul Reed at Hanoi stated that the volume of traffic which could be handled on the Caochang-Hochih road if and when it is completed would be insignificant compared with the volume formerly transported over the Kunming highway.

So far as the Burma highway is concerned, a member of the Embassy staff was informed by an official of the Ministry of Communications, on November 10, who had just returned from an inspection trip on the Burma highway in company with Mr. Sheshan, that he believed the Kunming highway was preferable to the Burma route because of the greater cost involved in use of the latter. It is, furthermore, difficult to believe that increased traffic on the Burma highway could make up for the complete stoppage of traffic on the Kunming route.
That the seriousness of the situation is recognized by General Chiang Kai-shek is indicated by the apparent magnitude of the counter-offensive he has ordered in the Haining area. Until such time as the Haining road may revert to Chinese control, however, there is reason to believe that the problem of importing essential supplies into China will remain as critical as it has been at any previous time since the beginning of the current hostilities.

Respectfully yours,

For the Ambassador:

WILLYS B. FERR
Counselor of Embassy

Enclosure:
1/ Text of statement to press made by Mr. H. E. Sheahan.

Original to Department by air mail
Four copies to Department by pouch
Copy to Embassy, Peiping by pouch
Copy to Consulate General, Shanghai by pouch
Copy to Consulate, Yunnanfu, by air mail
Copy to Consulate, Hankow, by air mail
Copy to Consulate, Rangoon, by air mail
The temporary suspension of the flow of supplies over the Manning highway occasioned by military operations in that vicinity is of distinctly minor importance, stated Mr. Maurice E. Sheahan, American highway authority, in an interview accorded our correspondent today. With the close of the rainy season, an unlimited amount of goods may be brought into China over other and more thoroughly conditioned highways.

Throughout the rainy season, despite the heaviest fall of rains ever recorded in South China, rains in which even the Burma railway was temporarily forced to suspend operations, the Yunnan-Burma highway was open and in use. Mr. Sheahan, who has just returned from a tour of inspection in the southwest, stated that he had observed as many as forty or fifty landslides in a space of twelve kilometers along the new highway, but none had been allowed to impede the smooth flow of traffic pouring into China from the south.

The Manning highway, he went on, is only one of many strands in the meshwork that ensures China her supplies of foreign goods. The highway has been in a state of ill repair for several months, and since the spread of war to its neighborhood it has fallen into a state of complete disuse. The Chinese in Kunming have within the past few days allowed the highway to be flooded and let the roadbed revert to the original paddy fields that preceded its construction, thus rendering it useless for enemy operations.

One of the most amazing features of the south China countryside, continued, Mr. Sheahan, is the multitude of back roads and country routes that may be linked up to ship goods in any direction required. These traditional back country roads in the Kunming area may be linked up in a few weeks to provide any imaginable detour. These roads consist of stone-paved paths over which animal traffic has coursed for centuries. It is only necessary to lift the stones out of their bedding, place them on the side of the old roadbed as hard shoulders and fill in the space with gravel to have roads that are fit for motor traffic. The existence of such back-ways and
paths have enabled some of China's new roads in the south-
est to be built with great rapidity.

The back-roads and byways constitute only a reserve
insurance for the flow of supplies through Manchuria, for,
in addition to them, the close of the month of December
will see the completion of a completely new motor road.
This road, long-planned and almost completed as a substitute
for the old highway, will shorten the distance between
China's southern border and Hanchow, in north Kiangsu,
by a couple of hundred kilometers. The new road is
much smoother, has far fewer curves, and is distinguished
by its excellent profile engineering. At least four
other routes, said Mr. Sheahan, are in the process of
construction.

Throughout southwest China the work of the Ministry
of Communications is progressing rapidly. Under the
leadership of Minister Chang K'iu-ssou, change after change
is being made in the gradual drive for efficiency and
speed in China's transport. Within the past few months
preparations have been made and approved for centralizing
the supply of spare parts to fourteen hitherto independent
government transport agencies. Amazing success has been
achieved in experimental operation of duck-bottoned
Chinese junks powered with American outboard motors. By
dividing the highways into sections, so that individual
drivers will traverse only sectors instead of entire trips,
it is expected that day and night operations may be begun
over China's southern arterial highways.

The Ministry of Communications, assisted by three
American highway experts, Nesrur M. E. Sheahan, A. B.
Basd, and C. W. Van Patter of the Kesshin Freight Lines,
Inc. of Chicago, has been taking full advantage of the
stability within China's principal highways, to
reorganize the various regional management into one
centralized, more economic and efficient transportation
agency. A new era of highway service is dawning for the
lasting benefit of China.
December 14, 1939

My dear Mr. President:

At our luncheon conference on December 12th you requested a statement showing what might be done to make funds available to finance a deficit over the next eighteen months of as much as $4,000,000,000 without increasing the public debt. You indicated that you might even want to show in the forthcoming budget a smaller public debt at the end of this period than now exists, in which case it would, of course, be necessary to obtain funds in excess of the $4,000,000,000 by means other than direct borrowing or taxation.

One obvious course of action open to us is the possibility of decreasing the working balance in the General Fund. I now estimate that the working balance on January 1, 1940, will amount to about $2,750,000,000. It would be possible, I think, if no new unfavorable developments occur, to reduce this balance to $750,000,000, by the end of the fiscal year 1941, in which case about $1,000,000,000 would be made available for current expenditure. Whether it would be wise, however, to commit ourselves in advance to so large a reduction in, I think, a matter for very careful consideration.

The Treasury has carried, as a matter of policy, a substantial working balance and it has also refrained from utilizing to the full the short-term borrowing possibilities available through Treasury bills. This has assured the immediate availability of sufficient
funds to meet whatever emergency might arise. The Treasury has
then been in a position to relieve the money market of major finan-
cial operations during critical situations, such as, for instance,
the one which occurred last September. I believe that there are
definite advantages in this policy, not only with respect to the
Government security market, but also because of the recent volume
of desired obligations are outstanding, such as United States Savings
Bonds, Federal Savings deposits, Unemployment Trust Fund, and assis-
tance of the many credit agencies of the Government.

The proceeds of the sale of obligations of credit agencies
of the Government constitute another possible source of funds.
During the calendar year 1939 we have sold guaranteed securities in
the amount of about $700,000,000, the proceeds of which have been
used to repay advances previously made by the Treasury. Thus the
amount to be obtained from repayment of advances has now been reduced
to approximately $300,000,000.

The credit agencies of the Government, which already have on
deposit in the Treasury working balances to the extent of approximately
$600,000,000, might conceivably use their borrowing power to obtain
additional funds from the market, in excess of their own actual needs.
These funds could then be deposited in the Treasury where they could
be available to meet current Government expenditures. However, adoption
of such a course might subject the Administration to sharp criticisms
on the ground that it constituted an evasion of the congressional intent
with respect both to the activities of those agencies and to the
limitation on the public debt.

The amount under the first two items would provide not more than $1,800,000,000, which is far short of the $4,000,000,000 desired. To obtain this sum it would, therefore, be necessary to employ additional resources which conflict with previous commitments to Congress and involve basic questions of currency and monetary policy. Resources which are legally possible include:

1. Use of Stabilization Fund Gold. To have the authority to transfer to the Treasury the $1,800,000,000 of gold now held for the account of the Stabilization Fund. If exercised this would provide $1,800,000,000 for the Treasury working balance to meet prospective expenditures. It would, on the other hand, leave the Fund with only a bank credit against which it could draw at any time. If the current operations of the Fund should require more than the present $300,000,000 working balance, it would be necessary for it to draw against this bank credit, and the Treasury in that event would have to find the money to meet such withdrawal.

It was certainly not contemplated at the time when the powers in the Gold Reserve Act with respect to the Stabilization Fund were extended that its gold assets would be used to meet current expenditures. As Secretary of the Treasury, I have repeatedly advised the Congress that $1,800,000,000 of this Fund is still held in the form of gold and that there is no intention of using that gold for any purpose.
other than to meet Stabilization Fund requirements. Only when these requirements no longer exist would it be appropriate to allocate the assets for the retirement of the public debt, and even then the proper timing of this use of the Fund would involve fundamental questions of monetary and currency policy.

II. Use Silver Balances for Issuance of Silver Certificates. We have authority to issue silver certificates up to the monetary value ($1.29 an ounce) of the free silver now in the Treasury. If exercised, this would increase the amount of funds available to meet expenditures by about $1,500,000,000. When the Silver Purchase Act was approved, we decided to issue silver certificates only up to the cost of the silver, and to set aside any seigniorage in a special fund, and not to treat it as an ordinary Government receipt. This was a decision not to use a monetary device for the purpose of increasing the amount of public debt borrowing. I still believe that decision was wise.

III. Use the Balance of the Increment Resulting from the Abandonment in the Height of the Gold Bailly. This balance, in the amount of approximately $342,000,000, could be transferred to the working balance. This increment balance was appropriated or authorized to be used for specific purposes, namely, loans to industry through the Federal Reserve Banks and payment to the Philippines in connection
with the reduction in the weight of the gold dollar. As in the case of the use of the Stabilization Fund gold and the silver coinage, the transfer of this increment to the working balance would raise a question of monetary policy. The sum involved, however, is not large and its transfer would have little practical importance.

IV. Other Locally Possible Measures. There are other executive powers which, if invoked, would make funds available in addition to those enumerated above; namely, further devaluation of the gold dollar, which, on the basis of present holdings, would provide about $3,100,000,000 if it were reduced in weight to the full statutory limit; equal devaluation of the silver dollar, which would provide about $3,500,000,000; and the use of Treasury currency, insurable, however, only under certain important restrictions, which would provide $3,000,000,000. I am not discussing these measures in detail for the reason that I do not think you have their use in mind.

There are two important phases of this whole problem upon which I should like to make further comment:

1. The budget and debt aspect, and

2. The general monetary and financial aspect.

We are faced with a substantial deficit for the fiscal year ending June 30, 1941, as well as for the current fiscal year. For the past ten years the Government has financed its deficits by selling public debt obligations based on the public credit. The fact that the
Treasury has been able to sell those obligations in the aggregate amount of approximately $25,000,000,000 during this period, and at the same time to reduce the average rate on the interest-bearing debt from 3.57% to 2.99% indicates to me that resources to borrowing in the market in the past year is still open to us without undue strain on the money market or unreasonable interest costs to the Treasury.

Now as to the monetary and financial aspects. The use of the Stabilization Fund gold, the silver seigniorage, the gold inconvertible balance, and the reduction of that part of the Treasury working balance not kept in commercial banks, would increase bank reserves by about $4,000,000,000. I do not believe that it would be advisable at this time to make recommendations to Congress which, if adopted, would commit this country to a policy of adding during the next eighteen months approximately $4,000,000,000 to the reserves of the banking system. The money markets of the country are more liquid today than ever before. Interest rates are at the lowest levels in the history of this country. The volume of individual deposits, of currency in circulation, and of excess reserves of member banks are all at or close to record levels. It is clear, therefore, that some of the monetary conditions that might furnish an appropriate occasion to increase bank reserves through means such as previously discussed is present at the moment. Our present monetary position already makes the effective use of credit controls
sufficiently difficult. Additions to banking reserves by such Treasury operations will add to the difficulty.

That changes in conditions may occur within the next eighteen
months no one knows. It is important, therefore, to retain freedom
of action in the monetary field. Continued use to execute the
monetary measures announced above would restrict such freedom of
action and might have other grave consequences.

To sum up: I think it would be inconsistent with wise
fiscal and monetary policy for you to announce in your budget
message for the fiscal year 1942 that you propose to use the methods
indicated above to prevent an increase in the public debt, much less
that you propose time to accomplish over the fiscal year 1941 an
actual reduction of the residual amount of the debt.

A reduction in the General Fund balance in an amount not to
exceed one billion dollars between January, 1940 and June, 1941,
will probably be entirely feasible, but I think that an announcement
that this is to be done should be qualified to admit another decision
if developments demand it.

I do not believe additional silver certificates should be
issued (beyond the cost of the silver acquired) for merely budgetary
reasons, but that any enlarged issue of this form of currency should
have a strictly monetary justification.

The gold reserved for the Stabilization Fund is a cash
resource that can be and should be ultimately used to reduce the
public debt, but both the commitments we have made to Congress and monetary considerations argue against its use at this time for the purpose of avoiding public debt borrowing. The same considerations apply to the remainder of the gold increment in the General Fund.

My recommendation therefore is that in that part of your budget message which deals with the means of financing the contemplated deficit for the fiscal year 1941 you indicate that the greater part of the deficit should be financed by an increase in the public debt.

It may be conceivable that conditions might arise in the next year and a half which would justify the use of any or all of the resources listed above, but to announce in advance that they are to be used whether or not the justifying conditions are present would seem to me to be a grave mistake, because it would hamper your freedom of action and might raise apprehensions with respect to our fiscal policy which would seriously damage the public credit and faith in the vision of the acts of this Administration.

Faithfully yours,

(Signed) E. Morgenthau, Jr.

The President,
The White House.
AMERICAN CONSULATE GENERAL

American Foreign Service, Hanoi, Indochina,
December 19, 1939.

Subject: Transshipment of Cargo from Haiphong to Rangoon.

The Honorable
The Secretary of State,
Washington.

Sir:

I have the honor to refer to my despatch no. 23 of December 4, 1939, in which mention was made that, as a result of the closing of the Dong Dang-Nanning road and in consequence of the far from bright future for the Caobang road, certain steps were being taken to transship cargo now at Haiphong to Rangoon. As confirming this mention, I have to report that I am reliably informed that the Chinese are endeavoring to charter a number of ships for this purpose.

A concrete case may be of interest to the Department. The SS. SIKIMA CITY arrived in Haiphong on December 16th with petroleum products and 60 trucks for China. The ship's agent has informed me that even before the ship arrived in Haiphong negotiations were started to arrange the transshipment of the trucks to Rangoon. Other organizations, such as the Foo Shing Trading Company, are actively negotiating for transshipment of much of their cargo now at Haiphong.

Despite the public optimism of the Chinese, who claim that the Japanese victory in Kiangsi is but a temporary success and that transportation by road will be restored in the not too distant future, these active
negotiations for transshipment from Haiphong to Hagoon are indicative of the actual feeling which prevails as regards Hagoon - that a Chinese counter-offensive may be successful but not to the extent of restoring road transportation within a reasonable period.

Respectfully yours,

For the Consul at Saigon,

CHARLES S. HERD II,
American Consul.

Original and 2 copies to the Department
Copies to Embassy, Chungking and Peking
Copies to Consulates, Nanning and Saigon
Copy to Consulate General, Hanghai

E35.4
CS /Sec
MEMORANDUM

To: Secretary Margenhem

From: Mr. Lockhard

TIN

Chinese annual production 13,000 Tons
Less domestic consumption 3,000 Tons
Balance 10,000 Tons

(At approximately $1,000 a ton = $10,000,000)

TUNGSTEN

Chinese annual production 10,000 Tons
Tungsten Ore
(This is latest estimate
based on present transportation facilities and might be increased to 12,000 tons
under favorable conditions)

Less pledged to Russia 5,500 Tons
Less pledged to Great Britain 500 Tons
Less sales to France 1,000 Tons
Balance 3,000 Tons

(At approximately $1,000 a ton = $3,000,000)

Note: Tungsten is controlled by the National Resource Committee of China and the latest information available is that they have a total of 7,000 tons of Antimony at the Port of Hsiangh, French Indo-China. The French Government has requisitioned this material but promises to pay the Chinese Government its value. No figures are available as to the proportion of Tungsten and Antimony making up this 7,000 tons.
Largely-American had been the personal idea that the French Government preferred to still the secret gold holdings as it is Stabilisation Fund before resorting to the actual reserves of the Bank of France, which are still substantial. It is the real thing to be decided if the Secretary of the Treasury's plan before arriving in Paris to report to his own government. Largely-American stated that he had just received a message from his people in Paris that the French had not yet issued any specific plans, and that the Secretary of the Treasury and his aides were not aware of any such plans and that they did not have the benefit of a full understanding of the French policy. I asked that he would meet the Secretary's aides because of the French policy, I asked that he would meet the Secretary's aides. I suggested that those factors might be considered in any皖tions to ascertain the Secretary's position from his visit to Paris. I suggested that the Secretary's aides, in their effect on the dollar requirements of the Government, to come to the Treasury and in its position from the Secretary's aides, in their effect on the dollar requirements of the Government, to come to the Treasury.
French financial resources are being drawn upon.

The gold which has been sold us since the franc weakened in August and since the war purchases assumed big proportions has come exclusively from the Stabilization Fund. I believe this fund amounted to about 20,000,000,000 francs at the outbreak of war, or the equivalent of some $450,000,000 at the present rate of exchange. Two recent shipments of gold from France to the United States via Canada would account for $225,000,000, or one-half of the fund's capital.
The Secretary of State presents his compliments to the Honorable the Secretary of the Treasury and encloses a copy of a paraphrase of telegram no. 155 of December 6, 1939 from the American Legation at Tehran with reference to a loan which the Iranian Government would like to obtain in the United States.

Enclosure:

From Tehran, no. 155, December 6, 1939.
PARAPHRASE OF TELEGRAM RECEIVED

FROM: American Legation, Tehran, Iran

NO.: 155

DATE: December 6, 1939, 3 p.m.

CONFIDENTIAL

It is now stated by the Ministry of Finance that the Government of Iran would like to obtain in the United States a loan of $40,000,000 or $50,000,000. He requests that the Department assist him in this regard. The loan would be guaranteed by oil royalties and Majlis would make the authorization. Amortization within ten years would be arranged. Approximately one half of the amount borrowed would be spent in the United States for airplanes and military supplies, rails, locomotives and other rolling stock.

ENGERT
December 19, 1939

Present:

Minister from Finland, Mr. Procope.

Minister: I thought a few facts would be of interest to you to know, as you promised, as you said you would take up the matter about the loan with the President.

I went last week, Saturday, to New York to discuss the question about the Relief Fund. I met Mr. Hoover first, for the first time now since the War broke out. At the same time I met a lot of other people who are not directly in favor of the Relief Fund collecting money, because they think we ought to -- the money ought to be collected for help, direct help in arms, call for armaments. He said -- we discussed -- I asked Mr. Hoover if he thought part of the money he gets could be diverted for that purposes. However, we agreed that it is impossible to finance a war in that way, but he expressed his most positive sympathy for every thought of a loan from this country. I did not mention the fact I discussed that with you. And he used this -- I told him -- he said that he, in order to make, to finance the war, we need a loan, yes, I said, but the loan is impossible to get for the time being in Wall Street. "Yes, I understand that. It is not possible to get that through private collections." That I knew and I have even stopped people who liked to collect money for that purpose, because I don't think it is much use. Then he said the following: this collecting of money, credits in the country is so strong that it will make it possible for you to get a loan.

And then I had a meeting with one of my friends, whose name I can't disclose. He says that he had had occasion to contact -- one of the Republican leaders up on the Hill -- Mr. Bloom and this gentlemen said that this Administration, in order to back up Finland, will not be criticized by him or McNary nor Borah, which astonished me.

HMJr: That's encouraging.
Minister: I like to tell you this.

HM, Jr.: That's encouraging.

Minister: Someone told me that you were the man who is sitting upon all the arms in this country! I never bothered you about that.

HM, Jr.: No. Whoever told you must be wrong.

Minister: It was a man down in New York. "If you like to have arms in this country you had better come to the Secretary of the Treasury."

HM, Jr.: He must be dreaming.

Minister: Because that is the other hope I have....

HM, Jr.: No; he must be dreaming.

Minister: .... to get some arms out.

HM, Jr.: No. He must be dreaming. No. The State Department directs you to wherever you should go to talk about armaments.

Minister: Yes. I have been already. I have seen the War Department and I have seen the Navy.

You have not had opportunity to see the President yet?

HM, Jr.: No. No. I hope to see him today. I have not heard.

Minister: I hope you can help us.

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Special Treatment for U.S. Detectives
Talk to Mr. Reynolds
The Fugit = The Budget

Spoke to Frank Murphy about Mme. Case.
Says Clarke is working Manner to the letter.

Gave Pres. Miss Moline
An memo on wheat.
List of Securities

Phil Young
Roddenmacher

Peter Heind - artist

Walter Fronken
Chicago

To J. F. M. Quine

Ed Mote - possibly business report
TO

Secretary Morgenthau

FROM

Miss Michener

Subject: Amount of wheat owned by Federal Government and available for sale.

Wheat owned by the Commodity Credit Corporation as of December 7, the latest date available, totaled 1,832,199 bushels. The figure had been reduced during the first seven days of December by about 500,000 bushels, through sales to the Federal Surplus Commodities Corporation, and has probably been further reduced since December 7.

The FSCC, as of December 16, owned 4,194,170 bushels of wheat acquired from the CCC, under contract permitting the wheat to be sold only for export, or to be distributed for relief purposes in the form of flour.

In addition, the following wheat is under control of the Government, but not available for sale:

For use in paying indemnities under the crop insurance program, the Government on December 16 held 11,694,090 bushels of wheat in storage, to which may be added 97,861 bushels of unfilled purchases creditable to the wheat insurance stock.

Wheat owned by growers but pledged against the Government 1939 wheat loan with the CCC and with banks, as of December 9, totaled 162,964,951 bushels.

A small amount may still be outstanding on past due notes under the 1938 wheat loan, but this loan has been practically all liquidated through sale by growers to the CCC, and transfer of title to the FSCC.
December 19, 1939.

My dear Mr. Vellozzi:

You will remember that yesterday you telephoned my office in order to expedite the handling of the papers connected with the Cuban Trade Agreement. I was glad to comply with your request and to have those papers expedited in handling. I signed them yesterday afternoon and hope that they reached you promptly.

It has happened once or twice before that there has been a similar request to expedite matters of importance. On tracing the papers connected with the Cuban Trade Agreement, I found that they had only arrived in the Treasury yesterday morning, and it was impossible, therefore, for me to study or even read them carefully before I signed them. It was also impossible for anyone else in the Treasury to study or to discuss the contents with me.

May I ask that in the future, whenever it is possible to do so, you allow us to have a week or ten days for the handling of such matters? It would be much appreciated if you could comply with this request.

Sincerely,

(Signed) H. Marquand, Jr.

By Messenger

December 20, 1939, 9:45 a.m.

Re: forwarding to addressee from office of the Secretary

Honorable Samuel Vellaos,
United Secretary of State,
Washington, D.C.
December 19, 1936.

By dear Mr. Welles:

You will remember that yesterday you telephoned my office in order to expedite the handling of the papers connected with the Cuban Trade Agreement. I was glad to comply with your request and to have these papers expedited in handling. I signed them yesterday afternoon and hope that they reached you promptly.

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May I ask that in the future, whenever it is possible to do so, you allow us to have a week or ten days for the handling of such matters? It would be much appreciated if you could comply with this request.

Sincerely,

(Signed) H. Morgenthau, Jr.

[Shorthand note: Original forwarded to addressee from office of the Secretary]

Honorable Sumner Welles,
Under Secretary of State,
Washington, D. C.
The question has arisen as to the circumstances under which the President would be required to make specific recommendations in the Budget to Congress with reference to increasing the limitations on the public debt or for providing other new sources of revenue.

The relevant parts of the provisions of the Budget and Accounting Act, 1921, are, as they appear in the Code:

U.S.C. title 31, sec. 13. "(a) If the estimated receipts for the ensuing fiscal year contained in the Budget, on the basis of laws existing at the time the Budget is transmitted, plus the estimated amounts in the Treasury at the close of the fiscal year in progress, available for expenditure in the ensuing fiscal year are less than the estimated expenditures for the ensuing fiscal year contained in the Budget, the President in the Budget shall make recommendations to Congress for new taxes, loans, or other appropriate action to meet the estimated deficiency. ** **"

U.S.C. title 31, sec. 14. Whenever such supplemental or deficiency estimates reach an aggregate which, if they had been contained in the Budget, would have required the President to make a recommendation under subdivision (a) of section 13 of this title, he shall thereupon make such recommendation."

The foregoing sections require the President to make recommendations to Congress for "new taxes, loans, or other appropriate action" only when there is an "estimated deficiency." There
is no "estimated deficiency", within the meaning of those sections, unless estimated receipts from all available sources, including amounts which can be borrowed within existing debt limitations and other amounts in the Treasury available for expenditure are less than the total estimated expenditures for the ensuing fiscal year. In other words, so long as the Budget can be balanced by borrowing within existing limitations or by using other available funds, such as the Treasury working balance, the President would not be required to submit any recommendations with reference to increasing the public debt limitations or for providing other new sources of revenue.

f.m. ff.
"In pursuit of the objective of attaining a higher national income we make the following recommendations with respect to fiscal policy for the next fiscal year:

"1. If taxes are to be increased, those selected should be such as interfere least with additions to the aggregate income of the American people. These taxes, among others, are: estate taxes, gift taxes, lowering tax exemptions as personal income rises, higher income tax on middle brackets.

"2. We advise against new taxes which operate to reduce substantially consumer purchasing power. These taxes, among others, are: processing taxes, sales taxes, taxes on payrolls, excise taxes."
"A year ago I recommended an increase in work relief, public works, and other related expenditures to check the downward spiral of business. The program undertaken at that time has contributed materially, I believe, to the existing upward movement of business and employment; and I feel that the business men and farmers and workers of the country, no less than the unemployed, are entitled to an assurance that this program will not be curtailed arbitrarily or violently.

"The actual cost of work relief and similar expenditures goes down after jobs are found by the workers on these rolls. A violent contraction, before the natural expansion of private industry is ready to take up the slack, would mean, not only human misery, but a disruptive withdrawal from American industry of a volume of purchasing power which business needs at this time. The necessity of increasing Federal expenditures a year ago to check a recession is a well-known fact. Any decision to decrease those expenditures now that recovery has just started would constitute a new policy which ought not to be adopted without full understanding of what may be the result."

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"I believe I am expressing the thought of the most far-sighted students of our economic system in saying that it would be unwise either to curtail expenditures sharply or to impose drastic new taxes at this stage of recovery. But in view of the addition to our public expenditures involved in the proposed enlarged national defense program and the program for agricultural parity payments, for which no revenue provision has yet been made, I think we might safely consider moderate tax increases which would approximately meet the increased expenditures on these accounts. It should be added, however, that it is my firm conviction that such new taxes as may be imposed should be most carefully selected from the standpoint of avoiding repressive effects upon purchasing power.

"Sound progress toward a budget that is formally balanced is not to be made by heavily slashing expenditures or drastically increasing taxes. On the contrary, it is to be sought by employing every effective device we may have at our command for promoting a steady recovery, which means steady progress toward the goal of full utilization of our resources. We can contribute very materially toward that end by a wise tax program."
"I am recommending the reenactment of the excise taxes which will expire in June and July of this year, not because I regard them as ideal components of our tax structure, but because their collection has been perfected, our economy is adjusted to them, and we cannot afford at this time to sacrifice the revenue they represent. If the Congress should at this session adopt new taxes more scientifically planned to care for the defense and agricultural programs, it is quite possible that the existence of these new taxes will enable us in a later year to give consideration to abolishing some of the present excise levies."
As to the question of taxes, I believe that our tax system, local and national, is as much of a crazy quilt as our banking system. Both reflect a planless, piecemeal growth by various authorities over a long period of years, with little or no regard for the economic and social affects. Both urgently need a complete overhauling directed toward simplification, coordination and avoidance of duplication. Both require that we agree upon objectives to be pursued by public authorities in the light of changing economic conditions.

As to tax deterrents, I, too, should like to remove those taxes that are discouraging new investment. On several occasions I have expressed my view that corporation taxes should be simplified; that greater latitude should be allowed businesses in carrying forward losses and that capital losses should be deductible from business operating earnings; that we should permit consolidated returns for corporations; that we should abolish tax-exempt securities; that our estate tax system should be improved by reducing exemptions and opportunities for avoidance; that the rates in the middle income brackets should be increased—that is, on incomes of from three to fifty thousand dollars a year; and that the base of the income tax should also be broadened by reducing exemptions.

However, in my judgment, the most important tax deterrents on business activity are those taxes which bear directly on consumption. And therefore, the most important tax reform would be to reduce consumption

Regraded Unclassified
taxes, which are, including Federal and State, about $1 billion more than in 1929. This would increase the purchasing power of consumers and stimulate the markets for business and industry. Such a reduction in taxes should be made up—since I think no one will argue that we should reduce revenue—by taxes that will fall in large part on those individuals and corporations whose incomes tend to increase the already large volume of idle funds.

It is beyond dispute, I think, that consumption taxes fall too heavily on the great masses of our people. A recent round table group, gathered together by Fortune magazine, all agreed that the present tax system bears too heavily on the lower income groups because of excise and sales taxes. Various studies that have been made by the Brookings Institution, the National Resources Committee, and other groups, all indicate that the great majority of our people at the bottom of the income scale would consume far more if they had the purchasing power. It is not among these people that idle funds accumulate, but in the numerically smaller groups, less than 10 per cent of the population, whose income taxes are low relative to the British scale and that prevailing in most other countries.

The tax revisions I have outlined would tend to stimulate consumer buying power, and thus require production of more goods which, in turn, would mean greater employment, and as the capacity of existing plant was reached, would open the way for using otherwise idle funds for investment in new productive facilities. To my mind, this is the sort of tax program we need at this time. It would be both economically sound and socially equitable.
There has recently been brought to my attention a compilation of the balance sheets of 153 companies. The cash holdings of the group increased from the middle of 1937 to the end of 1938 by $174 millions, or by 56 per cent. This was money withdrawn from the income stream—money paid in by consumers but not passed back to them in wages, dividends or lower prices. I am not for a moment questioning the right of corporate executives to increase or decrease their cash holdings at will, but we must recognize that when great sums are withdrawn in this or other ways from the income stream it inevitably means a slowing down unless it is offset through outlays by other businesses or by having the Government take up the slack.

A reasoned appraisal of our economic situation compels me to warn against the illusion that the reduction of taxes that fall on us as business men would solve our fundamental problem of idle men and idle money. On the contrary, the requirements of a sounder and more stable economy will, in my opinion, call on us in our own interest to provide relatively more rather than less of the total tax revenue as a means of maintaining and increasing consumption and thus of preserving existing investment and paving the way for new investment by providing a profitable outlet.

What we, as business men, should be interested in is what we have left over after our taxes are paid. We are far better off with high taxes and high incomes than with low taxes and low incomes. For example,
national income increased from less than $40 billions in 1932 to approximately $90 billions in 1937. Tax receipts of the Federal Government increased from about $4 billions for the fiscal year ending June 30, 1932, to about $6 billions for the fiscal year ending June 30, 1938. The country paid about $4 billions more in taxes but it had $50 billions more of income a year out of which to make these payments. I leave it to you to decide which level of income and taxes you would prefer.

***************

With the slower tempo of our national growth, and being now a creditor and not a debtor nation in need of capital, we must devise means to enlarge the domestic market for our products. To do this we need a better balanced distribution of our national income, which in turn involves the steady channeling of additional funds into the hands of those at the lower end of our income scale.

I have already indicated in an earlier part of my talk the kind of revision in our tax system that would seem to me to be necessary in order to increase the funds in the hands of consumers and to diminish the problem of finding investment outlets for accumulating funds. In some countries, as in England, this has been done, and the flow of income there is maintained with a smaller volume of investment, because a larger proportion of the income has been diverted to consumers through much higher income taxes on the groups with incomes from $2,000 to $50,000, and through adequate old-age pensions, unemployment insurance and other social services.

Perhaps the most important single step that can be taken now to increase the purchasing power of consumers and thus to diminish the need
for investment outlets is to revamp our present old-age insurance program. Under this plan by the end of this year it is estimated that there will have been collected from payroll taxes $1.7 billions, this burden falling almost entirely on consumers, whereas, practically nothing has been paid out in benefits. It is so constructed as to collect taxes from young men now with a view to taking care of them when they become old. This system needs to be so revised as to provide a reasonable pension to old people immediately, regardless of whether or not they have contributed to the fund. This would not only meet a great social need and popular demand, but would also be a sound economic measure at this stage in our economic life.

The present plan is operating as a gigantic saving device at a time when there is a surfeit of saving; it is decreasing consumption when we have inadequate consumer buying power. It would be appropriate to a capital-poor country where a curtailment of consumption was necessary in order to divert more resources into the making of plant and equipment. It has no possible economic justification, however, in our capital-rich, consumption-poor economy.

Payroll taxes in England amount only to 60 per cent of old-age pensions, the remainder being financed out of general revenues. Through the stimulation of consumption, England has been able to sustain a higher level of activity with less capital expenditures than formerly.
Bill Douglas told me at lunch yesterday that when he was out in Oregon last summer, the universal opinion of the people he talked to was that they would like to see increased taxes in order to help balance the Budget. That they are worried as to how all of these expenditures are going to be paid for, and, therefore, they would like to feel that they are paying for it now. He said that he wanted to talk to the President about this, but before doing so he wished to consult with me.

I told him that I would be glad to defend publicly raising an additional $1 billion taxes in order to pay for the extraordinary part of our rearmament program.

He said knowing that I was in sympathy with what he had to say, he was going to recommend it to the President.
December 19, 1939.
4:15 p.m.

Present:
Mr. Gaston
Mr. Hanes
Mr. Klough
Mr. Hefelfinger
Mrs. Klotz

E.M. Jr: The President wanted us to see if we could refinance the Panama Canal, call in all their outstanding bonds and get out a new set of bonds and help pay for the new locks. They are going to cost 25 million dollars. Did you work with Bell on the budget?

Hefle'rt: Some, yes.

E.M. Jr: Would you have the thing going so that he could talk to me about it tomorrow?

Hefle'rt: I don't think we could call in the outstanding bonds. They are not callable yet. I don't believe there is any authority to issue new bonds.

E.M. Jr: The Secretary of War said it three times now. I would like to either look it up or kill it. How about the new locks, 25 million dollars? The whole lock system is going to cost 273 million dollars. Would you mind doing it?

Hefle'rt: I will look into it and have it for you in the morning, yes sir.

(Mr. Hefelfinger left the conference)

E.M. Jr: Are you all set?

Hanes: Yes, sir.

E.M. Jr: Cancel your appointment?

Hanes: I was just trying to get this crowd together to dinner with me tonight, but I guess I am glad I didn't invite them.

E.M. Jr: I realize that what I am going to say isn't going to make sense, but at least it is an intelligent a report I can give of what took place at the President's today, see. At lunch
the President said to me, "Have you got a tax message ready for me," and I said, "No, you didn't ask for any tax message." "Well, haven't you got it? You have been working on it for three months." I said, "No, we haven't got a tax message." He said, "Well, how am I going to tell Congress how to raise the taxes?" I said, "Well, you never had any message that I know of." Is that right, Herbert? You worked on all of these.

Gaston:

Not quite right. In 1936, the President said that we needed so much additional revenue to replace the lost processing taxes and certain other lost revenue and specified how he thought the revenue ought to be raised.

H.M. Jr:

I knew you would remember.

Now, I said, "If you want us to do something, we can prepare a statement for you indicating along what lines, but I don't think you ought to tell Congress what kind of taxes - I think that is their job." So he said, "All right, now..."

Now, this is partly him and partly me. He said, "Give me a message..." I mean, this is partly - this is what came out of it. You have been to those things and Gaston has, with the President, and when he starts with something you don't know whether he is trying to feel your pulse or your teeth or something to tell you it is pretty hard, but this is what came out of it. "Give me a message indicating to Congress that I want them to raise 'X' hundreds of millions of dollars in addition, and I want it to come from that group of that can afford to pay it the most and it will fall on the group the least..."

Gaston:

That can least afford to pay it.

H.M. Jr:

That can least afford to pay it. In other words, he didn't use the word "sales tax" but that is what he had in mind. Then he said, "I want to tell Congress that - the last two or three years in my message, each year I have asked them in either this message or a substitute for a definite amount to pay for the parity payments,"
and he said, "I think Congress owes me four or five hundred million dollars."

That is about what it was, 441 million or something like that.

As I say, this is an awfully hard job, Johnny, because he was talking fast and then what he told - I have got to skip a minute - what he told the Cabinet - he made them a little speech in which he said, leaving out the budget, which is roughly 500 million dollars, he said, "I am within two or three hundred million dollars of balancing the budget with a normal deficit." Then he laughed. He said, "I want to start the figure, one billion nine," and so forth and so forth. What he has got in mind is, with the "B" budget, his deficit right now amounts to two billion eight, you see, so he is trying to finagle me to raise my estimates, which I can't. He is trying to get a couple of hundred million dollars out of Wallace to sell some cotton, which is possible, of the Cotton Commodity Credit. I don't know whether that goes back to the money we borrowed or whether that goes back to those fellows. What he needs, you see, he needs 800 million dollars. Now, what I think, Johnny - I say, you can cross-examine me when I get through and ask me what the hell I am talking about and I will try to tell you.

He wants to indicate to Congress that they owe him four or five hundred million dollars, because he has asked for it repeatedly to make up parity payments. I don't know whether that statement is correct. I think that is one - let's put it - that is in one pocket, one statement he wants to make.

Then I think on another piece of paper we ought to have another statement which would be a message saying to Congress that in order to finance this "B" budget - whatever it is, four hundred or five hundred million dollars, but it has had nothing to do with back payments - "I believe that Congress should study," and so forth and so on, "the best ways that they should raise it," but the President
wants to indicate into what groups he would like to see it fall. I tried to get out of him his time schedule, because he hadn't gotten from the Budget Bureau our latest estimate - he did no work on this over the weekend. After years of experience, I know he stops working on Friday before Christmas and you can't talk to him until after Christmas. I said, "What is your time schedule," and he wouldn't tell it to me. But I thought if you would carry this ball, see - you can cross-examine me when you get through and Roy can too - and I would like to have something that you and I could look at tomorrow morning. You don't mind my crowding you? I have done this every year myself at this time of year. I will be ready at 10:00 o'clock, if you will be, to have something to sit down with - just us, you see.

Hanes: All right.

H.M. Jr: Do you want to examine me? Does what I say make sense?

Hanes: I would like to get clear in my mind - you say that he says he wants to indicate to the Congress that he wants to get "X" millions of dollars. Well, it makes a lot of difference what that "X" is. Is it 500 million or is it 800 million or is it a billion, because I think we ought to set some figure, at least, in our minds.

H.M. Jr: I would say that it is not to exceed his "B" budget.

Hanes: I am not familiar with this "B" budget.

H.M. Jr: The "B" budget is the catch-all for the extras of the Army and Navy, which I understand is somewhere between four and five hundred million dollars.

Hanes: That was my understanding, too, of what the armament was, was 500 million dollars outside. Now, that - of course, it makes a lot of difference how we approach this thing. If we
are going to try to collect five or eight hundred million....

H.M. Jr:

I think this is what his problem is: At the present time his deficit is 2,8. He wants to get it just below 2. Some place or other, he is going to try to squeeze 800 million dollars. As I say, he first started off - I don't know whether he was trying to find out whether we had some secret tax message, you or I, or some program that we could simply say, "Here it is, Mr. President," but he switched on me so fast, that is why I am not clear, and then he has got this idea of - well, there it is, four or five hundred million that Congress owes him and then he has got - then he wants to somehow or other raise the difference between 2 and 2,8. He hasn't yet seen the final figures from the Budget Bureau.

Now, what else do you want to ask me? What he has got to do is, either by cutting down his expenditures or raising new money, he wants to wipe out 800 million dollars, that is the problem. That is his problem. He wants to wipe out 800 million dollars.

Hanes:

You don't think he wants us at this time to go into specific detail about how to do this job? It is merely to get a statement together laying before the Congress the desirability of raising new taxes to accomplish these two objects?

H.M. Jr:

Yes, and from what groups he would like to see it raised, and from what groups he would not like to see it raised.

Hanes:

I see.

H.M. Jr:

Roy?

Blough:

This is the budget for the fiscal year '41?

H.M. Jr:

That is right.

Blough:

So it wouldn't make any difference whether the
taxes that were imposed were very productive in '42 and '43, it has got to be productive in '41.

E.W. Jr: It has got to bring down the thing from 2.8 to 2. Now, again tomorrow it might be 2.8 or it might be 2.7, but I am thinking out loud and going back to what he said to the Cabinet, the thing that I wanted to read, 1,999,999,999, etc. I want it just under two billion dollars.

Gaston: That is a very vital point Roy raises. If it were out of income taxes and they were only applied to the calendar year 1940, he would only get 55% of them in the fiscal year, so you would have to levy taxes at the rate of a billion a year to get five hundred million in the fiscal year.

E.W. Jr: What I thought was that if we did something so that I could call up Pa Watson and say, "Now, Hanes, and I have got something on a piece of paper, when would the President like to see it?" Does what I say make sense to you?

Elote: It certainly does.

Hanes: It certainly does.

Gaston: I think you were a little vague, because the President was a little vague on whether he wants the four hundred million to make up for the parity payments that he never got plus an additional five hundred million to take care of the "E" budget or whether he wants just the five hundred million to take care of the "E" budget.

E.W. Jr: He doesn't know himself, but what he does know is that he is carrying a deficit figure of two billion eight and he would like to get it below two. That he knows.

Gaston: I don't see how the commodity credit thing is any good, because they have got securities outstanding that they are morally bound to satisfy.

E.W. Jr: He took my statement on the debt limit and says, "I don't want to argue about it." He said, "What am I going to do about it?" and I said, "I don't know that you have got to do anything in this message." But he didn't
give me all this stuff and it didn’t excite
him or anything else. Everything was very
calm and friendly like. That is the best
that I can give it and I told him this, that
whatever he wanted, if he would let me know
when he wanted to see me I would be available
and that you would be available.

Blough: Should we in this section, this separate proposal
on the parity payments - the fact that Congress
owes him the money and so on - is that intended to
also - would you think it would be better to
include reference to this year’s parity payments,
that they are not in the budget and that if any
are put in, Congress would have to raise the funds,
too.

E.N. Jr: I guess so.

Carton: That stuff is in the ’39 and ’40 budget message.

Blough: Are we referring to the parity payments for
’41, that is the question.

E.N. Jr: No, because if I understand correctly - you
see I am at a great disadvantage because here-
tofore as we approach this terrific time of the
year the Director of the Budget keeps me posted
as we go along, you know, and here we are and I
don’t know - I am going to call up Harold Smith
and ask him, just tell him what we are doing,
would be keep us posted. Have you got a head-
ache?

Hanes: Yes

E.N. Jr: After I have talked it out, I think I see what
he has in mind. The thing that is bothering him
is the eight hundred million. You (Hanes) will
organize your own shop as to how you need, but
I thought if Roy could get the description
from me he might want to ask some questions.

Hanes: Do you want us to be prepared also with figures
and facts about how to raise this money as well
as the words to go on the budget message?

E.N. Jr: I think this, Johnny: I think you ought to have
it. You and I ought to have it when we go over.
Personally, I am going to urge the President not
to put it in his message, see. I think he would
be in a much stronger position if he leaves it to the Committees in the Senate and House.

Hanes: I think it would be an awfully bad mistake.

E.M. Jr.: I have gone out on the end of the limb saying the Treasury has no tax program and I don't know that there is any tax program and all the rest of it.

Hanes: The papers say there is a secret one. I don't know who has got the secret.

E.M. Jr.: That is Mrs. Klotz, she has it.

(Conversation with Mr. Smith follows:)

(On phone) Hello.............
Hello
Mr. Secretary.

Harold?

Yes.

Are you where you can talk?

Yes.

Well now let me tell you in strict confidence what happened with me and the President, see?

Yes.

I'll tell you first and then maybe you'll come clean with me.

All right.

At lunch the President asked me whether we had a tax program for him and I said, "No", that he hadn't asked for any. Well I'll try to make it short because he approached it two ways. He's asked us to prepare a tax statement for him. He seems to think that his deficit at present is two billion eight including the B budget.

Yes.

I don't know whether that's right or not, but that's - he had some piece of paper.

Did he give that to you?

Yes.

He gave you the paper.

Well he gave me the figure of two billion eight.

No, but he didn't give you any details on it.

Well he was reading from his sheet and he - but he did not give me the paper.

Well, that's what I want to know.
H.M. Jr: No, I won't cheat. I say I won't cheat.

S: Well it wasn't that, I thought you should have it.

H.M. Jr: Well, now, here's the point, if I understand it. He said he wants to get it just below two billion, the deficit and he wants us to prepare a message, I take it to find, either he's going to try to save two or three hundred million out of the eight hundred million or he wants to raise what he can save in the form of taxes, see?

S: Yes.

H.M. Jr: Now he didn't seem to have the revenue figures which we sent over to you Friday night.

S: No, because we haven't had a chance to discuss it with him.

H.M. Jr: So Hanes is going to work on this this evening and after all if he is two or three hundred million dollars off, the sooner I know it the better.

S: Yes. Well that's the reason I think now we gave him - he rushed us and we gave him a tentative statement on the expenditures just before he left for Hyde Park.

H.M. Jr: Yes.

S: And I told him now we want - we haven't quite - those were guesses, some of them based on - we haven't cleared all the budgets, some of them based on last year and we'd want to have a little time to revise those. Now we pulled forty million out of the works program since he saw the figure.

H.M. Jr: I see.

S: And so I'd like to have a chance in the next few days to revise those expenditure figures or maybe we can give them to you in the rough tomorrow because when he talked of two million eight that's based upon, as I see it, with the figures, expenditure figures we gave him, that's based upon your earlier estimate of revenue which was six three.

H.M. Jr: Oh!
S: And so that he - I think he still has that perhaps in mind. I don't know where he'd get his two eight otherwise, except he did tell us in the beginning he wanted the deficit down to two eight. Well as we went along we found out that the works program was so obligated that it took nearly five million dollars to continue the projects without any new ones. I mean five hundred million.

H.M. Jr: Now what -

S: So that in order that, you're thinking in the same terms as apparently he is, I think I should get these expenditure figures to you.

H.M. Jr: I think you should, but now let me get this - let me just use the figures that the President is using, for the moment.

S: Yes.

H.M. Jr: He said two eight.

S: Yes.

H.M. Jr: Did that include the five hundred million for the B budget.

S: The two eight as we presented the thing to him, your two eight is deficit. Now we only expended - we only presented to him the expenditure figures.

H.M. Jr: I see.

S: So the expenditure figures do include the B budget.

H.M. Jr: Well -

S: And if he says two eight then he's still thinking of about six three for revenue rather than your revised figure.

H.M. Jr: Well the thing that we gave you is just under six.

S: That's right.

H.M. Jr: So it means the deficit is about three one.

S: Yes. It means that he's off and is giving you
a two eight because -


S: Let me see. That would make the expenditure figure—that is pulling the old age fund out of both sides, well on the expenditure basis for '41 it's eight five two eight.

H.M. Jr: Eight five —

S: Two eight.

H.M. Jr: Two eight. Now does that include the B budget?

S: That includes the B budget, but it does not include the old age reserve which is out of both sides.

H.M. Jr: Yes.

S: Now the appropriation figure is, well this debt retirement, you know more about it than I do, but the appropriation figure for '41 is comparable is eight one seven eight. But then when you add debt retirement it gives '41 eight seven six four and then we put in on the expenditure side just the nominal hundred million which brings the other figure up for '41 expenditures of eight six two eight. I think I'd better get these over to you even in the rough.

H.M. Jr: All right.

S: Because that's evidently what he —

H.M. Jr: Well because after all if we're three hundred million dollars —

S: Yes, if you're off it's too bad.

H.M. Jr: Well —

S: I'll get started with that right away.

H.M. Jr: We can't do an intelligent job.

S: That's right.

H.M. Jr: And I'm going certainly keep you informed, hour to hour what I'm doing here on the revenue end.
S: Well, we—I think we'll—we can recheck these expenditure figures now and get them to you so they'll be —

H.M.Jr: Could I get them the first thing in the morning?

S: Well I think so, let—I'll get a hold of Lawton and see if we can revise these according to the changes that have been made. This is very tentative, and I think we can get them to you possibly by ten o'clock.

H.M.Jr: Well if you could, if you could make that the deadline.

S: Yes.

H.M.Jr: Could you?

S: Yes, yes, I'll do that.

H.M.Jr: Well thank you.

S: All right.

H.M.Jr: Thank you—Hello.

S: Yes.

H.M.Jr: Have you given the President the deadline when you're going to send this thing to the printer?

S: You mean the—

H.M.Jr: The budget.

S: No, of course some of it is being printed up currently, with the final message and so on. Of course he hasn't done any work on—

H.M.Jr: Well that's what I—

S: We're only shaping it up.

H.M.Jr: I gather he hasn't done anything on it over the weekend.

S: No that's right. And we're just shaping up some ideas for him and we want to have some conferences
on them but as far as the message goes he hasn't
done a lick of work.

H.M.Jr: Well I tell you what I think I'll do. I think
I'll send you over, well I don't know - if the
question of the debt limit comes up, see?

S: Yes.

H.M.Jr: I'd like it - I told him how I feel about that, I'd
appreciate if you'd talk to me about that.

S: Yes, all right, sir.

H.M.Jr: Thank you.

S: All right.

H.M.Jr: Goodbye.

S: I'll get this to you. Thanks.
E.W., Jr.: Well, there you are. It is just as bad as it was every other year. As the thing approaches, it gets wilder and wilder. You (Hanes) didn't go through this last year, did you?

Hanes: I went through it right up until the last minute when you were writing the message. That is the part I missed. I would have missed that anyway, if I had been here.

E.W., Jr.: Well, there you are. Now, you know everything that I know. You know everything that Harold Smith knows and what he doesn't know, so from now on --

Elrough: It is a beautiful job. We have got to raise eight hundred million dollars.

E.W., Jr.: I did a little testing on my own, see. I did a little testing on my own. I wanted to see how the President felt on this thing and I gathered - of course, everything that we are saying here is a quadruple secret. I don't think he wants to ask for a - his top limit on taxes is five hundred million dollars. I did a little testing. He was testing me and I did a little testing on him. I don't think he would go above five hundred. The reason, Herbert, was, I wanted you to know about this because you had been through this before. I don't expect you to work with these gentlemen tonight, but I would like you to sit in tomorrow again. You have been through so many of these things with me and you could help Johnny and be available. I don't want you to sit up tonight, because you worked all Saturday and Sunday.

Gaston: I like the smell of it.
December 19, 1939.
12:52 p.m.

Captain Collins: Good morning Mr. Secretary.

E.W. Jr: Hello Captain. Anything happening on that new Board that I ought to know before I see the President at lunch?

C: Oh, Mr. Secretary, why there was only — I will send you at once the report that I sent to Yao concerning the work that was done for the Finnish Government.

E.W. Jr: Oh!

C: What time are you going sir?

E.W. Jr: Well I'm going over there now, in ten minutes. I can read that later on.

C: Sir?

E.W. Jr: I can read it afterwards.

C: Yes. Well I'll send that over to you, sir. I should probably have done that, it was —

E.W. Jr: I tell you what you do — let me just think how I can get that —

C: I can send it to the White House and ask them to bring it in to you, sir.

E.W. Jr: That’s — that’s right. That’s right. Do that.

C: I’ll have it on the way right away sir.

E.W. Jr: Fine. What else?

C: Well that's all sir, the only meeting we had — this meeting last week and that was on this case of the Finnish Government, most of which however had been cleaned up before it was presented to the Board.

E.W. Jr: Well I'm amused — this is strictly between us, but General Watson asked whether he could bring General Arnold and Colonel Burns over to see me. Hello —

C: Yes, sir, I'm listening.

E.W. Jr: To talk about this Board, and I said yes provided
that the President o.k'd it, so I'm going to find out what he's done.

C:  Yes, sir.

H.M. Jr: I said I wouldn't see him unless the President approves it.

C:  Yes, sir.

H.M. Jr: What would they be wanting to see me about?

C:  Well they wanted to go back over there as they lost the first round, now they're in for the second round, presumably. They still wanted to go back.

H.M. Jr: I see. Why is Arnold so interested in this?

C:  Well, on account of the aeroplane end of it.

H.M. Jr: I see. Is this Brewster plane any good?

C:  Well, it's -- it's a new product, it's supposed to be pretty hot. The Navy had a contract you know. They had a test plane there and they had a contract.

H.M. Jr: Well you can find out for me.

C:  For them, and then they decided that they would have to make a change which permitted them to dispose of the ones that they had on hand at the moment to the Finnish Government. It's a technicality but it permitted them to take -- deliver some of their earlier planes.

H.M. Jr: Did Mrs. Klotz phone you?

C:  Sir.

H.M. Jr: Did Mrs. Klotz phone you?

C:  I can't hear you sir.

H.M. Jr: Did Mrs. Klotz phone you about the Brewster?

C:  No sir.

H.M. Jr: Well I'll tell her that I talked to you about the other thing. I was curious to know what kind of
a plane it is. Do you think you can find out?

C:

Oh yes, I can get all of that.

H.M.Jr:

And – I'd like to know, I mean I wouldn't stir up anything but if you could find out, let me know.

C:

Yes, sir. Well Mr. Secretary, oh well, both the planes – there was no ordinance available at all of course.

H.M.Jr:

No I mean what is it a single motor, so forth and so on?

C:

No, she – well she's a fast fighter. I can get all the dope on that. It's a Navy plane, it's not an Army plane.

H.M.Jr:

Well get it for me, no hurry about it.

C:

Yes, sir. Yes, sir.

H.M.Jr:

O.K.

C:

All right, sir.

H.M.Jr:

Thank you.

C:

Goodbye.
December 19, 1939.

H.M. Jr: Hello.
Operator: Mr. Traphagen hasn't come in but he said he'd be in by five minutes of one.
H.M. Jr: Well don't bother me now, all these things on split seconds I - get him today.
O: All right.
H.M. Jr: Is Mrs. Klotz talking?
O: Yes, she is.
H.M. Jr: Who to.
O: She's talking to Mr. Swope of the Silver Noxygen Company.
H.M. Jr: Oh. Well I didn't want to break in - for me.
O: Yes.
H.M. Jr: As soon as she's through talking, I'll ring the bell when she goes, I want her.
O: All right.
December 19, 1939.
4:55 p.m.

Mrs. Klotz: Hello.
Operator: Go ahead.
Arthur Purvis: Is that Mrs. Klotz?
K: Hello Mr. Purvis. Yes this is she.
P: Oh Mrs. Klotz. Just before Mr. Butterworth left, he telephoned me up and said that there might be a possibility of helping in regard to a particularly important requirement of the Air Ministry in England for aluminum extruded bars and tubes.
K: I see.
P: And I understood that it has arisen out of, probably out of some discussion that Kennedy had had when he came over to Washington. Of that however I am not sure.
K: I'm not a bit familiar with it Mr. Purvis.
P: I wonder whether - here is my difficulty. May I put it to you this way?
K: Please.
P: I have now received from London the particular material that they are terribly anxious to get and it's true that the urgency is as great -
K: I see.
P: As they thought. Now, Mr. Butterworth telephoned to Washington and ascertained that my proper course was to send this information to, when it came, he had to fly off to England of course, was through Mr. Collins.
K: Mr. Collins, yes.
P: As he is head of the new group.
K: Yes.
P: Now on the other hand that group head has not yet - although I know he's appointed, we haven't had the
official information about it.

K: That's right.

P: And I am very anxious to get this very urgent thing, especially in view of the offer of help quite high quotas with the aluminum corporation.

K: Yes.

P: I'm anxious to get that information to the proper quarter, and really what I'm seeking the Secretary's advice for is whether I send it to him - this cable that's come in showing exactly what we'd like to get, if it is possible for that offer to be fulfilled, or whether I should send it to Mr. Collins, with whom I might be in slightly improper relations because I haven't yet had an official word that I should be in contact with him.

K: Mr. Purvis, my advice would be to send it to the Secretary.

P: I couldn't be very far wrong on that.

K: Not a bit.

P: Shall I put it in an envelope to you. Would - so that you would open it.

K: Yes I'll open it, I'll see that he gets it.

P: I'm ever so much obliged.

K: That's all right.

P: I'll send it tonight.

K: Thank you. Goodbye.
December 19, 1939

Jake Viner told me that the State Department have asked those manufacturers who have processes for making octane gas in Russia and Japan to immediately withdraw their experts. The head of one of these companies is a friend of Jake Viner's in Chicago and he is very much upset because they have long-time contracts and stand to lose a great deal of money. He wanted me to know it and also whether I could offer any advice and I said no.

I gather that A. A. Berle is handling this.
December 19, 1939

Secretary of State
Department of State
Washington, D. C.

Attention Mr. Joseph C. Grew, Chief
Division of Controls

Dear Sirs,

Your letter of December 15, 1939 enclosing copy of the statement made by the President at his press conference December 2, 1939 has been received. We are informed that the letter and statement are to be interpreted by us to apply, for the present, to Germany, Russia and Japan. We shall, of course, be guided by our Government's policy.

We have no open contracts with Russia.

Regarding Japan we have a contract with Messrs. Balfour Guthrie & Company of New York City for 10 tons of Molybdenite Concentrates to be shipped not later than January. This contract is based on an offer which we made on December 5, 1939 and which was accepted by Messrs. Balfour Guthrie & Company on December 7, 1939.

Regarding Germany, we have contracts expiring on December 31, 1940 with three German firms covering their total Molybdenum requirements except such quantities as they may be able to purchase through clearing from Norway, Sweden and Finland. These three firms are — T. G. Farbenindustrie, A.G., Frankfurt, Gesellschaft fuer Elektrometallurgie, Berlin and Hermann G. Starch, A.G., Berlin. Under our contracts with these firms we are obligated to maintain consignment stocks at European ports for withdrawal by them in accordance with their requirements.

At the beginning of the war we advised our German customers that we were no longer able to ship on consignment, but that we were prepared to deliver the material to them on an f.o.b. U.S. port basis, payment terms — cash against railroad bills of lading. There remained only a small quantity of Molybdenum on consignment at the outbreak. There remained only a small quantity of Molybdenum on consignment at the outbreak. There remained only a small quantity of Molybdenum on consignment at the outbreak. There remained only a small quantity of Molybdenum on consignment at the outbreak. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since break of the war. This was withdrawn in the first three weeks of September. Since

Very truly yours,

CLIMAX MOLYBDENUM COMPANY

Max Schott
President.
You will have seen from recent newspaper reports that the moral embargo
as urged by the President in his statement of December 2, 1939, released to the
press on that day, has now been extended so as to include aluminum and bauxite.

We are now in receipt of a communication from the Department of State,
Washington, D. C. enclosing a copy of the President's statement above referred to.
For your information we herewith quote the full text of the communication from
Washington, as well as of the President’s statement.

(quote)

We understand that this moral embargo embraces Russia, Germany and Japan.
We have advised our State Department that we shall be guided by our
Government's policy.

In view of the many inquiries from stockholders and investment houses in
the name of stockholders as to the possible effect of this embargo on the sales of
your Company, and in order to enable stockholders to form their own judgment, we
have decided to give you the following information.

On the basis of actual figures for the first 11 months of 1939 and of our
estimate for the month of December we arrive at total sales for the year amounting to
27,145,000 pounds Bauxite. Of this total 15,699,921 pounds Bauxite were shipped
to Germany, Russia and Japan; 6,200,000 pounds Bauxite is our estimate of total
domestic sales for the year 1939; the balance amounting to 5,255,079 pounds Bauxite
is made up of sales to foreign countries not included in the moral embargo.

As to the effects of this embargo on your Company's business, we are not in
a position to make reliable predictions owing to disturbed world conditions. However,
we deem it proper to inform you that we have been advised by our customers in countries
which are not affected by the embargo, that their estimated requirements for the year
1940 are over 5,000,000 pounds in excess of their purchases for the year 1939.

Our domestic business has shown an upward trend during the year 1939.
PARAPHRASE OF TELEGRAM RECEIVED

FROM: American Legation, Stockholm, Sweden

DATE: December 19, 1939, noon

NO.: 510

As of interest to the Department, I was informed by the Governor of the Riksbank this morning that the Swedish Minister to the United States has been given instructions to make informal inquiries of the Secretary of the Treasury as to whether it would be agreeable to the Government of the United States for a short-term loan to be floated through a bank in America by Sweden. The loan which is contemplated, the Governor told me confidentially, would amount to $100,000,000 which would be paid back during a period of from 2 to 5 years. The gold and foreign exchange account in the U.S. of Sweden has been reduced to a total of approximately $140,000,000, he added.

STERLING

EA: MSG
PARAPHRASE OF TELEGRAM RECEIVED
FROM: American Embassy, Paris, France
DATE: December 19, 1939, 7 p.m.
No.: 3001
FROM MATTHEWS.
FOR THE TREASURY DEPARTMENT.
I just got back to Paris after having had a most interesting three-day trip to the front. This trip included a glimpse of troops from the German Army 200 yards away at the German end of the bridge over the Rhine at Kehl, and several hours in the largest fortress in the Maginot Line. I also had a ride through the deserted city of Strasbourg, and saw the review yesterday by Prime Minister Chamberlain and Gamelin of a mixed battalion of French and British troops, which took place a dozen kilometers behind the present front.

I can say that the morale on the French front is excellent, judging from personal conversations with and observations of both officers and men. I include in this the young artillery captain who took me through the turrets of the fortress mentioned above; this captain has been in the fortress since the 20th of August and since that date has not once been outside his subterranean home - the men, however, get six days out each month. It is the expectation of most of the officers that the war will be long and hard, and that a serious military defeat is necessary for Germany before there will be a collapse in that country; they did not profess to know when and
and how the latter is to come. Both officers and men are in
common kept too busy with the work of the day to think much
about how and when the end is to come. What particularly
impressed me was that paternal relationship between officers
and men so unique with the French army, and the imitation of
which would completely undermine discipline in the army of
any other country. The soldier in the French Army knows
very well that his officer knows his job thoroughly, that he
will do his utmost to protect his men, and that he will share
both dangers and hardships.

There was some snow and the weather was cold; however,
many areas are still flooded and the ground is far too soggy to
permit in the opinion of most (?) there any important operations
on the French front very soon. The Germans, on the other hand,
have increased the size of their local patrols recently, as
well as the intensity of their attacks on the outposts of
the French. According to stories that we heard, the details
of all French troop movements seem to be known to the Germans,
who even announce them correctly over local radios in advance
of the movements.

I had lunch today with Robert Masson, who is the managing
director of the Credit Lyonnais. He said that he had spent
some months in Russia as a member of a French military mission
at the time the Kerensky Government was in power. Masson is
fully
fully convinced, as a result of his experience at that time, of the fundamental weaknesses of the Russian war machine, and the dearth of real officer material in the Russian Army. The Finnish campaign has more than vindicated the correctness of this view, he feels, but he is afraid that unless the Finns receive help from the outside in the form particularly of anti-tank guns and munitions, they will be crushed soon by the sheer weight of numbers. Masson seemed to be particularly indignant at the unwillingness of Sweden to give Finland more help, but he did realize of course the difficult position Sweden is in, in the face of threats from Germany.

END SECTIONS ONE TO FOUR INCLUSIVE.

BULLITT.
Secretary of State,
Washington,

3001, December 19, 7 p.m. (SECTION FIVE)

An instruction of the Foreign Exchange Office published in the Journal Official of December 17 clarifies the obligations of banks with respect to the declarations of foreign holdings to be made under earlier decrees (our telegram No. 2912, December 6, 7 p.m., and previous). It seems designed to make more accurate the necessary French inventory of actual holdings abroad through the avoidance of duplications in declarations. Where banks hold assets abroad as investment of their own funds they should so declare them but where accounts are administered for their clients as such they should be included in the owner's declaration and not in the banks. Banks should not, therefore, mention in their declarations of holdings abroad "assets which belong to their clients or which constitute the counterpart of accounts opened in the name of their clients or deposits made by their clients". They are instructed therefore not (repeat not) to declare the following.
Secretary of State
Washington

3001, December 19, 7 p.m. (SECTION SIX)

(A) "Credit balances in foreign currencies with their correspondents abroad or with their agencies and branches abroad to the extent that they represent accounts in foreign currencies of their depositors or other uses of funds abroad of the same accounts; (B) securities in their dossier abroad held either for the account of their clients or for the account of other intermediaries whether these securities should or should not be declared by their owners according to whether they are considered as exported or as repatriated; (C) checks, drafts, bills of lading, coupons, subscription rights, certificates and movable securities handed over to them by their clients for transmission abroad for collection, negotiation or transfer whether detained in France or abroad or in the course of being sent abroad; (D) gold and foreign exchange held on deposit for the account of their clients whether or not the proprietor is held to make a declaration. (END OF SECTION SIX)

BULLITT

JRL
EMB
Secretary of State
Washington

3001, December 19, 7 p.m. (SECTION SEVEN)

(E) foreign bank notes purchased from clients to be ceded to the Bank of France or to the Foreign Exchange Office but still held by approved intermediaries either because they have just been purchased or because they are provisionally held in virtue of an authorization of the Bank of France or of the Foreign Exchange Office; (F) generally speaking all holdings abroad or credits abroad which the approved intermediaries hold in the course of their professional activity either provisionally or definitely and continuously so long as these foreign assets do not cease to be the property of their clients."

Today's JOURNAL OFFICIEL publishes a decree setting up a permanent consultative committee to assist the Minister of Armament D'Autry in technical and industrial questions presented to it by the Minister. (END SECTION SEVEN)
Secretary of State,
Washington.

3001, December 19, 7 p.m. (SECTION EIGHT)
The committee is to contain several representatives of the Senate and Chamber of Deputies and is designed to form "the most flexible and effective liaison between Parliament, the Government and production". The eight sections of the committee are listed as follows: organization of labor and production metallurgy non-ferrous metals, machinery and transformation of metals, chemical products, electrical construction, miscellaneous industries and transfer of industries.

The securities market experienced another moderate selling wave today but recovered much of the ground lost before the close. Rentes were somewhat neglected but the trend was generally downward.

(END OF MESSAGE)
Copy to Cullen to take care of this.

This was
BRITISH PURCHASING COMMISSION

December 19, 1939.

Dear Mr. Secretary:

Before he left for the other side, Mr. Butterworth telephoned advising it was understood there is an acute shortage of aluminium extruded bars and tubes which is holding up the British Government's aircraft production program. He stated it might be possible to assist at this end in overcoming the shortage.

I cabled London to make quite sure that the emergency was vital enough to justify such a special step, asking also for particulars of the requirements and delivery dates if it was desired to take advantage of the offer. I have now received the attached cable from which it will be noted that both extruded bars and tubes are urgently required, but that the urgency for tubes is far greater even than that for bars.

Mr. Butterworth suggested that when the information came through I should expose our situation through the medium of Mr. Collins. As we have not as yet received final official advice to make contact with Mr. Collins, I feel a
Page 2.

December 19, 1939.

little diffident in doing so. I am therefore sending you the cable in the hope that you will guide me as to how we might be able to take advantage of the suggestion so kindly made.

I would appreciate very much any guidance you can give me.

Yours sincerely,

[Signature]

Secretary of the Treasury,
Washington,
D. C.
Re your telegram of December 12th. Duralumin Extrusions in the form of bars and tubes urgently required. Urgency for tubes is far greater than for bars.

Ion tubes in conformity with British Standard Institution specification 4 F 4 are wanted within four months or even earlier.

1½ half inch by 14 S.W.G

40 1½ " " 20 "
20 ton 1½ " " 22 "
10 " 1½ Qtr. " " 20 "
20 " 1 " " 20 "
30 " 7/8 " " 16 "
30 " 3/4 " " 20 "
10 " 3/4 " " 24 "
3 " 5/8 " " 20 "
10 " 5/8 " " 22 "
4 " 1/2 " " 20 "
5 " 3/8 " " 17 "
10 " 3/8 " " 22 "
5 " 3/8 " " 24 "
15 " 5/16 " " 17 "
5 " 1/4 " " 22 "

? L/F ? round bar in conformity with British Standard Institution specification 5 L 1, Section 3 and Table 1 of same wanted within six months:

10 Ton 1/2 inch Diameter
25 " 5/8 " "
25 " 3/4 " "
25 " 1 " "

Regraded Unclassified
<table>
<thead>
<tr>
<th>Quantity</th>
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<td>25</td>
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<td>50?</td>
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<td>50</td>
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<td>50</td>
<td>1 7/8</td>
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<td>75</td>
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<td>50?</td>
<td>2 1/4</td>
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<tr>
<td>50</td>
<td>3 1/2</td>
</tr>
</tbody>
</table>

Following Hexagon Bars in conformity with British Standard Institution specification 5 L 1, Section 3 and Table 3 of same wanted within 5 months:

Bar for making 1/4 inch diameter machine bolt - 10 Ton

<table>
<thead>
<tr>
<th>Diameter</th>
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</thead>
<tbody>
<tr>
<td>3/8</td>
</tr>
<tr>
<td>1/2</td>
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<tr>
<td>5/8?</td>
</tr>
<tr>
<td>3/4</td>
</tr>
</tbody>
</table>

As regards sheet. Please ascertain what deliveries can now be given by Aluminium Company for remaining 600 tons of Air Ministry specification DTD 275 being made Alcoa work(s) Tennessee. Confirmation will be posted. Ends.
My dear Mr. Secretary:

Let me acknowledge, with thanks, your courteous letter of December 15th relating to the exploration of a proposed inter-American institution designed to promote a greater degree of cooperative responsibility and participation in the economic and financial development of the Americas.

I need hardly say that I am very glad of this indication of your view in the matter. Since Mr. White, on behalf of the Treasury experts, is maintaining close touch with the proceedings, I shall take the liberty of asking him to keep you fully informed as the discussion progresses, so that we may have the benefit of your views on the specific problems as they arise.

My understanding is that the Committee hopes to get the matter forward so as to have a concrete suggestion.

The Honorable
Henry Morgenthau, Jr.,
Secretary of the Treasury.
suggestion which they may present by the first week in February -- which may or may not be possible, depending on circumstances.

I am

Sincerely yours,

Adolf A. Berle, Jr.
Assistant Secretary
Secretary of State,
Washington.
147, December 19, noon.
Department's telegram No. 123, December 18, 7 p.m.

For progress and content of the law see my telegram 133, 135, 140. Subdivision A of Article No. I gives special powers to President for "regularization of service of public debt and renewal of service on loans in total or partial default on such new bases as the executive organ agrees and the contraction of loans to attain the ends contemplated in the present law, it being understood that the total of new loans contracted cannot exceed fifty million pesos or its equivalent in foreign currency. Provided: for the operations contemplated in this article and in the other laws which authorize contraction of loans there shall be required the prior and favorable opinion of the National Loan Commission, which henceforth will be composed of six members chosen three by each House of Congress."
TREASURY DEPARTMENT
INTER OFFICE COMMUNICATION

DATE: December 19, 1939

TO: Secretary Morgenthau

FROM: Mr. Metrich

The foreign exchange market experienced another dull day. The opening quotation in New York for sterling was 3.94-3/4 and by early afternoon, it had reached the high of 3.95-1/4. It subsequently closed at 3.95.

Sales of spot sterling by the four reporting banks totaled $230,000, from the following sources:

- By commercial concerns: $94,000
- By foreign banks (Europe and South America): $136,000
  Total: $230,000

Purchases of spot sterling amounted to $380,000, as indicated below:

- By commercial concerns: $206,000
- By foreign banks (Far East and Europe): $174,000
  Total: $380,000

Today the following reporting banks sold cotton bills totaling $104,000 to the British Central at the official rate of 4.021:

- $100,000 by the Chase National Bank
- $4,000 by the Guaranty Trust Co.
- $104,000 Total

During the past week the belga has shown considerable strength, improving from .1054 on December 12 to .1056 today.

The other important currencies closed as follows:

- French francs: .0226
- Belgian francs: .3315
- Swiss francs: .2263-1/2
- Canadian dollars: 12 3% discount

The Belgian franc improved from 12-5/8% discount yesterday to 12% discount today. The better rate is probably due to the new agreement with that country regarding sugar.

The Federal Reserve Bank purchased 44,000 belgas for the account of the Bank of Latvia.
We purchased the following amounts of gold from the earmarked accounts of the banks indicated:

$1,000,000 from the Netherlands Bank
675,000 from the National Bank of Belgium
$1,675,000 Total

The Federal Reserve Bank reported the following shipments of gold:

$6,810,000 from South Africa, representing two shipments by the South African Reserve Bank to the Federal Reserve Bank of New York for account of the Bank of Sweden. These shipments will probably be earmarked for account of the Swedish Bank.
2,006,000 from Norway, shipped by the Bank of Norway to the Federal Reserve Bank to be earmarked for account of the Bank of Sweden.
282,000 from Norway, shipped by the Bank of Norway to the Federal Reserve Bank to be earmarked for account of the Bank of Norway.
155,000 from Canada, shipped by the Royal Bank of Canada, Montreal, to the Royal Bank of Canada, New York, for sale to the U. S. Assay Office at New York.
$9,255,000 Total

The State Department forwarded to us a copy of a cable from the American Consulate General, London, stating that invoices were certified for the following shipments of gold from England:

39,000 shipped by Macutta & Gliedsmid, London to the Banque Belge pour l'Étranger, New York.
$1,423,000 Total

These shipments of gold will be sold to the U. S. Assay Office at New York.

On the report of December 19, received from the Federal Reserve Bank of New York, giving the foreign exchange position of banks and bankers in its district, the total position of all currencies was short the equivalent of $15,618,000, a decrease of $1,472,000 in the short position. The net changes in positions are as follows:

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>SHORT POSITION DECEMBER 6</th>
<th>SHORT POSITION DECEMBER 13</th>
<th>DECREASE IN SHORT POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>$5,923,000</td>
<td>$4,494,000</td>
<td>$1,429,000</td>
</tr>
<tr>
<td>Europe</td>
<td>$8,463,000</td>
<td>$6,026,000</td>
<td>$2,437,000</td>
</tr>
<tr>
<td>Canada</td>
<td>257,000 (Long)</td>
<td>572,000 (Long)</td>
<td>315,000 Increase in long position</td>
</tr>
<tr>
<td>Latin America</td>
<td>34,000</td>
<td>246,000</td>
<td>$212,000 Increase in short positions</td>
</tr>
<tr>
<td>Far East</td>
<td>2,870,000</td>
<td>3,178,000</td>
<td>$388,000 Increase in short positions</td>
</tr>
<tr>
<td>All Others</td>
<td>27,000</td>
<td>26,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Total</td>
<td>$17,050,000</td>
<td>$15,618,000</td>
<td>$1,472,000</td>
</tr>
</tbody>
</table>
The only price fixed for silver in Bombay was for delivery January 7. The price, less the import tax, approximated 43.59¢.

A Dow Jones news item stated that a new rule under the Defense of India Act for the control of the internal price of silver was announced. This new rule empowered the government to impose upon those authorized to import silver into British India, such restrictions as it may consider necessary regarding its use and disposal. A similar power was conferred upon the Reserve Bank of India.

The Federal Reserve Bank of New York reported to us that silver brokers in New York had been requested by dealers in India to make offers to them. The only reply that was given was by Handy and Harman who stated that it would only sell silver on bids on a dollar price basis and payment to be made in U. S. dollars.

The prices fixed in London for spot and forward silver were 23-1/2d and 23-11/16d, up 1/16d and 1/8d, respectively. The U. S. equivalents were 41.74¢ and 41.68¢.

The first repercussion in New York from the reports that India would license the imports of silver into that country was the rise in Handy and Harman's price for foreign silver to 35-1/8¢, up 3/8¢ from yesterday. It appears that the sellers of silver are withholding their stocks from sale, awaiting a clarification of what the rules and regulations will be for the importation of silver into India. It was also reported to us that one of the New York banks bid 35-3/8¢ for 100,000 ounces of silver. This transaction was subsequently consummated at 35-5/8¢ for delivery within one month. There was also one sale of 100,000 ounces at 36¢ for delivery up to one week.

The Treasury's price for foreign silver was unchanged at 35¢. As Handy and Harman's price was above the Treasury's, no purchases of silver were made by us today.
GROUP MEETING

December 19, 1939.
9:30 a.m.

Present: Mr. Hanes
         Mr. Riefler
         Mr. Viner
         Mr. Ball
         Mr. Harris
         Mr. Graves
         Mr. Foley
         Mr. Gaston
         Mr. Thompson
         Mr. Schwartz
         Mrs Klotz
         Mr. White

H.M.Jr: Basil, on this Collector of Customs at San Francisco, you will have to help me out on my memory. Are we going ahead with that or do I recommend there should be some office there?

Harris: The Collector, we go ahead. The Comptroller, we are going to have a recommendation either today or tomorrow.

H.M.Jr: But on the Collector....

Harris: The Collector is O. K.

H.M.Jr: Well, then all I do is tell you (Thompson) to prepare it for the President.

Harris: That is right. You had the balance of Mr. Gaston's recommendations or analyses.

H.M.Jr: He said O. K.

Gaston: Yes. Well, it is based on an earlier memorandum in the file.

H.M.Jr: If you fellows - I thought you (Viner) weren't allowed to come to these meetings. How are you getting along on your speech?

Viner: I haven't started yet. I am still working on your stuff.

H.M.Jr: You remind me of my daughter. You don't like your dolly, do you? My wife asked me if I was going
to school this afternoon and I said that was
right, referring to Cabinet.

Gaston: I have nothing. You got my note?

H.M.Jr: I got your note on that Farm Credit thing. When
I fight for an organization, I fight, but it looks
to me as though Mr. Goss was kind of squared by
telling him to hold his job. Is that unfair?

Gaston: It may be a little.

H.M.Jr: Darn it all....

Gaston: He fell into Wallace's trap.

H.M.Jr: Goss comes around - this is on Farm Credit being
taken over. He comes to see me Saturday and says
if they take it over he is going to resign and
devote himself to fighting this thing. I said,
"That is up to you." He wanted to go and see
Farley and I said, "No, he is a political man.
Go and see Wallace." He did that. Wallace said,
"I want you to stay there with the Land Bank and
all that." Goss is going to stay. Well, I can't
help it. I am going to keep on. Did you get the
same impression?

Gaston: Yes, I got the same impression.

H.M.Jr: What else, Herbert?

Gaston: That is all.

H.M.Jr: Ed?

Foley: I have a memorandum I will let you have to put in
the budget message to meet the so-called estimated
deficiency. Danny and I talked about it last night.

H.M.Jr: Whose deficiency?

Foley: The President's deficiency.

H.M.Jr: Oh, let's have it. Talk up, will you, unless you
have got a cold.
No, I haven't got a cold.

This is the question of what does the President have to say in the budget about the debt limit and Mr. Foley says:

"The question has arisen as to the circumstances under which the President would be required to make specific recommendations in the budget to Congress with reference to increasing the limitations on the public debt or providing other new sources of revenue.

"The relevant parts of the provisions of the Budget and Account Act, 1921, are, as they appear in the Code:

[U.S.C. Title 31, Sec. 13. "(a) If the estimated receipts for the ensuing fiscal year contained in the budget, on the basis of laws existing at the time the budget is transmitted, plus the estimated amounts in the Treasury at the close of the fiscal year in progress, available for expenditure in the ensuing fiscal year are less than the estimated expenditures for the ensuing fiscal year contained in the budget, the President in the budget shall make recommendations to Congress for new taxes, loans or other appropriate action to meet the estimated deficiency. * * *"

[U.S.C. Title 31, Sec. 14. Whenever such supplemental or deficiency estimates reach an aggregate which, if they had been contained in the budget, would have required the President to make a recommendation under subdivision (a) of Section 13 of this title, he shall thereupon make such recommendation.

"The foregoing Sections require the President to make recommendations to Congress for 'new taxes, loans, or other appropriate action' only when there is an 'estimated deficiency.' There is no 'estimated deficiency', within the meaning of those sections, unless estimated receipts from
all available sources, including amounts which can be borrowed within existing debt limitations and other amounts in the Treasury available for expenditure are less than the total estimated expenditures for the ensuing fiscal year. In other words, so long as the budget can be balanced by borrowing within existing limitations or by using other available funds, such as the Treasury working balance, the President would not be required to submit any recommendations with reference to increasing the public debt limitations or for providing other new sources of revenue."

Do you agree with this?

Bell: Yes, I think it is all right. I think the estimated deficiency probably is used in an unfortunate sense.

Foley: That is paraphrased there and that is what the statute says.

Bell: It isn’t in the technical sense it is used generally. I think it is all right. I assume that the debt limit is going to be exceeded.

H.M.Jr: Well, we will leave it as is until somebody raises it.

Foley: Yes.

H.M.Jr: It is good to have done it now so I wouldn’t have to get you out of bed or out of a party on the night of the 31st.

Foley: That is a bad night.

H.M.Jr: Anything else?

Foley: No, sir.

H.M.Jr: We are waiting to hear from Mr. Jones, aren’t we?

Cotton: Yes. You are going to talk to Mr. Traphagen?

H.M.Jr: Oh yes, that is right. Weren’t you South Americans going to be sent for by Mr. Jones?
Cotton: Well, I was going — he asked us if we would get up some ideas for him.

Riefler: He wants to date it today.

H.M.Jr: Why don't you do this, sort of keep it going, because Jones is leaving town tomorrow. Why don't you call him up and say, can you be of any assistance or something or other or that you have got a piece of paper? In other words, stimulate the thing so that we get something out of Jones. I think Jones has got an idea.

Cotton: Yes, he asked us to do that.

H.M.Jr: Will you follow through on it?

Cotton: Yes.

H.M.Jr: Mr. Harris?

Harris: There was a meeting of that interdepartmental committee yesterday morning. One of the things that they decided was that they would sell ten fairly old ships to the British for the movement of a large lot of lumber from the Pacific Coast. Everybody was in accordance and discussed a great many other aspects of the shipping situation, some of which was carried over until tomorrow.

H.M.Jr: Well now, are you seeing that if Treasury has any objections they file them before?

Harris: We have Cairns there and another chap.

H.M.Jr: Anything else?

Harris: That is all.

H.M.Jr: That Mr. Hull's paper, I don't even know what it cost me. How much did it cost the Treasury?

White: Sugar?

H.M.Jr: Yes.

White: I only had three minutes to initial it and I didn't have a chance to figure it out. I think it is
preposterous to give us a document of that kind. We usually have a couple of hours, I had three minutes. I didn't know what was in it and I just did it not to make any difficulty. I don't know what our initials mean under those circumstances.

H.M.Jr: Or my signature.
White: We accept the responsibility without any....
H.M.Jr: We ought to have a week, hadn't we?
Harris: A week or ten days. That was a very involved one, too.
H.M.Jr: Well, we will do it this time and then I will file a letter of protest and I don't think it will happen again.
White: There is a letter here from....
H.M.Jr: Excuse me. Basil, could somebody go over and just let me know what the darn thing would cost the Treasury? I know it costs something.
Harris: Yes.
White: There is a letter here from Mr. Welles raising again the question of getting an expert from - I take it, it would most appropriately be from Danny Bell's organization. This is a repetition of a prior request with a little more insistence. Who do you want to handle it?
H.M.Jr: How did it come to you?
White: Mr. McReynolds' office sent it to Mr. Thompson's office and he sent it to me.
Cotton: I had already talked with Bell about it. I presume it is the same thing.
H.M.Jr: Give it to Thompson and let him settle it and let him say yes or no for my signature, will you please?
Thompson: Yes, sir.
H.M.Jr: Just fix me up a letter and say yes or no. I will sign it.

Harry?

White: That is all.

H.M.Jr: Chick?

Schwartz: Nothing.

H.M.Jr: I see that some of the papers think that we are favorable to Mr. Wallace and some think that we aren't.

Schwartz: It depends on who they talk to.

White: Because I said they are throwing a boomerang at me, they are not favorable. That was funny. I was also sorry to learn in some of the papers that I could have stopped the war and I didn't.

H.M.Jr: The thing, Harry, that got me the greatest - I am glad you brought that up. I would have gone ahead with it but Dr. White said it cost too much. Oh boy, you won't be invited to any more midnight meetings. You are Treasury in the big way.

White: With a world war in the offing and the question, shall we stop it or shall we not, we will refer this matter to Harry White, and Harry White says no, it costs too much so let the war go on.

H.M.Jr: I thought that was wonderful. I was waiting for somebody to say something. I didn't want to rub it in.

White: I said a lot of things, but I wouldn't want to repeat them here.

H.M.Jr: That appeared in the paper and Mr. Duffield's resignation - there was no hook-up between the two, was there?

White: No.
Viner: Peace is expected.
White: Peace is wonderful.
H.M.Jr: And peace reared its ugly head. White said it cost too much. That’s top. Well, it helped the bond market. The bond market went up on the thought that Barry was for economy.
White: So careful of Treasury expense for a change.
H.M.Jr: Harold?
Graves: I sent you a note yesterday telling you of the action finally taken by the Bureau of the Budget on our Procurement Division.
H.M.Jr: I didn’t see Miss Chauncey yesterday.
Graves: We were notified about this just before noon on Saturday. They gave us a small fraction of what we had asked for to transfer temporary emergency people now doing regular work to our regular fund. They gave us a fraction of what we asked for to set up a statistical unit in the Procurement Division, but gave us nothing to extend the functions of the Procurement Division beyond their present scope. Mr. Smith told me that the Bureau of the Budget would help us to pay funds by transfer from the various agencies of the Government to permit us to expand the work of the Procurement Division beginning the first of July next. Our hearing before the House Committee on Appropriations is today.

Now, that leaves us utterly unable to do anything before the first of July with reference to carrying out the program that you had outlined to me. I do feel, however, that we can make substantial headway from that time on, although we have a very difficult problem ahead of us in obtaining the funds which are going to be necessary to enable us to operate. We apparently are cut off altogether from extending the function of the Procurement Division to the field, purchases.

H.M.Jr: Harold, I tell you what I would like you to do. Get me a letter talking about the functions and
not mentioning any money and say, "This is what we propose to do," and that we can't do it - I will write it directly to the President you see.

Graves: We were not notified, you see, until the last minute about this thing and the House hearing ahead of us, it seemed to me that we were practically cut off from any....

H.M.Jr: Can't you go ahead and ask for it at the House hearing?

Graves: No.

Bell: Against the law.

Graves: I think it is not proper for us to do that.

H.M.Jr: I don't think I will write to the President, then. I have never done that. I don't think I will write to the President.

Graves: We can go a substantial distance.

H.M.Jr: Let's do that. I have never written to the President.

Graves: It is going to be much slower.

H.M.Jr: Let's do the best we can.

Graves: That is my recommendation, that we put up with this and do the best we can.

Bell: You can go after a supplemental.

H.M.Jr: Let's do the best we can.

Bell: Dan?

H.M.Jr: Any deadline on that letter? Do you want to take it with you this afternoon?

H.M.Jr: No, I am going to give it to him at lunch.

Bell: Well, it is all ready.
H.M. Jr: Would you bring it in personally at 10:45?
Bell: I think I can, yes. It is all ready, it is just being run. Gaston just passed it, I think.

H.M. Jr: Bring it in at 10:45.
Bell: May I discuss at the same time the allotment?

H.M. Jr: At the same time.

Bell: Miss Perkins is having her meeting this morning and I understood you wanted me to attend that.

H.M. Jr: Yes, please.

Bell: There is also a meeting of the Board of Directors of the Federal Farm Mortgage this afternoon. It may be the last, in view of what is happening.

H.M. Jr: Well, Mr. Wallace receiving Mr. Gaston and me at 11:30 - he wouldn't receive us until Louie Brown got there. According to Wallace, Louie Brown knows all his doings.

Gaston: You notice the deadline on that unqualified resignation was Wednesday morning. That is the final deadline for him to submit his unqualified resignation.

H.M. Jr: Well, Wallace wanted it Thursday. I expect to receive a doublecross, so I don't want....

Bell: I might get some information. That is what this meeting is for.

H.M. Jr: Norman?

Thompson: I have another retirement case.

H.M. Jr: Do you want to extend it?

Thompson: No, that is just a letter on it.

H.M. Jr: Anybody got anything else? Whoever is Comptroller of the Currency this morning is coming in at 10:00 o'clock.
My dear Mr. Smith:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Honorable Harold F. Smith,
Director, Bureau of the Budget,
Washington, D. C.

Enclosure

By special messenger 12/19 at 4:30 PM marked "personal and confidential."
My dear Mr. Smith

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 19th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

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(signed) H. Morgenthau, Jr.

Honorable Harold B. Smith,
Director, Bureau of the Budget,
Washington, D.C.

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Sincerely,

(signed) H. Morgenthau, Jr.

Secretary Harold B. Smith,
Director, Bureau of the Budget,
Washington, D.C.

Enclosure

By special messenger 12/19 at 4:30 P.M. marked "personal and confidential."
By Dear Mr. Smith

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Sincerely,

(signed) H. Morgenthau, Jr.

Honorable Harold B. Smith,
Director, Bureau of the Budget,
Washington, D. C.

By special messenger 12/19 at 4:30 PM
marked "personal and confidential."
Dear Mr. Currie:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 18th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Ensemble Lauchlin Currie,
Administrative Assistant to the President,
Department of State,
Washington, D. C.

Enclosure by special messenger - 12/19 at 4:30 P.M. marked "personal and confidential"
By Dear Mr. Currie

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 18th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1935 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morganthau, Jr.

Meanwhile Leonel Currie,
Administrative Assistant to the President,
Department of State,
Washington, D. C.

Enclosure

by special messenger - 12/19 at 4:30 P.M.
marked "personal and confidential"
By dear Dr. Currie:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 16th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Honorable Leonid Leonidov,
Administrative Assistant to the President,
Department of State,
Washington, D. C.

Enclosure

by esp. messenger - 12/19 at 8:30 P.M.
marked "personal and confidential"
My dear Mr. Currie:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 18th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) E. Morganthau, Jr.

Honorable Louis H. Currie,
Administrative Assistant to the President,
Department of State,
Washington, D. C.

Enclosure

by spee. messenger - 12/19 at 4:30 P.M.
marked "personal and confidential"
By Dear Mr. Chairman:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 16th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) E. Morgenthau, Jr.

Enclosure

Honorable Marriner S. Eccles,
Chairman, Board of Governors,
Federal Reserve System,
Washington, D.C.

By spec. messenger 12/19 at 4:30 P.M. marked "personal and confidential”

OGH

Enclosure

Dec 19 1939

Regraded Unclassified
My dear Mr. Chairman:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Honorble Marriner S. Eccles,
Chairman, Board of Governors,
Federal Reserve System,
Washington, D. C.

Enclosure

By spec. messenger 12/19 at 4:30 P.M. marked "personal and confidential"

Dec 19 1939

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Sincerely,

(signed) H. Kergentz, Jr.

Honorable Harry G. Euless,
Chairman, Board of Governors,
Federal Reserve System,
Washington, D. C.

By spee. messenger 12/19 at 4:30 P.M. marked "personal and confidential".

Radio wire
12/19/39
By Dear Mr. Chairman:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Honorable Harriman S. Hruska,
Chairman, Board of Governors,
Federal Reserve System,
Washington, D. C.

By special messenger 12/19 at 4:30 P.M. marked "personal and confidential."
My dear Mr. Secretary:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Honorable Henry A. Wallace, Secretary of Agriculture, Washington, D.C.

Enclosure

sent by spec. messenger 12/19 at 4:30 P.M. marked "personal and Confidential" OGH
By Dear Mr. Secretary:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) H. Morgenthau, Jr.

Respectfully,

Hans H. Hudson, Assistant Secretary of Agriculture, Washington, D. C.

Sent by spec. messenger 12/29 at 4:30 P.M. marked "personal and confidential."
My Dear Mr. Secretary:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) E. Morgenthau, Jr.

Honorable Henry A. Wallace,
Secretary of Agriculture,
Washington, D.C.

Enclosure

sent by spec. messenger 12/19 at 4:30 P.M. marked "personal and Confidential" OON

Enclosure

EC/EC
12/19/39

Regraded Unclassified
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Sincerely,

(signed) H. Morgenthau, Jr.

Honor[able] Henry A. Wallace,
Secretary of Agriculture,
Washington, D.C.

Enclosure

sent by spe[cial messenger] 12/19 at 11:30 P.M. marked "[personnel and confidential]"

Enclosure

12/19/39

Regarded Ucclassified
By dear Mr. Secretary:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 16th, I enclose a copy of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(signed) E. Morganthau, Jr.

Honorable Harry A. Wallace, Secretary of Agriculture, Washington, D.C.

Sent by spec. messenger 12/19 at 4:30 P.M. marked "personal and confidential."
By dear Mr. Chairman:

With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 15th, I enclose two copies of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(Signed) E. Morgenthau, Jr.

Honorable Frederic A. Delano, Chairman, Planning Board, National Resources Committee, Washington, D. C.

Enclosure

By spec. messenger 12/19 at 4:30 P.M. marked "personal and confidential."
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With reference to the income certificate plan for agriculture discussed at the meeting of the Fiscal and Monetary Advisory Board held in my office the morning of December 18th, I enclose two copies of a memorandum prepared in the Treasury Department on the subject. The analysis was based on the certificate plan as incorporated in several bills introduced during the 1939 regular session of Congress. It is understood that this plan differs in some respects from the plan at present contemplated by the Department of Agriculture.

Sincerely,

(Signed) H. Morgenthau, Jr.

Honorable Frederic A. Delano, Chairman, Planning Board, National Resources Committee, Washington, D. C.

Enclosure By own messenger 12/19 at 4:30 P.M. marked "personal and confidential."

REG/unc
12/19/39
My dear Mr. Chairman:

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Sincerely,

(Signed) H. Morgenthau, Jr.

Honorable Frederick A. Delano,
Chairman, Planning Board,
National Resources Committee,
Washington, D. C.

Enclosure

By spee. messenger 12/19 at 4:30 p.m. marked “personal and confidential.”
December 19, 1939

Cabinet

THE WHITE HOUSE
WASHINGTON

Wants tax message

Pew

President

Wants China to continue to play with Russia. To keep Russia and Japan apart.

Gave Pres. note about Schmidt.

Pres. told Hull to add nickel and tungsten to list of metals.